

Might Supplementary Tethered Currencies Reduce Financial System Risks?

*Shann Turnbull PhD
sturnbull@mba1963.hbs.edu

ABSTRACT

The research question is to investigate if supplementary tethered currencies might reduce financial system risks and provide a superior fallback position to Bitcoin in a crisis? To investigate the question, a hypothetical \$Z supplementary cost carrying currency is considered whose value is tethered to the retail value of kilo-watt-hours generated from renewable energy. Gesell (1916) proposed cost carrying money that was supported by Fisher (1933), Keynes (1936), Suhr (1989), Buitter (2009) and Menner (2011). Private issues of self-financing self-liquidating cost carrying “Stamp Scrip” money competed successfully with official gold backed currencies during the Great Depression in Europe and the US. The emergence of private cost carrying currencies in Germany since 2003 tethered to the Euro provides evidence of its viability and acceptance. The paper concludes that pegged side chain crypto currency technology provides a basis for nation states and/or their bioregions to unilaterally establish sovereignty over their financial system to minimize crisis contagion by introducing Tethered, Tagged and Terminating (“3T”) currencies that are better fit for purpose than official digital money. The short-term incentive to facilitate and encourage monetary experiments towards this goal is provided by: (i) the pressing need to establish a more attractive alternative than Bitcoin in the event of another financial crisis, (ii) raise tax revenues by identifying profits shifting and money laundering from tagging transactions and (iii) tracing illegal or terrorist transactions. Because Bitcoin does not meet any of the 3T conditions its tax status should be that of a commodity not a currency.

Key Words: Cost carrying money, Market failure, Systemic risks, Tagged currency, Tethered currencies.

JEL Classification: E02, E21, E22, E50, E60, D63, F30, F40, F60, G00

*Co-founding member of the [Sustainable Money Working Group](#) (UK)

Principal: International Institute for Self-governance

PO Box 266 Woollahra, Sydney, Australia, 1350

Ph: +61418222378; Fax: +61280655905

Skype: shann.turnbull

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1. Introduction

This paper is motivated by the cover story of *The Economist* (1990b: 9): “Its time to tether currencies”. Motivation has been reinforced by the interest of governments into digital currencies. The Australian Senate announced¹ on 2 October 2014 an inquiry into digital currency. On 3 November 2014 the UK Treasury made: “A call for information” on digital currencies².

The Economist in 1990 went on to say: “Economic historians will look back on the 1980’s as the decade in which the experiment with floating currencies failed”. The article explained how economic theories that *The Economist* had supported did not fit the empirical evidence in regards to how a floating currency should “act as a balancing mechanism”.

Three decades later, the global financial crisis of 2008 and subsequent uncertainties about the maintenance of the Euro, again provided evidence that the financial system with floating currencies did not “act as a balancing mechanism”. Nor is the current system capable of being reliably regulated according to the Secretary General of the Basle Committee on banking supervision. He stated “it will be impossible to avoid a repeat of the failures that caused a near collapse of the financial system in 2008” (Drummond 2011).

Since the 2008 crisis, the financial system has increased the risk of failure according to Haldane, when he was the executive director for financial stability at the Bank of England. Haldane (2011) identified a “doom loop” from banks creating credit to lend to each other. In this way banks have become more tightly interconnected so any idiosyncratic failure of one could lead to the failure of many. Unconventional monetary policy had been introduced not grounded in theory or much empirical experience according to Joyce, Miles, Scott & Vayanos (2012). “Banking and finance are now seen as a source of system instability” (Woolley 2010).

These concerns raise the need to consider the very fundamental question if the nature of modern money contributes to systemic risks? The question if modern money is fit for purpose is a neglected issue. The monetary system determines how goods and services are priced and so the efficiency of how resources are allocated. This impacts on the efficiency of the macro economy.

However, as no official currencies can be defined in terms of any one or more specified goods or services it raises the question as to why prices are optimal for allocating resources efficiently? In other words are the values created by official currencies fit for the purpose for efficiently allocating resources on a sustainable basis? This raises the question if the nature of money, its creation and distribution is fit for purpose? Might one or more currencies tethered to a sustainable service of nature reduce systemic risks and inefficient allocation of resources?

Money has become disconnected from real things including the state of the environment. In regards to the environment Stern (2006) reported that climate change is “The biggest market failure the World has ever seen.”

Modern currencies have become a belief system based on an ideology that markets are “free” and independent of human manipulation. However, the purpose of central banks is to control the volume of money created and its interest cost. The monopoly control of official forms of money means that central banking policies are applied throughout an economy. Like command and control economies the opportunity for variety is denied. This denies evolutionary processes to discover varieties of money that are better fit for purpose. It can

¹ http://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Economics/Digital_currency

² <https://www.gov.uk/government/consultations/digital-currencies-call-for-information>

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also introduce major distortions in prices for allocating resources as discussed later. However, the global emergence of new types of digital currencies is introducing a “choice in currency” as envisaged by Hayek (1976a) and with “Free Banking” (Dowd 1992, White 1993).

Technology has introduced new many new types of currencies like “Bitcoin” (Nakamoto 2009) that is not centrally controlled by either governments or private interests. Like official money Bitcoin is a virtual currency or a synthetic commodity whose value cannot be defined in terms on any one or more real goods or services. As noted by financial commentator Münchau (2014): “Our flawed financial system is reflected in Bitcoin”. In other words official money is just as virtual as Bitcoin.

Visitors from another planet would find our belief in markets incomprehensible. Why should a currency whose value cannot be specified by any real things, be used to determine how real things are valued, priced and so distributed? Our visitors would conclude that money was a religion not subject to scientific validation. Might virtual official currencies undermine the rationale for market economies? This question leads to our research question if supplementary tethered currencies might reduce risks of the financial system and provide a superior fallback position to Bitcoin and/or other crypto currencies in a crisis?

As no official money is today tethered, an analysis of the research question requires considering a hypothetical currency that is tethered. *The Economist* (1990b: 9) noted that “History offers no entirely convincing model” on how to define the value of a currency. There are currently some 5,000 or so non-official currencies registered with the Complementary Currency Research Centre (CCRC 2014) that are tethered. Brenes (2011: 34) reports on various agricultural commodities backed vouchers described as a “currency” in Central America. But these do not seem to possess the potential to provide a stable unit of value. There are around fifty different types of mediums of exchange listed in the CCRC reference data and it is not clear which may be tethered to anyone or more commodities other than human labor. Many are tethered to official currencies of their host economies like the Brixton Pound in the UK, and the Wirtschaftsring or WIR (Economic Ring) in Switzerland. The WIR is the oldest and biggest complementary currency established in 1934 (Greco 1994).

Time Banking (Cahn & Rowe 1992) is tethered to human labor, as are many Local Exchange Trading Systems (LETS) like Ithica Hours³ (Nishibe 2001). However, the value of labor hours can vary considerable between individuals according to their physical and intellectual contributions. The value of the various contributions can also vary greatly and depends on the context of supply and demand in any particular region or time. Labor hours do not provide a satisfactory basis for establishing an objective unit of value for a tether.

According to Antonopoulos (2014) there are already 190 crypto currencies using the technology. There has also been a proliferation of privately issued transnational virtual currencies like “QQ coins”, Facebook credits, ‘Litecoin’, “Ripple” (*The Economist* 2013) and the “Ven”, “Linden Dollar”, “Second life”, “World of Warcraft Gold”, “Entropia” (Stalnaker 2011). Some are tethered to various commodities and/or derivatives.

The classical proposals for tethering the value of a currency is to establish a basket of commodities in proportions that follow their consumption in the currency region (Selgin & White, 1994). However, the mix would change between and within nations. Changes in the mix can arise for some commodities over the seasons and technology is continuing creating changes in patterns of consumption. Such changes introduces a governance problem of how often changes in the reference commodities were introduce and by how much, by whom, for

³ <http://www.ithacahours.com/>

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what currency region, and other concerns set out in Turnbull (1983).

The problem is compounded with the private issue of tethered currency when there is little or no transparency as to the exact nature of the basket commodities with private interests possessing the power to change/manipulate the mix of commodities. In an attempt to minimize the above concerns a hypothetical \$Z currency is suggested as a means for investigating the research question.

Consideration of how a tethered \$Z currency could be constructed is considered in the following section. The third section considers how \$Z might best be tethered, and in the fourth section how \$Z might be governed? In the fifth section options are considered for how a \$Z might be tested and developed and if Bitcoin should be recognized as a currency for tax purposes.

2. Selection of the type of reference currency

Technology has introduced new options on how money can be created, designed and used. Cell phones make it practical to re-introduce cost carrying money that has been used over the millenniums (Gesell 1916, Suhr 1989, Turnbull 2009a).

Costs arose in ancient forms of money from the need to provide storage facilities be they for precious metals or consumables (Davies 2002; Galbraith 2001). Consumables like grains, tea and tobacco degraded in storage to introduce additional costs. Storage facilities became banks by issuing deposit notes to suppliers of physical or “hard” currency stored for safekeeping. The notes represented a title deed to the ownership of the hard currency in storage. Redemption of the notes would involve a discount to cover the storage cost (Suhr 1989). Deposit notes could be used as hand-to-hand money but it was the hard currency that carried the cost of storage on redemption.

Besides earning a storage fee from deposits banks could also earn interest by making loans. Rather than transferring their hard currency to a borrower, it was more convenient for both the borrower and the bank to create a paper title deed to a specified amount of hard currency in their vault or warehouse. The title deed created for borrowers could be identical to the title deed given to those who deposited hard currency and so could be used as hand-to-hand money. In this way loans created deposit notes that were used as hand-to-hand money.

Bank deposits represent today around 97% of the money supply with only around 3% of it being in the form of notes and coins. Some countries like Sweden are proposing to do away with notes and coins⁴. Officials describe banks as deposit *takers*, when in fact their dominant function is being deposit *makers*. In this way official language obscures the fact that private banks are the dominant creators of official money.

The interest earned from lending deposit notes provided the incentive for banks to print more currency notes than the hard currency that they held in their vaults. This was not only a fraud on those who had deposited hard currency but it also created a Ponzi scheme because it would be impossible for a bank to deliver hard currency to all the holders of their notes at the same time. As the bank only held a fraction of the hard currency it had promised to deliver on demand to holders of its promissory notes, this fraudulent practice is described by the euphemism of “fractional banking”.

The idea of money owners earning interest growing at compounding rate from deposit notes created by a stroke of pen became a concern of Proudhon (1840). Proudhon

⁴ <http://www.cbc.ca/m/touch/world/story/1.1202565/>

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considered interest as unearned income that allowed money owners to gain wealth without either the owner or their money contributing value to society. The concerns of Proudohn inspired Gesell (1916) to propose that paper money should depreciate in value. This automatically arose in ancient time when money was a consumable commodity like grain.

This form of money would no longer be attractive to carry out the function of being a store of value. The role of money would be simplified to become mainly a medium of exchange and a unit of account or value. This introduces profound benefits considered later.

In 1919 cost carrying paper notes began circulating in Germany that required a stamp of 1% of their face value to be purchased from the issuer and be affixed to the notes each month (Fisher 1933:17). Gesell (1916) had proposed a cost of only 0.1% of the face value of each note per week, equivalent to 5.4% per annum. Keynes (1936: Chapter 23 part VI) thought that this “would be too high in existing conditions, but the correct figure, which would have to be changed from time to time, could only be reached by trial and error”. However, during the height of the Great Depression a much higher rate of 2% a week was widely accepted in Europe and the US. This meant that the issuer received an income from the sale of stamps of 104% per year. The revenues allowed the issuer to give away the notes that were described as “free money” or “Stamp Scrip” yet still make a 4% gross profit after redeeming them for their full value after a year. In other words the money became self-liquidating and self-financing.

Fisher (1933: 64) describes how the “pump priming” of the US economy in 1932 by the Federal Reserve failed because its approach “was conceived *for the producer, not the consumer*” (Italics in the original text). He went on to say that: “this is precisely where Stamp Scrip comes in – to give buying power to the consumer, *and supply the compulsion to use it.*” Fisher also notes that it discourages “the banks from hoarding cash – ‘to keep liquid’ as they prefer to express it.” This use of cost bearing money, as noted by *The Economist* (2009a) and Monboit (2009) again has relevance as a way of “reinflating” an economy described by Fisher (1933: 61). However, since the financial crisis in 2008, “pump priming” has again been “conceived for the producers, not the consumers” of credit.

The viability of the private issue of stamp scrip has again been demonstrated in Germany where it re-emerged in a minor way as a complementary currency to the Euro in a number of regions (Migchels 2012). Gelleri (2009) established the most successful regional cost carrying currency in 2003 known as the “Chiemgauer”. A Regional Money Association⁵ was established in 2006 with the support of Kennedy (1988). The Chiemgauer established collaboration with a local bank and has been rapidly increasing its turnover with two thirds of the transactions activated by mobile phones.

In 2002 cell phone technology developed to a degree that allowed Africans in regions with few land lines a fewer banks to spontaneously use simple cell phone airtime as a proxy for money (McKemey, Scott, Souter, Afullo, Kibombo & Sakyi-Dawson, 2003). “Africans were transferring airtime to their relatives or friends who were then using it or reselling it”. Since 2007 a number of governments in developing countries have allowed cell phones to distribute their official currencies both domestically and internationally (Turnbull 2010a: 34). Today there are as many cell phones in the world as men women and children⁶ while only half the population of the world have bank accounts⁷.

With an appropriate application, cell phones could automatically remit the carrying cost

⁵ <http://regionetzwerk.blogspot.de/>

⁶ <http://www.businessweek.com/articles/2012-04-25/why-half-the-world-doesnt-have-bank-accounts>

⁷ http://en.wikipedia.org/wiki/List_of_countries_by_number_of_mobile_phones_in_use

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that acts like a negative interest rate to greatly facilitate the use of cost carrying money (Turnbull 2010a). “Bitcoin’s technology could be used to transfer ownership in other currencies or any other kind of financial asset” (*The Economist 2014a*). It can also create “a global registry of ownership in physical assets”. Ali, Barrdear, Claws & Southgate (2014) noted that the distributed ledger of the Bitcoin technology had the potential to replace central banking with decentralized banking. An outcome anticipated by a number of authors including King (1999: 47).

Proudohn (1840), Gessell (1916), Fisher (1933), Keynes (1936), Suhr (1989), Buiter (2009) and Menner (2011) have identified a number of attractive features of negative interest rate- money. A review is tabulated in the concluding section. These features together with its rapid widespread acceptance during the Great Depression and its modern acceptance in Germany, provides compelling reasons for adopting it as a type reference currency to investigate sources of market failure or systemic risk. The next section considers how this type of currency might best be tethered.

3. Selecting the tether for a reference currency.

Technology over the last 25 years has introduced new options for tethering money not raised by *The Economist* (1990b). However, it is worth noting the two requirements they suggested for establishing a tethered currency:

To succeed, a system of fixed exchange rates must be credible. If financial markets expect an exchange rate to be changed, the battle to keep it fixed is nine-tenths lost. Second, the system should have price stability built securely into its fabric. This is desirable in itself, but without it the system is anyway unlikely to be credible. (*The Economist 1990b: 9*).

To provide a basis for evaluating the relative value of currencies in terms of real goods and services *The Economist* invented in 1986 “The Big Mac index” based on the theory of purchasing-power parity (PPP) (*The Economist, 2014b*). However, when *The Economist* (1991) analyzed price distortions created by fiat money in the Soviet economy it used energy consumption measured in Kwhs as suggested by Turnbull (1977).

The attraction of using Kilo-watt Hours (Kwhs) rather than hamburgers is that the quality and characteristics of a hamburger can vary while the quality of energy is not an issue and its quantity can be metered. Another attraction of Kwhs is that living standards correlate with the consumption electricity (Gogerty & Zitoli 2012). Electricity has become essential for modern societies. Energy consumption can determine the quality of life⁸. Other essentials ingredients to sustain life like clean air, water, and food can now be produced with the aid of energy driven technology. The direct use of clean air, clean water and other commodities as a tether, introduce uncertainties in their governance as raised in the introduction. But this does not deny their possible use to introduce competition in currencies as advocated by Hayek (1976a,b).

The most compelling reason for using Kwhs as a tether arises ironically from the manner of their generation. As noted above the generation of Kwhs from burning carbon has created “The biggest market failure the World has ever seen” (Stern 2006). One way of correcting this market failure in allocating resources is to tether the value of money to Kwhs generated from benign sources of renewable energy. A currency tethered in this way could be described as representing “Sustainable Energy Dollars” (SEDs). For brevity they will be referred to as how they are pronounced “\$Z” (Turnbull 2012b). \$Z would change the relative prices of other goods and services and so how the “invisible hand”

⁸ Peshine Smith articulated in the 19th Century the idea that improvements in living standards arising from technological change might best be measured by the production of non-human energy (Hudson 1975: 212-240).

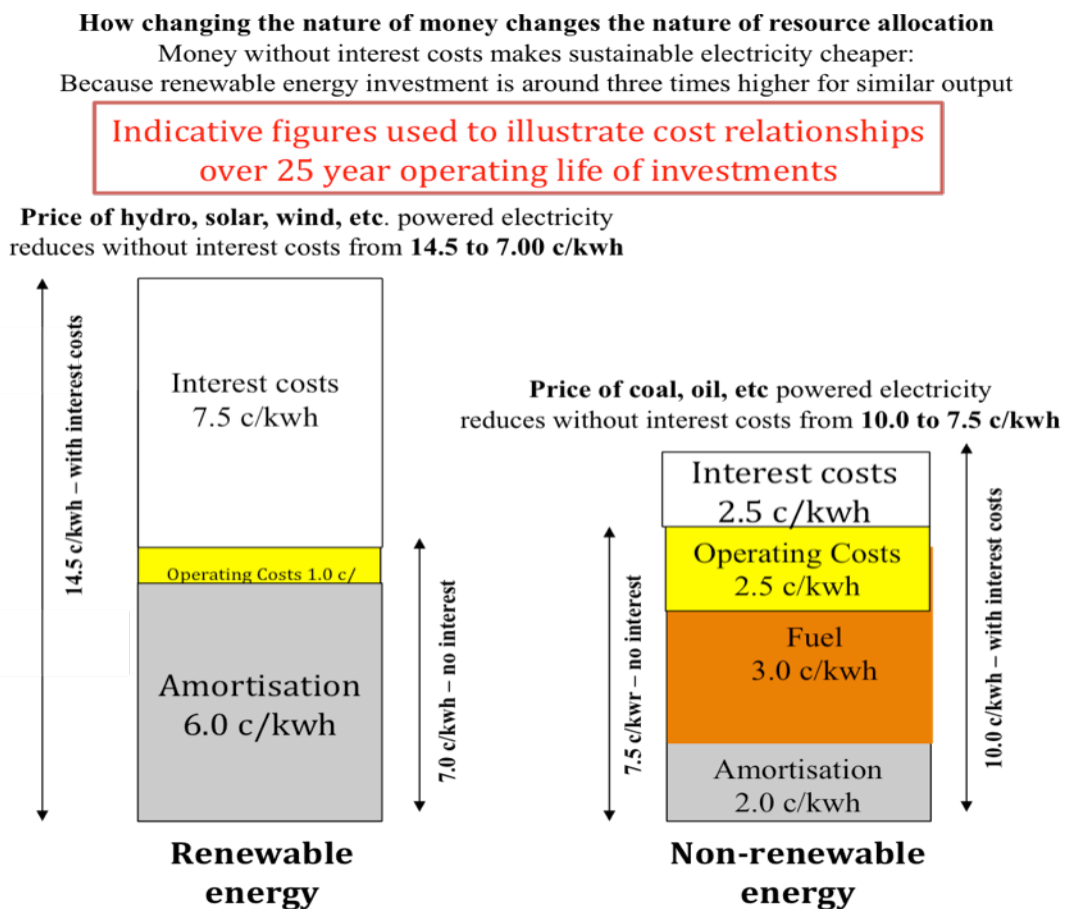
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allocated resources.

The Stern report has introduced a convincing reason that the history of money had not previously considered for tethering a currency. How \$Zs can ameliorate: “The biggest market failure the World has ever seen” is next considered. Also, how might \$Z meet the two conditions specified by *The Economist* (1990b: 9) for its acceptance.

The cost of the investment to generate electricity from benign renewable energy is typically three times greater than the investment cost required for generators burning carbon (Turnbull 2010b). If for simplicity we assume both types of investments have the same useful life (e.g.25 years) and are only financed by debt, then both the interest cost and the amortization cost of the renewable energy investment will be three times greater as indicated in Figure 1.

Figure 1



As a result, removing the cost of interest for both sources of energy through the introduction of \$Z can make electricity generated from renewable energy more competitive than burning carbon. The major remaining cost subject to inflation for renewable energy would be its operating costs. The costs of burning carbon subject to inflation would be five times greater made up of operating costs of \$Z. In addition, over 25 years the cost of non-renewable carbon sources could outstrip inflation as they became depleted and/or carbon taxing and trading was introduced.

Figure 1 and the analysis of Turnbull (2010b) indicate how \$Zs with a negative interest rate could reduce or eliminate the need for carbon taxing or trading to reduce or remove “The biggest market failure the World has ever seen”. This provides a necessary but not sufficient condition for adopting benign renewable energy as a currency tether.

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Sufficient conditions require a governance architecture that provides creditability that the tether will not be changed or manipulated and that “price stability” is “built into its fabric”. These issues are considered in the following sections.

4. Governing the tether

Electricity can be generated from a number of benign renewable energy resources from any location on the planet. However, some bioregions will be better endowed than others to convert benign renewable energy into electricity. This reality raises the issue of “optimal currency areas” (Mundell 1961, Hall 1983, Jacobs 1985).

If a currency is to define economic values to efficiently allocate global resources then relative competitive advantage of each bioregion will need to be reflected in its unit of value. As a consequence it would become necessary for each bioregion to determine its own standard of value. In this way the environment would influence how the global population is distributed according to the carrying capacity of each bioregion to sustain humanity with benign renewable electricity. Market prices, values and costs become defined and so dependent and connected to each bioregion. A feedback mechanism is created between the environment and society to further the sustainability of both.

The diversity of bioregions and the need to provide creditability of how currency regions are governed would mean that each nation might possess a number of different currency regions. So while cost carrying \$Zs could provide a global medium of exchange its value could be different in each bioregion.

Each currency region could establish its own currency tether and associated carrying cost for its \$Z. It is envisaged by Turnbull (2012b) that the carrying cost would cover the cost of creating, operating and regulating the regional currency. One method of creating \$Z is for producers, traders, consumers and/or investors securing insured credits to facilitate their transactions. This bottom up approach provides a way of keeping the volume of tethered money in line with the volume of economic activity. This contrasts with both conventional and unconventional monetary practices (Joyce, Miles, Scott & Vayanos 2012). Credit insurance would be provided through a mutually owned organization that would establish limits for each of its members like credit card organizations or like for the Swiss WIR. The mutual organization facilitates the issue of \$Z with part of the credit insurance fee attached to the currency created. Additional fees may need to be paid to the mutual insurer according to the credit worthiness and activities of each of their members.

In each currency region there could be a number of sources of benign renewable energy that includes retail sources like solar, wind, micro-hydro, geothermal and biological. Distributed householder and/or community sources could provide high transparency to provide open checking by a broad constituency of both producers and/or consumers. This could be used to create a rich grass roots social and political constituency to provide both acceptance and creditability in tethering \$Zs to the retail value or renewable electricity. The tethering process would then be quite different from the private dealing that determine the London Interbank Offering Rate (LIBOR) or the UK foreign exchange rate that have been subjected to manipulation.

Another vital difference from traditional commodity backed currencies is that \$Zs are not backed by *any* commodity but by the contracts generated by economic transactions. Liquidity is not based on the supply or demand for electricity but on the term of the contracts created. *There is no need for fractional banking.* Instead of defining contractual relations in official fiat money producers, consumers, traders and investors could elect to

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define their contracts in \$Z. Bitcoin and the many other private currencies around the world operate on this basis. Choice in currency is now globally practical as envisaged by Hayek (1976a) and reported by Antonopoulos (2014). The Bitcoin technology can be used to create locally tethered currencies as described by Black et. al (2014).

Democratically controlled renewable energy supply institutions organized as a cooperative, provide a basis to average out over a bioregion the various sources of renewable energy. One of many such institutions is the Midcounties Cooperative⁹ in England with 439,000 members and gross sales of over £1bn. What makes this institution particularly suitable for tethering \$Zs is that it maintains a common price for all its customers. Such an institution provides a way to both creditably establish a tether and in way that could build in “price stability securely into its fabric”.

Price stability would be built in because the cooperative could be averaging production costs over different sources of renewable energy from different technologies and from different efficiencies of the same technology. While geothermal, hydro, biological and soon fusion¹⁰ technologies can provide continuous sources of energy other sources like solar, wind and waves are not continuous and so may require additional investment per unit of output in energy storage systems.

Over time technology could improve so \$Z cannot provide an absolute steady unit of value. For example, the efficiency of solar generators is expected to double¹¹ over the next five years to make them more competitive than burning carbon. However, if the use of solar energy became dominant the need to invest in energy storage would moderate changes in the value of \$Z. As the useful life of renewable electricity generators is around 25 years or longer, the rate of change of the average value of \$Z would be retarded further as more efficient technology replaced the less efficient. In this way \$Z can be expected to hold their value on a more stable long-term basis with much less short-term volatility.

It is difficult to envisage how the governance of \$Z could introduce instabilities that could be greater from those arising from un-tethered official currencies that are next considered.

5. Evaluation of un-tethered official currencies

In this section an evaluation is made of existing un-tethered official currencies in regard to: (a) centralized control of money; (b) incentives to invest in money rather than sources of prosperity; (c) wealth and income in-equality; (d) indiscriminate money creation; (e) undemocratic sources of money creation; (f) monopolization of money; (g) inflation, (h) volatility in the value of money; (i) volatility in the relative value between currencies; and (j) “The biggest market failure the World has ever seen” (Stern 2006).

(a) Centralized control of money

As referred to already central banking can be viewed as a specialized form of central planning that requires one set of monetary policies to fit all areas in a currency region. This

⁹ <https://www.midcounties.coop/>.

¹⁰ Transcript of interview with Mike Dunn, Program Director, National Ignition Facility, Lawrence Livermore Laboratory, Livermore, CA, USA. ABC Science Show, Saturday 8 March 2014 12:29PM posted at: <http://www.abc.net.au/radionational/programs/scienceshow/milestone-for-the-fusion-reaction/5307494#transcript>.

¹¹ Transcript of interview with research professors Stuart Bowden and Chistina Honsberg, School of Electrical Computing and Energy Engineering, Arizona State University, Tempe Phoenix Arizona, USA, ABC Science Show, Saturday March 8, 2014 at 12:11 pm posted at: <http://www.abc.net.au/radionational/programs/scienceshow/solar-energy-challenges-conventional-power-price/5307366#transcript>.

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approach has led to unconventional monetary policies. But the unconventional policies described by Joyce, Miles, Scott & Vayanos (2012) are still top down rather than bottom up as could be introduced with \$Z. This possibility arises because \$Z can be issued on a self-financing and self-liquidating basis as discussed in the second section. \$Z with a 2% a week carrying cost could be given away to citizens to stimulate the economy from the bottom up.

An example of this approach is provided by the Bankhead-Pettengill Bill introduced into the US Congress on February 17, 1933. The Bill proposed that the US Government issue one trillion dollars of stamp scrip to be distributed to each State in proportion to their population (Fisher 1933: 79-82). Half the money was to be given away to the unemployed and other welfare recipients and the other half spent by the States on infrastructure. The stamps were to be sold by the US Post Office owned by the Government, unlike the Federal Reserve Bank. It was attractive for merchants even if they had to pay 2% of the notes in their tills at the end of each week because this was less than the accumulated cost of credit on multiple transactions during a week. All the script issued would be redeemed by the Post Office after 52 weeks to provide a \$40 billion profit for government. The proposal, that would have by-passed the Federal Reserve System, was overtaken by President Roosevelt introducing the first stage of the New Deal two weeks later. This not only protected the interests of the Federal Reserve Bank but also expanded its operations.

Cell phones now provide a way for governments to directly issue tethered or untethered money to their citizens. The whole banking system could be by-passed to stimulate economies from the bottom up. There would be no need for quantitative easing or other unconventional monetary policies with the attendant risks of inflation and/or assets bubbles, etc. Because such issues could be designed to be self-financing and self-liquidating governments could spend money without increasing their debt or tax levels.

Fisher (1933) provides evidence that governments would increase their tax revenues with a supplementary issue of cost carrying money. In reporting on the issue of stamp scrip in the Austrian town of Woergl in 1932, Fisher (1933: 26) states: “after the scrip was issued, not only were current taxes paid (as well as other debts owing to the town), but many arrears of taxes were also collected”.

Self-financing self-liquidating cost carrying money could also be given away to Small and Medium sized Enterprises (SMEs) to stimulate the economy (Turnbull 2009b). No credit checks on firms would be required. Nor would there be a need to create special institutions to fund SMEs as the UK government has proposed (Groom & Jenkins 2014; Groom 2014).

In the event that another financial crisis arose before the government developed such proposals, private interests could issue self-financing money to keep SME's from insolvency. In such a circumstances governments might well overlook any illegalities that such an initiative might introduce. It is on this assumption that the Sustainable Money Working Group (SMWG 2014) was established in London in October 2011. Membership of this group includes the peak body representing the cooperative movement as well as the peak body of the British Chambers of commerce. The members of both organizations involve hundreds of thousands of firms involving around 40% of the UK adult population.

(b) Incentives to invest in money rather than sources of prosperity

The motivation for Gesell and others to promote and adopt cost carrying money was to promote the use of money as a medium of exchange rather than as an investment. Gesell (1916) states:

Must money always remain what it is at present? Must money, as a commodity, be superior to

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the commodities which, as medium of exchange, it is meant to serve?” (Introduction); “Money becomes useful only when it changes possession, when it serves as a medium of exchange and circulates” (Chapter 10); “One of these apparently trivial facts, which has, up to the present, been totally overlooked, is that the nature of our traditional money allows demand (the offer of money) to be delayed from one day, one week, one month, one year to another whereas supply (the offer of wares) cannot be postponed a day without causing its possessor losses of every kind” (Chapter 11).

Keynes (1936) stated that: “The idea behind stamped money is sound” and explains “Gesell’s contribution to the theory of money and interest” in the following way:

In the first place, he distinguishes clearly between the rate of interest and the marginal efficiency of capital, and he argues that it is the rate of interest, which sets a limit to the rate of growth of real capital. Next, he points out that the rate of interest is a purely monetary phenomenon and that the peculiarity of money, from which flows the significance of the money rate of interest, lies in the fact that its ownership as a means of storing wealth involves the holder in negligible carrying charges, and that forms of wealth, such as stocks of commodities which do involve carrying charges, in fact yield a return because of the standard set by money.

Keynes (1936: 234) went on to say:

Those reformers, who look for a remedy by creating artificial carrying cost for money through the device of requiring legal-tender currency to be periodically stamped at a prescribed cost in order to retain its quality as money, have been on the right track, and the practical value of their proposal deserves consideration

Suhr (1989) described cost carrying money as “neutral money” as it could be used to remove the bias to invest money rather than productive assets.

(c) Wealth and income in-equality

In the words of Gesell (1916) who described cost carrying money as “Free-Money”:

The purpose of Free-Money is to break the unfair privilege enjoyed by money. This unfair privilege is solely due to the fact that the traditional form of money has one immense advantage over all other goods, namely that it is indestructible. The products of our labour cause considerable expense for storage and caretaking, and even this expense can only retard, but cannot prevent their gradual decay. The possessor of money, by the very nature of the money-material (precious metal or paper) is exempt from such loss in commerce therefore the capitalist (possessor of money) can always afford to wait, whereas the possessors of merchandise are always hurried. So if the negotiations about the price break down, the resulting loss invariably falls on the possessor of goods, that is, ultimately, on the worker (in the widest sense). This circumstance is made use of by the capitalist to exert pressure on the possessor of goods (worker), and to force him to sell his product below the true price.

In other words it is unfair for owners of money earning interest to increase their claims on society without either them or their money necessarily making a contribution to improving society.

The special privilege possessed by banks to create non-cash money in the form of deposits by making loans allows them to earn special profits not available to others. Huber & Robertson (2000: 89) estimated that the special profits amounted to be 15% of the UK tax collection in 1999. It would much more sense for the government to create deposits and then lend them to the banks while removing the ability of banks to create deposits as suggested by Patman (1941)¹²; Fisher (1934); Friedman (1960); Tobin (1987); Kay

¹² Congressman Wright Patman was a member of the US House of Representatives Committee on Banking and Currency for 40 years and chairman for 20 years. He stated: “When our Federal Government, that has the exclusive power to create money, creates that money and then goes into the open market and borrows it and pays interest for the use of its own money, it occurs to me that that is going too far. I have never yet had anyone who could, through the use of logic and reason, justify the Federal Government borrowing the use of its own money. I am saying to you in all sincerity, and with all the earnestness that I possess, it is absolutely wrong for the Government to issue interest-bearing obligations. It is not only wrong: it is extravagant. It is not only extravagant it is wasteful. It is absolutely unnecessary.” He went on say: “Now, take the Panama Canal bonds. They amounted to a little less than \$50,000,000 — \$49,800,000. By the time they are paid, the Government will have paid \$75,000,000 in interest on bonds of less than \$50,000,000. So the Government is paying out \$125,000,000 to obtain the use of \$49,800,000. That is the way it has worked all along. That is our policy. That is our system. The question is: Should that policy be continued? Is it sane?”

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(2009); King (2010: 170); Benes & Kumhof (2012). In other words, removing the practice of fractional banking.

Eliminating fractional banking would avoid increasing the level of debt to expand the money supply as well as avoiding the need for governments to borrow money and raise taxes to pay compounding interest obligations. However, allowing governments to become directly involved in creating money could raise concerns. This could be removed by \$Z being created by bioregional mutual credit insurers in response to the demand for credit to be used for productive purposes (Turnbull 2012c).

(d) Indiscriminate money creation

The privilege of fractional banking allows banks to create loans for any purposes. The loans could be productive purposes to increase the prosperity of society, for speculative purposes, or for activities that may harm society and its environment. Selective monetary policies could be introduced with the existing system. But this would involve a top down approach orchestrated by central banks and not necessarily in a transparent and open manner. The introduction of \$Z could be used to both introduce transparency and so markets for credit insurance. Market forces allocating credit insurance to create \$Z could assist in evaluating if the use of money was to fund projects that added value by becoming self-financing or were of speculative nature (Turnbull 2008).

(e) Undemocratic sources of money creation

Money is currently created on a top down basis by government mints, central banks and private bankers. The introduction of \$Z could be used to create a democratically controlled bottom up transparent process as described above.

(f) Monopolization of money

How a monopoly of an un-tethered currency over diverse regions can introduce serious price distortions can be illustrated by a mind experiment.

For simplicity let us assume that the amount of foreign exchange (FX) required in any geographic region is proportionate to its population. As only ten percent of Australians live in Western Australia (WA) then this region would only require ten percent of Australian FX. However, the export of WA minerals generates seventy percent of Australian FX. This means that every Western Australian is obtaining six times more FX than they can consume. In Eastern Australia the citizens are only obtaining thirty percent of the FX they require.

If both regions could establish their own un-tethered currency then the WA dollar would obtain a much higher value than the Eastern Australian dollar. The changes in the pricing of domestic goods and services in each currency region would be greater than introduced by most reasonable levels of taxes or tariffs. Eastern Australia would obtain an international competitive advantage in exporting educational services, manufactures and in attracting inbound tourism. Citizens might then migrate from East to West to obtain a higher living standard from WA obtaining additional revenues from the sale of their FX surpluses to the East.

A similar problem exists in the Euro Zone. A win-win solution for each region can be achieved by establishing its own unit of value such as described for \$Z. An important consequence would be the ring fencing of contagious systemic risks to each bio-region in a much more compelling way than current practices and proposals to ring fence retail banking from investment banking.

(g) Inflation

Is it reasonable? Is it right, or is it wrong? If it is wrong, it should be changed.”

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As indicated in Figure 1 and discussed above the cost of electricity from renewable energy sources is largely fixed by the sunk cost of the investment. Operational and maintenance costs subject to inflation are of the order of ten percent per year. Increases in these costs might well be offset with the addition of newer technology that increase the average output per sunk cost within a \$Z currency region. In regions with long life hydroelectric or geothermal generators changes in costs of output could be minimal.

Improvements in solar technology at present appear to offer the greatest scope in reducing the sunk cost per unit of output in relation to other sources or renewable electricity. As noted above the increased output per sunk cost would be averaged over the currency region during the 25-year operating life of the legacy technology.

Central Banks typically seek to orchestrate their policy levers to keep inflation within a two to three percent range. For example, a 2.75% inflation rate would half the purchasing power of official money over the 25-year life of renewable electricity generators. This provides grounds to expect that \$Z tethered to a currency region totally dependent upon solar energy need not exceed currently acceptable levels of inflation. Market expectations on the ability of central bankers to meet their inflation targets are another unknown as is the possibility of new financial crises. While the longer-term implications for inflation from the recent massive quantitative easing has been questioned an even more crucial question is the future of central banks.

The future of central banking has been questioned by a number of authorities (Dowd 1998, Friedman 1999: 28, Friedman 2000, Gormez & Budd 2003, King 1999, Goodhart, 2000, Rahn 2000, Cronin & Dowd 2001, Capie, Tsomocos & Wood 2003, White 2001). According to King (1999: 47 & 48) “Will future historians look back on central banks as a phenomenon largely of the twentieth century?” “There is no reason, in principle, why final settlements could not be carried out by the private sector without the need for clearing through the central bank”. King (1999) went on to state:

Without such a role in settlements, central banks, in their present form, would no longer exist, nor would money. Economies of this kind have been discussed by Black (1970), Fama (1980), Friedman (1999), Hall (1983) and Issing (1999). The need to limit excessive money creation would be replaced by a concern to ensure the integrity of the computer systems used for settlement purposes. A regulatory body to monitor such systems would be required. ...

... Central banks may be at the peak of their power. There may well be fewer central banks in the future, and their extinction cannot be ruled out. Societies have managed without central banks in the past. They may well do so again in the future.

While Capie, Tsomocos & Wood (2003) raised the question if central banks would survive the question that they answered was that money would survive from the use of technology to reduce the transaction costs of electronic bartering.

Since the time when the European Central Bank (ECB 2012) did not consider existing private currencies as a threat, their profile of has increased (Filtz 2013). An important innovation of “Pegged Sidechains” attached to the Bitcoin blockchain was announced by Black et. al 2014. On page 16 they noted that pegged sidechains are best suited for a cost carrying currency. The cost of verifying the integrity of the chain need no longer be dependent upon mining new Bitcoins. Users of the currency would directly pay for the verification of the side chain currency that could be a bioregional tethered \$Z (Turnbull 2014)¹³.

¹³ A framework for regulators to consider how emerging new private currencies might be regulated is presented in Turnbull (2011b, 2013b,c).

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(h) Volatility in the value of money

For commodity export economies the value of their official currency becomes very much dependent upon international commodity prices. This can frustrate both long term business planning and so investment as well as domestic monetary policies. The Australian economy is a case in point where the Governor of its Central Bank has expressed concern that the Australian dollar was overvalued in 2013. This concern may have been an important reason for announcements in 2014 of the planned closure of the three remaining automobile manufacturing plants, a large aluminum smelter and an extensive debate over the future viability of the national airline.

The un-tethered Australian currency raises the question of why should nations possess a form of currency whose value that they cannot control? That this question can be raised indicates that the currency is dysfunctional and “not fit for purpose” (Turnbull 2014). As indicated in discussing (f) the monopolization of money, the diversity of Australian bioregions suggest that it needs more than one reference unit of value to establish stable viable and sustainable prosperity throughout its economy.

(i) Volatility in the relative value between currencies

The volatility in the relative value between currencies is another source of problems. Joye (2014) reported that “fake prices” exist internationally. *The Economist* (1997) reported how “Volatile currency markets claimed the scalps of two emerging economies’ finance minister this week.” The article describes a number of techniques for tethering currencies and states: “The debate about whether it is better to fix exchange rates or let currencies float is one of the longest-running in economics. Both approaches have their merits.”

It is not only emerging economies that are at risk. A case in point is the four major Australian banks that together have over 80% of banking business in the country. Before the 2008 financial over a third of their balance sheets were financed by foreign wholesale borrowings. This has now been reduced to around a quarter. However, all shareholders funds of the four major banks would be wiped out if 25% of their balance sheets had to be refinanced with an Australian dollar that had dropped by more than 30%. A drop of 30% in the exchange rates makes refinancing 43% more expensive. 43% of 25% is over 10% of their balance sheet that could wipe out their shareholders funds.

The possibility of the Australian currency dropping by over 30% is indicated by the fact that in 2011 its peak value was 110% of the US dollar and it then remained at over parity levels for a couple of years. After the 2008 crisis the value of the Australian dollar dropped to 65% of the US dollar, 41% below its later peak, and 35% below the parity level it held for a couple of years.

The banks and the regulator provide assurances that all foreign bank borrowings are fully hedged. But no details are published as to the nature of the counter parties. One problem revealed by the 2008 crisis was that some major counter parties were also subject to failure. International adoption of \$Z could provide a way to reduce volatility between currencies in different currency regions. In addition contagion would be reduced with each bioregional currency area possessing its own tethers.

(j) The biggest market failure the World has ever seen

As discussed in the introduction, a compelling reason for tethering currencies as proposed for \$Z is to minimize market failure in allocating resources to renewable energy rather than burning carbon. This opportunity that also reduces or eliminates the need to introduce carbon taxing or trading and so could represent the most crucial economic, social, and political dysfunctionality of official fiat currencies.

Concluding remarks

The ten points (a) to (j) considered above substantiate the remarks made by King (2010: 18)

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that: “Of all the many ways of organising banking, the worst is the one we have today”. There are a number of other economic, social, political and environmental concerns as set out in ‘Table 1, Existing Official Money and Sustainable Value Money (\$Z)’ that also draws on other writings not previously cited above such as Turnbull (1989, 2013a).

Table 1, Existing Official Money and Sustainable Value Money (\$Z)

	Difference between:	Existing official money	Sustainable Value money (\$Z)
1	Money created by:	Government & banks	Consumers, producers, traders and investors
2	Interest rates set by:	Central Bank	Cost of risk insurance ¹⁴
3	Expansion of money:	Government ratios/regulation	Value of market transactions
4	Value defined by:	Government fiat	Benign renewable energy
5	Unit of value	Not defined	Renewable kwhs (\$Z)
6	Store of value	Yes, subject to inflation	Not a store of value
7	Integrity of value	Indeterminate	Tethered to renewable energy
8	Integrity of system	Exposed to contagion	Little exposed to contagion
9	Choice of currency	Government monopoly	Determined by currency region
10	Inflation control by:	‘Blunt’ policy instruments	Value of renewable energy
11	Structure of money:	Unlimited accrual of interest	Carrying cost limiting life
12	Economic flaw-1	Incentive to own money	Disincentive to hold money
13	Economic flaw-2	Allocates resources to finance	Real assets more attractive
14	Economic flaw-3	Distorts price relativities	Prices set by renewable energy
15	Financial system cost	Ever increasing	Minimized
16	Financial assets/real	Ratio increases	Incentive to minimize
17	Economic growth	Required to pay interest costs	Accommodates de-growth
18	Social flaw-1	Compounds unearned income	No unearned income
19	Social flaw -2	Concentrates influence	Localizes influence
20	Political flaw-1	Concentrates power	Enriches local democracy
21	Political flaw-2	Low accountability	Cooperative accountability
22	Environmental flaw 1	Incentive to burn carbon	Favors renewable energy
23	Environmental flaw 2	No feedback from nature	Nature controls price signals
24	Ecological feedback	None	Local renewable energy service
25	Sustainability	Highly questionable	More likely

A number of the additional concerns arise from the ability of official currencies to earn interest as considered above in 5(b): Incentives to invest in money rather than in sources of prosperity. The practice of fractional banking means that new debt and interest obligations are created with growth in deposit money not necessarily tied to growth in productivity or even production and consumption. If the new loans do not increase productivity in the real economy then interest payments and debts will also increase. Interest payments on home loans and social infrastructure can more than double the cost of financing such long life assets. Kennedy (1998) argues this is a source of inflation. It also exacerbates “financialisation” of the economy (Palley 2007) with an every increasing share of GDP being absorbed by the financial sector whose purpose is to service the real economy (Refer to rows 15, & 16 in Table 1).

¹⁴ When \$Z are created by a third party insuring private contracts to allow them to be used as money with part of the insurance cost attached to the contract/currency to create a negative interest rate. Cost attached to the currency could also include a contribution to a redemption fund and/or a verification fee on a decentralized system as referred to in the text. *The Economist* (1990a: 17) refers to verification fees as “seignorage”.

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Financialisation in leading advanced economies has accelerated in the current century with unprecedented growth in both government liabilities and central bank balance sheets. This process is unsustainable. Correction could create considerable difficulties, instability and risks. The need for a failsafe fallback position to provide “financial lifeboats” could be seen to become urgent (Turnbull 2012a; SMWG 2014). Bitcoin does not provide a viable fall back option as it is limited in scale, un-tethered and does not provide the benefits described above for \$Z.

Exacerbating the problem of excessive financialisation and debt in advanced economies are declining and aging populations (Rosenberg 2010). This reduces the tax base while at the same time increases welfare and pension costs. Further financial stress and systemic long-term risks seem inevitable.

As noted in row 17 of the Table, \$Z can accommodate economies with de-growth. But this does not deny increasing prosperity. Declining populations and de-growth would seem to be an inevitable growing phenomena. It would ameliorate environmental degradation to improve the ability to sustain society on the planet as suggested in row 25 of the Table.

Even if a negative interest rate currency was not tethered a self-financing, self-terminating supplementary official fiat currency has compelling appeal for a government that seeks to stimulate the economy and support SMEs. All that is required is a mobile phone application. The Canadian Royal Mint ran a competition in 2012 to develop applications to transact official money¹⁵. The conversion of applications to handle cost carrying money would not seem a step too far to build a financial lifeboat for citizens and SMEs in the event of another financial crisis (Turnbull 2011a,b; 2012a)? The technology would then be in place to experiment to test the theory and practice of tethered currencies (\$Z).

Technology now allows many units of account to be stored and shared in digital form in credit cards, debit cards and cell phones. The current multiplicity of un-official digital units of account is bound to increase. The time seems overdue for governments to become more involved in the constructive evolution of mobile money. Table 1 indicates the economic, social, political and environmental attractions for rewarding politicians who provide leadership to promote a more rational, efficient, equitable, lower cost and sustainable domesticated financial system that can also become insulated from a crisis in an alien financial system.

Stodder (2005) has also provided empirical evidence that privately organised complementary exchange systems in Switzerland and the US increases macroeconomic stability. The Swiss data is from the WIR and the US data is from the International Reciprocal Trade Association (IRTA) founded in the early 1970's.

Unlike modern official currencies it would be unlikely that \$Z would be subjected to volatility, manipulation by governments, their central bank, speculators, hedge funds, speculators, alien central banks or financial crises. In these ways and those considered above, \$Z provide a basis for ameliorating systemic problems, market failures and risks in the current system. So instead of just being a supplementary currency it may prove practical for \$Z to become an alternative currency.

There are many profound changes that arise from replacing the current “worst” system of banking with one that uses negative interest rate money tethered to a sustainable ubiquitous service of nature. Their consideration would lead the discussion beyond the purview of the research question of this paper.

The past and current acceptance of cost carrying money indicates that even if it was not

¹⁵ <http://mintchipchallenge.challengepost.com/>

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tethered, self-terminating (cost carrying) currencies offers a more attractive alternative to Bitcoin in the event of another financial crisis. As noted above a self-terminating “stamp scrip” type of currency could be issued directly to citizens by governments independently of the banking system through the use of cell phones. In addition it would provide the means to stimulate the economy without governments increasing debt or taxes.

The compelling political and economic attraction of self-terminating currencies are that they could be used to provide liquidity directly to voters and avoid quantitative easing that inflates the balance sheets of the central bank. To obtain these benefits and safeguard citizens from any financial crisis, governments should immediately procure cell phone applications that can both distribute emergency self-terminating money but also be used to collect conventional taxes.

In the event that governments do not take up this suggestion, then their regulators should establish guidelines for the private sector to introduce self-terminating emergency currencies. In addition, regulators could facilitate experimentation and testing of alternative currencies that are better fit for purpose than existing official currencies. To avoid the “Doom Loop” identified by Haldane (2001), experiments could be encouraged for democratically controlled mutual organizations to establish decentralized independently organized supplementary \$Z types currencies. In this way domesticated currencies could be ring-fenced from contagion arising from an alien crisis.

The capability of crypto currencies to provide a detailed audit trail of every transaction could be used by governments to trace tax avoidance, terrorist payments other illegal payments and money laundering. It is recommended that Governments take up the recommendation made at the first hearing of the Australian Senate inquiry into digital currency on November 26th that all digital wallets transacting Bitcoins be registered with the Government or its Tax Office¹⁶.

The next step should be for governments to convert their official digital currency into a crypto-currency to allow them to monitor and trace all transactions in their economies. This could be achieved by nations using the Bitcoin technology to establish locally monitored pegged side chains (Black et. al 2014). According to evidence provided to the Australian Senate hearing this could provide participating governments with considerable additional revenues. The immediate cost/benefits of governments adopting crypto-currencies seem highly compelling. The longer-term benefit would be to obtain the capability of introducing an official currency that is better fit for purpose with the many attractions identified in Table 1.

To sum up, the Bitcoin technology, but not Bitcoins, provide a way for nation states and/or their bioregions to domesticate their financial systems with Tethered, Tagged and Terminating (3T) currencies that are better fit for purpose than the current type of official digital money. The short-term incentive to facilitate and encourage monetary experiments towards this goal is provided by: (i) the pressing need to establish a more attractive alternative than Bitcoin in the event of another financial crisis, (ii) raise tax revenues by identifying

¹⁶ YouTube recording of November 26, 2014 Senate hearings posted at: <https://www.youtube.com/watch?v=6rGHSpC5uNk> The recommendation that Bitcoin wallets be registered with the government was made by Mr Ronald Tucker, Chairman, Australian Digital Currency Commerce Association. Official transcript posted at: <http://parlinfo.aph.gov.au/parlInfo/search/display/display.w3p;db=COMMITTEES;id=committees%2Fcommsen%2F2b299dcf-cf57-4234-a640-c28f9b18ac42%2F0007;query=Id%3A%22committees%2Fcommsen%2F2b299dcf-cf57-4234-a640-c28f9b18ac42%2F0000%22>

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profits shifting and money laundering from tagging transactions and (iii) tracing illegal or terrorist transactions. Because Bitcoin does not meet any of the 3T conditions its tax status should be that of a commodity not a currency.

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