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Part 1

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PART 1

How Might Cell Phone Money Change the Financial System?

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Abstract

The emergence of cloud banking in developing economies from billions of cell phones transacting both legal tender and informal units of accounts has created a need to reconsider habits of thinking about the nature of money and banking in advanced societies. The dysfunctional nature of modern money and banking is revealed by considering cell phone units of account based on four historical forms of money: (i) the current form of synthetic or "fiat" legal tender that can earn interest, (ii) fiat money that does not earn interest but has a usage fee, (iii) "free-money" issued privately with a usage fee, and (iv) "natural" money redeemable into specified goods and/or services with a usage fee. The value of a "green" form of natural money, redeemable into units of renewable electricity, becomes fixed by the investment cost of generators to create an inflation resistant unit of account. This paper identifies green dollars as offering a competitive medium of exchange for the "invisible hands" of (i) investors, (ii) Islamic economies and businesses, (iii) green voters, (iv) governments seeking to reduce the need for carbon taxing or trading, and (v) those seeking a reserve currency in case the financial system fails.

The purpose of this paper is to consider how the emergence of cell phone money in developing economies may change the financial system in advanced economies.

At the end of 2009 there were 4.6 billion cell phone subscribers in a world of 6.7 billion people.[1] Around two thirds of cell phones are in developing countries poorly serviced by landlines and banks. Handsets costing U.S.$13 [The Economist (2009b)] are now produced with transmission time stored in their "subscriber identity module" (SIM). These phones possess the facility of sending part of their prepaid stored transmission time to other cell phones and/or to replenish their stored transmission time from sources of credit on the Internet via the cell phone network provider. In this way cell phone transmission time has become a unit of account in many developing countries that a village store will redeem into goods [The Economist (2009b)].

Transmission time is metered by phone network operators who keep track, store, and/or create airtime credits on their computers in same way banks keep track and store and/or create credits of legal tender on their computers. In this way, cell phones introduce "cloud" banking with units of value stored on any computer in the world used by the cell phone network operator and/or by an "Internet service provider" (ISP) accessed by a cell phone subscriber.

The dysfunctional nature of modern money and banking is revealed by considering cell phone units of account based on four historical forms of money: (i) the current form of synthetic or "fiat" money as decreed by governments to be legal tender that can earn interest, (ii) fiat money that does not earn interest but has a usage fee, (iii) "free-money" issued privately with a usage fee, and (iv) "natural" money redeemable into specified goods and/or services with a usage fee. Usage fees with natural money limits its life and so are described as "ecological" [Turnbull (2008a, b); (2009b)]. An ecological form of natural money whose unit of value is determined by kilo-watt-hours (kWh) of renewable electricity is described as "green" money. The value of a green form of natural money, redeemable into units of renewable electricity, becomes fixed by the investment cost of generators that may last 25 years or more to create an inflation resistant unit of account. This paper identifies green money as offering a competitive medium of exchange for the "invisible hands" of (i) investors, (ii) Islamic economies and businesses, (iii) green voters, (iv) governments seeking to reduce the need for carbon taxing or trading, and (v) those seeking a reserve currency in case the financial system fails.

Cell phones with e-money represent a disruptive technology. Before Mervyn King accepted the position of Governor of the Bank of England in 2003 he raised the possibility with others [White (2001)] that e-money could result in central banks being replaced by "free banking" and/or decentralized banking [Dowd (1992), King (1999)]. Decentralized banking would introduce profound changes in the power of governments, businesses, and the nature of democracy.

Money creates power. So those who seek to exercise power have sought to control the production and management of what can be used as money. Over thousands of years, rulers, dictators, churches, popes, sovereigns, and bankers have involved themselves in the creation and/or control of money. History records many alliances between the self-interests of bankers, rulers, and religious leaders [Davies (2002), Galbraith (1976), White (1993)]. While the development and spread of democracy has reversed historical practices in exercising power, the development of decentralized banking controlled by the people for the people has yet to be reintroduced. The democratization of global communications through the Internet with cell phones transacting e-money has now created a technology for democratizing economic power in a way democracy has for political power.

Since 2008 a number of governments in developing countries have allowed cell phones to store and distribute their legal tender. The central banks in both the Philippines[2] and Bahrain[3] have approved domestic and international transfers directly between cell phones without the need for settlement having to be cleared through their respective banking systems. This step towards a system of decentralized banking from e-money was anticipated by King (1999) who stated, "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."

In developing countries, cell phones are available that can be used as "swipe" cards to purchase goods and services in the same way debit cards are used today. Competing cell phone companies in developed countries are seeking permission to follow this example. Once the electronic infrastructure has been established, only trivial technical changes are required to introduce privately issued and controlled currencies like fly-buy points or other units of account. In this way, communities around the world are obtaining the facility for introducing competing units of account based on whatever the local community finds convenient to be used. The chosen unit of account may or may not also carry out the other two traditional roles of money to be a store of value and a medium of exchange.

1 http://reviews.cnet.com/8301-13970_7-10454065-78.html
2 http://www.nextbillion.net/remittances-mobile-globe-cash
3 http://wirelessfederation.com/news/zain-bahrain-launches-zain-wallet-bahrain/

Evolution of money and banking

This section describes how the nature of money and banking has radically changed over recent times to introduce inherent flaws in the ability of the financial system to allocate resources efficiently, equitable, democratically, or on a sustainable basis.

For thousands of years the only type of money in the world was "natural" [Smith (2009)] money based on real things. As reported by Suhr (1989), "In Ptolomean Egypt, peasants delivered their grain to public storehouses and received certificates of deposit." The deposit notes were typically scratched on sherds of pottery and represented a negotiable property right to a specified amount of grain. In this way deposit notes took on the role of money as a store of value and medium of exchange with the quality and quantity of grain being the unit of value. However, at redemption of the deposit note into grain, a storage and maintenance fee was deducted and in some cases also a tax.

Instead of sherds of pottery, paper deposit notes acting as IOUs were issued by goldsmiths and bankers in the Middle Ages to clients who deposited gold with them for safe keeping. Depositors paid a storage fee, rent, or demurrage charge that acted like a negative interest rate. The deposit notes represented a title deed to the ownership of a specified amount of gold, silver, copper, or later on in the American colonies, tobacco [Galbraith (1976)]. The notes could be used as money but it was money that incurred a fee for its use as in Ptolomean Egypt.

The greed and opportunism of early bankers resulted into practices that today would be both unethical and illegal if carried out by a non-banker. Bankers would accept a deposit of gold to obtain a fee for its safekeeping and issue a deposit note payable to the bearer of the note. The note would circulate as hand-to-hand money as the holder held a property right to a specified amount of gold at the bank. The banker would then create a duplicate deposit note for the same gold to lend to a borrower to earn interest!

By this means the banker had created two property rights to the same unit of "hard," "specie," or "base" money. This duplicity illustrates how banks create money out of nothing even when paper money is redeemable into a natural commodity. If a borrower required specie currency, then the banker became an embezzler when they physically lent out the hard currency deposited with them for safekeeping by a client. The more loans a bank made, the more interest and profits it made, so there was a compelling incentive for banks to print more and more duplicate notes providing property rights to the same unit of specie currency so as to make more loans. As the bank would only hold a small fraction of the specie currency it had promised to pay to all bearers of its notes, the practice was described a "fractional banking." As holding paper notes is more convenient than holding gold bullion or other types of specie currency the practice became accepted. However, it represents a type of Ponzi scheme as only a fraction of the paper money issued could be redeemed into specie money.

When money created by the banking system earns interest it creates another systemic problem from the need to forever create more money to pay the interest liabilities being generated. Debts grow even if the economy does not. It provided one reason for this author to suggest in 1982 that the financial system contained the seeds of its own destruction [Turnbull (1989)]. "The Euro zone's debt crisis" [The Economist (2010)] reveals how the exchange of debts within a region exacerbates the problem when not significantly supported by external credits as China provides to the rest of world.

The Royal Charter given by the King of England in 1694 to private entrepreneurs to establish the Bank of England made legal the duplicity of banks creating money out of nothing. The duplicity provided a way for the King to obtain silver to finance a war against France without taxing his subjects [Galbraith (1976)]. The bank issued shares to investors in exchange for silver that the Bank then lent to the King at interest. The King issued non-interest bearing notes promising to pay back the silver to the bank. The Bank lent these notes signed by the King to borrowers to earn interest. In this way the bank obtained interest from both the King and borrowers for the same unit of silver. The promissory notes issued by the King then circulated as hand-to-hand money. Other banks were also issuing promissory notes redeemable into silver so when the King wanted to borrow more silver he banned other banks issuing competitive notes around London. As the King later required even more silver he extended the monopoly of the Bank of England to issue his notes to all of England. In this way, Bank of England notes became a national monopoly – a practice copied by most other governments around the world, which explains how legal tender became monopoly money.

However, currency notes typically represent less than 5% of the money supply. Banks making loans create the other 95% or more of the money supply. When banks make loans they simultaneously increase both the liabilities and assets in the banking system. Borrowers provide assets to banks in the form of their promise to pay back the loan that is matched by liabilities of the banking system to provide funds. In this way loans create the deposits for making the loans. Regulators limit the creation of credit by this means so that the total liabilities the banks can create do not exceed a specified multiple of the shareholder's equity. The ratio of equity to total liabilities is described as the capital adequacy ratio. Currently banks are expected to have equity that is not a smaller fraction than around 8% of total liabilities.

A mystery of the banking system is why governments inflict upon themselves the need and cost of borrowing money from bankers when

governments have the power to create their own money and not pay interest? The present practice is systemically indefensible. It means that for religious folk, banking has become the biggest confidence trick in the history of civilization.

A second systemically dysfunctional feature is the ability of money to earn interest at a compounding rate for an unlimited time. Fiat money is a social construct that can be created with negligible cost and not be based on the existence of any productive real resource. It becomes an artificial or synthetic asset yet it is given the ability to grow in value without limit and without any human input through accruing interest. Without checks and balances this feature is incompatible with establishing a stable system.

Proudohn (1840), a contemporary of Karl Marx, argued that money should depreciate over time. He argued that is was not surplus value from production that exploited labor but the unearned value obtained by owners of money through interest payments. Gesell (1916) was inspired by Proudohn and noted that the value of real assets deteriorates overtime. Gesell proposed that money should have usage cost to make investors neutral to owning real assets or money that at that time was redeemable into gold or silver. The ideas of Gesell inspired many communities to introduce various types of cost carrying or demurrage currencies that are considered in the next section.

The creation of money that does not deteriorate in value over time also means that a bias is created against increasing productivity by investing in “the processes by which society expands its power to make nature yield its resources more abundantly” [Moulton (1935)]. All such processes that increase productivity wear out but synthetic interest earning assets do not. So a compelling bias is created for investors to allocate human resources to creating, managing and speculating in synthetic assets and so the growth of the financial system rather than in assets that make society more productive and sustainable. The result is a process described as “financialization” [Palley (2007)] by which the size of the financial system increases as a percentage of gross domestic product (GDP).

The financial system can be thought of as the oil in an automobile engine that may represent less than, say, 1% of its mass but without it, the engine cannot work. However, the overhead cost of the financial system in servicing the real economy as a percentage of GDP continues to grow. Its cost in the U.S. rose from 15.2% in 1979 to 20.4% in 2005 [Palley (2007)].

The payment of interest is also indefensible on grounds of equity as it means the rich who own money can get richer by lending money to the poor who pay interest. It is by this means that the World Bank extracts value from poor nations and transfers their income to the rich economies that fund the Bank. This problem can be avoided with self-financing strategies [Turnbull (2001, 2007)] and/or through Islamic banking that forbids the payment of interest. As confirmed by Keynes (1936), “the rate of interest is purely a monetary phenomenon.”

Interest payments can double or even triple the cost of paying off 25-year loans to finance a house, or self-financing infrastructure facilities like water and sewerage works, toll roads, and airports. In this way interest inflates the prices charged for public services and/or increase the taxes that need to be imposed to pay their interest costs. It is systemically contradictory for governments to impose taxes to pay interest on money created by bankers out of nothing that the government could instead create itself. Credit creation by the government instead of by the banks would reduce any inflationary impact of credit creation as costs are significantly reduced [Kennedy (1989), Huber and Robertson (2000)]. Huber and Robertson showed how such a change could substantial reduce the need for the U.K. or U.S. governments to raise taxes to pay for borrowing costs.

The cost of interest contributes to what Stern (2006) described in his report on the economic effects of climate change as “the biggest market failure the World has ever seen.” It is the higher interest cost of sustainable sources of generating electricity that makes burning carbon more attractive [Turnbull (2008a)]. This situation arises because the investment required by per unit of output of generating electricity from water, wind, sun, geothermal, and other sustainable sources can be three or more times greater than that from power generated from burning carbon.

Another bias in resource allocation arises when diverse economic regions share a common currency, as occurs in the European Union, or in natural resource rich countries like Australia, Brazil, and Canada. Consider a mind experiment that assumes that the consumption of foreign exchange in a region is directly proportional to the population of the region. Let us make two other reasonably realistic assumptions for a country like Australia where 1) 10% of the population live in Western Australia, thus requiring only 10% of Australian foreign exchange, and 2) Western Australians earn around 60% of all Australian foreign exchange through the export of their minerals and primary products. This means that on average each Western Australian is earning six times the foreign exchange they are spending and citizens in the east are earning less than half the foreign exchange they require.

Now if Western Australia established its own currency, then its value would be determined by its terms of trade with the rest of the world. The other 90% of Australians residing in the eastern states are earning only 44% (90%/40%) of the foreign exchange that they require. The result would be a substantial decline in the value of the Australian dollar used in the eastern states to create a boom in inbound tourism, education exports, and manufacturing while the stronger Western Australia currency

would attract migrants from the eastern states and make imports much cheaper. Other larger exporters in the eastern states, mainly coal miners and farmers would demand that their regions establish their own non-urban currency to allow them to survive. The history of "faulty feedback to cities" created by a common regional currency over the last thousand years is documented by Jacobs (1985).

The mind experiment illustrates just how potent the design of a currency system can be. Currencies can create market forces far more influential than tariffs and taxes in allocating resources. It illustrates how imbalances can arise in the European Currency Union. It helps explain the economic success of cities with their own currency like Hong Kong and Singapore. Singapore became a competitive manufacturing center when it became independent of Malaysia in 1965 whose currency was kept high by it being a major rubber and tin exporter.

Another feature that makes modern money systemically indefensible is that it has been cast adrift from the discipline of being defined in terms of any specified goods or services. This occurred in 1972 when the U.S. removed the ability of the U.S. dollar to be redeemed into gold. Money that exists as legal tender only by the force of law is described as "fiat" money. All major currencies are either national monopolies or in the case of the euro, a trans-national monopoly. When the euro was created as not being redeemable into any specific commodity, The Economist (1990) described it as "funny money." Like other fiat currencies it can be rightly described as monopoly funny money.

In summary, some of the major systemic indefensible features of the existing monetary regime identified in this section are:

(i) Money is a social construct not definable in terms of anything real.
(ii) There is no basis for interest to be paid for money that is not saved but created out of nothing.
(iii) Prices of real resources are determined without sensitive feedback signals from the environment.
(iv) There is no global unit of value for real resources to be allocated by market forces on a sustainable basis.
(v) There is no inflation resisting global unit of account.
(vi) There may be little basis for resources to be efficiently allocated in diversified economies that share a common currency.
(vii) Governments have delegated to banks the power to create over 95% of money that is a public good to further the profits of private banks.
(viii) Governments raise taxes to pay interest on borrowed money that governments could create themselves to eliminate the need to raise taxes to pay interest.
(ix) More money and credit needs to be continually created to fund the interest payments to private banks generated from their earlier expansion of credit.
(x) The use of money that generates interest charges rather than a carrying costs creates:
  (a) A systematic bias for inequality in wealth with the owners of money increasing their income without human inputs.
  (b) A compelling incentive for the cost of the financial system to grow relative to the costs of the whole economy.
  (c) A substantial bias to burn carbon to generate electricity rather than using investment intensive renewable resources.
  (d) A disincentive to own real assets that deteriorate or incur costs to maintain and/or improve the quality and sustainability of life.
  (e) The need for investment analysis to discount the future value of money and so the ability of humanity to have a sustainable future.
  (f) No basis to justify the reliance on market forces to sustain the existence of humanity on the planet.

The following section considers alternative forms of money that in various degrees overcome the above systemic indefensible features of the existing monetary regime.

Historical examples of cost carrying natural money

This section reviews three forms of cost carrying money introduced or proposed during the Great Depression to supplement official money. At that time official money in Europe had been an unreliable unit of value and in the U.S. it was in short supply.

The different types of money considered for an e-currency to follow are: (i) privately issued money with a usage fee whose value is based on official money, (ii) government issued money with a usage fee, and (iii) privately issued money with a usage fee redeemable into a specified commodity. All three examples represented natural money, as legal tender at the time was typically redeemable into gold or silver. The concluding next section considers green e-money redeemable into units of kilo-watt-hours (kWh) generated from renewable energy sources.

Mainstream economic analysis has neglected[4] the rapid and widespread emergence during the Great Depression in Europe and the U.S. of privately issued "free-money" [Gesell (1916)]. In considering how free markets might organize money, Selgin and White (1994) did not consider money arising without an interest rate as it has in past eras and also during the Great Depression when cost carrying notes emerged. The notes very successfully competed with official money even though they lost all their value if a fee was not periodically incurred [Fisher (1933)].

4 The literature review of free banking (White 1993, volume I: pp xvii-xxii) does not cite Fisher, Gesell, Keynes, Suhr, or any other writers on the theory or practice of cost carrying money.

To answer their question of "How would the invisible hand handle money?", Selgin and White (1994) restricted their invisible hand to only creating three sorts of money: (i) natural money based on a single commodity, (ii) multiple commodity money, and (iii) "no base money" or fiat money. In addition, their analysis implied that any commodity backing a currency would be traditional hard commodities rather than a service of nature like electricity generated from renewable sources.

The monetary regimes considered in this paper introduce two elements mostly neglected in the literature of: (i) cost carrying money and (ii) money defined in terms of a service of nature that is required to sustain life. Today, energy has become a basic necessity to sustain life as grain was three thousand years ago. Energy has the advantage that it can be objectively measured to provide a universal unit of account. However, the value of each unit could vary from region to region according to its endowment of renewable energy.

One explanation of why cost-carrying money has been neglected by economists is that they may find it difficult to envisage why anybody would accept a form of money that incurred a cost and so could not be used as a long-term store of value. However, as noted above, this type of money had been in use for thousands of years. The point that cost-carrying money does not provide a store value turns out to be an advantage. It simplifies the role of money to just being a unit of value to mediate exchange transactions of other goods and services.

The reasons why and how cost-carrying money was introduced in the Great Depression and quickly spread was documented by leading monetary scholars of the time like Fisher (1933) and Keynes (1936). It is curious why their writings on "stamp scrip" (Fisher 1933) that Gesell referred to as "free-money" have been overlooked. Especially as contemporary scholars have been considering imposing a cost on international transfers described as a "Tobin Tax" [OECD (2002)].

Gesell proposed that money should incur a cost of 0.1% of its face value per week, equivalent to 5.4% per annum. Keynes (1936) 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." In practice much higher costs were used. Today the privately issued Chiemgauer currency in Southern Germany is using notes with a cost of 2% per quarter or 8% per year [Gelleri (2009)]. Fisher (1933) and Keynes (1936) supported the introduction of stamped scrip because among other things it could be used to stabilize prices. Keynes referred to Gesell as "unduly neglected prophet." In Chapter 23, part VI of his "General theory" Keynes[5] states that Gesell's 1916 book described, "the establishment of an anti-Marxian socialism" based on "an unfettering of competition instead of its abolition." Onken (2000) described it as "[a] market economy without capitalism."

Keynes (1936) wrote: "The idea behind stamped money is sound" and 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."

The private issue of cost carrying money in competition with official money was initiated in Germany after the first World War and spread to a number of European countries as documented by Fisher (1933) and Onken (2000). Various levels of cost were introduced from 1% monthly to 2% weekly. However, this type of money spread so quickly and was so successful in reinvigorating local communities in the depth of the Great Depression that it was soon made illegal by governments as it threatened the role of official money and their central banks.

On the reverse side of each currency note issued that incurred a cost there would be spaces for affixing stamps purchased from the issuer of the money to show that payment for the use of the money had been made each week or month as the case may be from the date of issue of the note. In some regions the notes were redeemable into official money and/or the specie currency by which it was backed on the payment of a redemption fee. The redemption fee was made greater than the cost of affixing a new stamp to keep the note valid and so useable. This meant it was cheaper to keep notes alive than to redeem them. In a number of locations the notes were redeemable into specified goods or even a commodity like coal, as used to restart a bankrupt coalmine in the German village of Schwanenkirchen [Fisher (1933)].

Cell phone technology now allows stamps to be replaced by direct credits to the issuer of e-money in a similar manner that debits are directly recorded against the owners of credit or debit cards when they make a purchase. It has only been practical to consider the introduction of cost carrying e-money since the roll out of 3G-cell phone technology around 2004. A type of stamp scrip widely introduced in the U.S. in 1933 were notes requiring a two cent stamp per dollar value to be affixed each week. Various parties such as the local chamber of commerce, city or local government, would issue the notes. Merchants, their local suppliers, and employees would agree to accept the notes that were given away to customers to generate economic activity in the community. Those that did not accept the notes would lose business.[6]

5 Keynes (1936) stated: "I believe that the future will learn more from the spirit of Gesell than from that of Marx."

6 Privately issued IOUs were accepted as money in a similar manner in the then new English colony of Australia during the 18th century before precious metals had been discovered, banks established, or the government had imported a printing press [Butlin (1953)]. Rum also became a popular form of currency.

A widely used form of stamp scrip in the U.S. would lose all its value at midnight each Tuesday unless additional stamps valued at 2% of the face value of the note were affixed to it. The notes were redeemable into official money after one year. By that time the issuer would have sold 52 stamps of two cents each for each one-dollar note on issue. In this way the issuer obtained a profit of 4% of the value of the notes issued as the value of stamps sold for each dollar note would be 52 x $0.02 = $1.04.

Because of the cost of holding stamp scrip, it was used quickly since if you did not use it or stamp it you lost it. Fisher (1933) reports that stamp scrip circulated three or four times faster than official money and for this reason was commonly referred to as "speed money." Gelleri (2009) reports that the Chiemgauer notes circulate at a similar rate of three times faster than the euro even though the carrying cost is substantially less than that reported by Fisher.

The use of cost carrying money would result in merchants needing to pay a usage charge of 2% on the value of the scrip in their tills each Tuesday night. However, a 2% charge once a week is far more attractive than paying 2% or more on every credit card transaction during the week. Ironically cost carry money introduces significant savings for both merchants and the economy as it multiples the productivity of money in mediating transactions by a factor of three.

One of the incentives for governments to introduce or enforce legal tender laws was to suppress the success of private sector initiatives in introducing stamp scrip. Instead of banning such initiatives, governments today could consider introducing it to overcome many of the indefensible dysfunctional attributes of the current money system noted in the previous section.

Fisher (1933) describes how the "pump priming" of the U.S. economy in 1932 by the Federal Reserve failed because its approach "was conceived for the producer, not the consumer." He went on to say "this is precisely where the 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." These very same issues arose again 75 years later with the global financial crisis of 2008. However, after the global financial crisis of 2008 many governments made the same mistake in reinflating modern economies as Fisher described in 1933.

The 2008 crisis triggered a reappraisal of deep-rooted habits of thinking about money by some commentators. The Economist (2009a) asked "Will old-fashioned scrip make a comeback" with George Monboit (2009) of The Guardian writing: "If the state can't save us, we need a licence to print our own money. It bypasses greedy banks. It recharges local economies. It's time to think seriously about an alternative currency."

The magic of cost carrying money is that it pays for itself. The 1933 U.S. version became self-liquidating in one year. Any inflationary pressures that might exist from creating more money in a recession or depression are reversed, as the money is self-canceling. More importantly, governments can stimulate their economies without the need for either going into debt or raising taxes [Turnbull (2009a, b, c)]. The Bankhead-Pettingell Bill introduced in the U.S. Congress on 17 February 1933 would have achieved this result [Fisher (1933)]. The bill is as relevant today to stimulate an economy and/or finance universal healthcare and social security as it was in 1933.

The bill proposed the issue of one trillion dollars of stamp scrip as legal tender requiring a stamp of 2% of the face value of each note to be affixed each week and redeemed for official money after one year. The scrip was to be distributed to each U.S. state in proportion to their population. Half of the scrip was to be given away to each citizen and the other half used by each state to build infrastructure services.

However, 14 days after the bill was introduced, President Roosevelt announced the New Deal on March 4th that temporarily closed all banks and prohibited the issue of all "emergency currencies." In this way the power and influence of the privately owned Federal Reserve System was protected from competition from both private currencies and the U.S. Post Office. The stamps were to be sold by the Post Office who would have also redeemed the scrip to make a gross profit of U.S.$40 billion.

History also reveals that those in control of fiat funny money have protected its monopoly status by banning competing monies, even when the alternative scrip or currencies proved to be highly successful in reinvigorating local economies. Godschalk (2008) states, "real innovations like e-money are still lacking which could be (anonymous) transferable from person to person or new digital 'numeraires' (as a new private currency not nominated in state money units like $ or €)." It is these types of e-money that are considered in the concluding next section.

Implications of e-money

This section considers the implications of a green type of e-money emerging. Over the last ten years numerous scholars have considered the implications on the architecture of the financial system from the introduction of e-money in its existing fiat form [Cronin and Dowd (2001), Dowd (1998), Friedman (2000), Rahn (2000)]. In considering the implications of e-money King (1999) continued the quote, cited above, by saying: "Without such a role in settlements, central banks, in their present form, would no longer exist, nor would money. Financial systems 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."

Gormez and Budd (2003) support the views of King (1999) that e-money will promote a choice in competing private currencies. Hayek (1976a,b) promoted the idea of competing currencies to control inflation. Gormez and Budd concluded, "the impact and effects of e-money are broad-ranging and far reaching." They went on to state that "it will increase the efficiency and productivity of the future monetary and financial systems, whether conducted within existing or revised arrangements."

In considering "revised arrangements," money that can earn interest or that is not redeemable into specified goods or services is not considered as a competitive option for e-money for the reasons identified above. Non-interest earning money in the form of cost-carrying e-money would obtain the support of numerous "invisible hands" of Islamic bankers and traders that could initiate or promote its adoption.

A theoretically attractive form for natural money is one redeemable into a basket of commodities in a ratio that reflects their consumption as included in the analysis by Selgin and White (1994). But patterns of consumption change and are different in different regions. So uncertainty would be introduced from the political processes required in deciding which commodities are included and in what proportions and when and how changes should be made in these parameters.

An analysis of the economic, political, and practical advantages of using kWh over gold and other alternatives are presented in Turnbull (2008b). In practice there could be competing alternative types of private e-money. But worldwide concern over climate change could produce an overwhelming number of invisible hands to support the use of green e-dollars redeemable into kWh produced from renewable energy. The introduction of green money would be especially compelling where it provided an alternative to carbon trading or taxing.

The local value of green dollars would be inflation resisting as the cost of production is largely fixed for the 25 year, or more, life of the generating equipment put in place to convert renewable energy into electricity. The financing of green generators by the issue of pre-payment vouchers to pay for electricity consumed in the future is described in Turnbull (2008b). The vouchers would be redeemable at different dates to pay bills over the life of the green generators to provide an inflation-resisting unit of value. Central banks would no longer be required to maintain the purchasing power of e-money redeemable into pre-payment vouchers. This feature could provide a basis for the most pragmatic invisible hands to prefer green dollars in preference to other types private or official money.

Neither the government nor commercial banks would be required to create credit. Nor would additional green money need to be created to finance the interest cost of creating old money as currently occurs. A sustainable economy becomes feasible [Daly (1977), Kennedy (1989)].

Credit would be provided as it is today by suppliers of goods and services. The existence of a local inflation-resisting green unit of value would provide a numeraire for traders and investors to establish the prices of their transactions. Credit required to bridge the payback period of new investments could be created in a similar manner as used to finance green generators. Alternatively, investment banks could fund new ventures by the issue cost-carrying money that would pay for itself even if the venture failed. Governments could fund public infrastructure projects on a similar basis to eliminate the cost interest. This would reduce the taxes that needed to be raised and/or reduce the price paid by consumers for public services.

The revenues that governments could obtain from that issue cost carrying money are so great that they could be used to fund universal social security and health care. The introduction of green e-money as a supplementary form of legal tender would provide a way to reduce the size and cost of the financial sector of economy and increase the size and cost of the welfare sector. Reversing the process of financialization in this way would make a major contribution to improving economic equity and the quality of life.

A compelling reason for governments to facilitate, if not initiate, the introduction of green e-money is to put in place a supplementary financial system to support, if not replace, the existing dysfunctional system. The excessive debt burden of the richest countries has increased the risk of another systemic failure of the existing system. The existence of private and/or official issued green e-money would provide a systemic economic lifeboat in the event of another financial crisis as well as reducing the need for carbon taxing or trading.

In discussing the economic details for the general introduction of cost-carrying money Suhr (1889) stated, "we can confidently leave most of them to the practitioners who, once they have understood the system, can bring neutral money to life better than monetary theory can." While there could be major differences in the details of how economic institutions might operate the differences would be less in regards to the social, political, and environmental implications.

Decentralized banking introduced by green e-dollars would allow local communities, towns, cities, and governments at local, state, and national levels to become self-financing to liberate them from dependency on alien sources of finance as is often the case [Turnbull (2008a)]. In advanced economies, around a third of household income can be exported

to alien communities by mortgage and/or rent payments. This indicates the substantial contribution internal financing can contribute to the enrichment of local communities.

Communities would no longer be resource rich and finance poor by economic values being drained out to alien sources of finance. There would be no need for the World Bank and other multinational or bilateral financial aid agencies [Turnbull (1986, 2001, 2007, 2008a)]. Agencies may only be required to share the knowledge of how to create and manage community currencies to facilitate self-financing economic activities.

Central banking after all is but a specialized sort of central planning that assumes one set of policy prescriptions are suitable for all regions at the same time. Decentralized banking decentralizes economic, social, and political power to enrich democratic institutions that may otherwise become captive to financial interests. Various ways in which the institutional arrangements could be established are considered in my other writings [Turnbull (1976, 1986; 1992, 2001, 2007)].

Green e-money would remove the ten systemic dysfunctional attributes of the existing financial system listed above. Green e-money would be a global unit of account but whose value would vary according to the local cost of renewable energy. By eliminating the cost of interest green money would remove the bias created by the current financial system against the use of renewable energy.

In a number of developing countries the existence, let alone the state, of the local banking system has become irrelevant to the billions of people using cell phones to transact billions of dollars. There now exist the means for citizens in advanced economies to carry on business if a financial crisis again emerges. This supports the arguments presented above that governments should encourage the spread of e-money.

To sum up, the introduction of an ecological form of e-money in the form of green dollars would: (a) provide a stable unit of local value negating the need for central banks; (b) provide money not used as a store of value; (c) provide improved equity by reducing unearned income; (d) reverse financialization with real assets becoming more attractive; (e) facilitate steady state economies with a global unit of account but not of value; (f) promote sustainability by reducing the relative cost of finance intensive renewable energy in comparison with energy obtained from burning carbon; (g) facilitate community banking; (h) mitigate the social power of money; and (i) enrich democracy. Green e-money provides a basis for establishing a more efficient, equitable, and resilient financial system to service and promote a more efficient, equitable, sustainable, and democratic real economy not dependent upon continued growth.

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