An Electronic Penny for Your Thoughts: How the Rise of Digital Money has Affected Ireland’s Recent Past

PAUL FERGUSON  
*Sensible Money*  
paul.ferguson@sensiblemoney.ie

TONY WEEKES  
*Sensible Money/ Centre for Progressive Economics*  
tony.weekes@sensiblemoney.ie

July 2013

Abstract: This paper analyses the various mediums of exchange the Irish economy has employed as money since the 1960s. Specifically, we look at the effects of the declining use of cash over electronic money since the advent of computers. We explain the properties of electronic money such as its origin, its temporary nature and its accompaniment with a corresponding debt. The uniqueness of the current financial crises is examined from the point of view of the likely rate of growth of the electronic money supply. We look at social and economic trends in the last five decades in Ireland and analyse the expansion and contraction of the electronic money supply as a possible cause of such trends.

Part 1: The Properties of Electronic Money

Before we describe how many of our financial and social problems can be explained by our increasing use of electronic money over cash it is important for the reader to understand some of the properties of electronic money. In particular it should be fully understood how electronic money is created and deleted and whose decisions influence the amount of electronic money in the economy. How money is created is an area of much confusion even amongst economists. For the most part economics teaches the outdated *money multiplier* model of banking which doesn’t accurately explain how money is created. Fewer economists enter debate about how money is destroyed since economics doesn’t provide any teachings in this area at all. Our paper *How Money is Created and Destroyed: A Guide to the Eurozone Monetary System* explains the mechanics of the monetary system in detail but we will provide
an overview below.

1.1 Different types of money

There are three types of money denominated in euros in the euro zone:

1.1.1 Cash and coins

Cash & coins are created and issued by the national central banks (NCBs) of the euro zone under the approval of the European Central Bank (ECB). The profit that the NCBs of the eurozone make from the low-cost production and sale of cash is known as seigniorage. The profits from seigniorage and other activities that the NCBs record are pooled together and redistributed to the various departments of finance of the governments of the euro zone. Seigniorage is a source of non-tax revenue and the proportion a country receives from the ‘profit pool’ depends on its population and its contribution to GDP. Both factors hold equal weighting. Cash makes up less than 3% of the euro zone’s M3 money supply and the tax-take from seigniorage is almost negligible in today’s digital world.

1.1.2 Reserve-account-money

Reserve-account-money is a type of electronic money, created by the NCBs and used by banks to settle payments with each other. This type of money is only available to those organisations who have accounts at the NCBs, i.e. financial institutions and the government. It is recorded on the balance sheet of the central bank and cannot enter general circulation. Even if the central bank created an abundance of this type of money it wouldn’t necessarily increase the money supply as the ECB has noted themselves.

---

1 In The Treaty on the Functioning of the European Union (The Lisbon Treaty); Article 128 states that the ‘The ECB shall have the exclusive right to authorise the issue of euro banknotes within the Union. The ECB and the NCBs may issue such notes. The banknotes issued by the ECB and the NCBs shall be the only such notes to have the status of legal tender within the Union.’

2 The ECB’s Organisational Chart explains the ‘capital subscription’ which each euro zone country has. From the description ‘The capital of the ECB comes from the NCBs of all EU Member States. It amounts to €10,760,652,402.58 (as of 29 December 2010). The NCBs’ shares in this capital are calculated using a key which reflects the respective country’s share in the total population and gross domestic product of the EU. These two determinants have equal weighting.’


4 The Treaty on the Functioning of the European Union (The Lisbon Treaty); Article 123 states ‘Overdraft facilities...shall be prohibited, as shall the purchase directly from them by the ECB or NCBs of debt instruments. [However this] shall not apply to publicly owned credit institutions which, in the context of the supply of reserve-account-money by central banks, shall be given the same treatments by NCBs and the ECB as private credit institutions.

5 ‘It is a fallacy to make a mechanical connection between the creation of central bank liquidity and a rise in the money supply. The liquidity we provide to banks is used in the markets where banks lend to each other. It does not automatically increase credit or money in the economy – and so does not automatically lead to price pressure in the economy.’ Mario Draghi, President of the European Central Bank (2013) Speech at the Katholische Akademie in Bayern, Munich.
1.1.3 Bank-account-money

The third type of money accounts for approximately 97% of the eurozone money supply. This money is digital and exists as the numbers in bank accounts. However, unlike reserve-account-money and cash, it is not created by the central bank. Instead, bank-account-money is created by the commercial banks usually in the process of advancing loans.

1.2 How banks create money

This section describes how commercial banks create bank-account-money. The main way banks create money is through processing loans. A customer, who we shall call Joe, walks into AIB and asks to borrow €4. In theory the bank will check that it has ‘excess’ reserve-account-money such that it can take on an additional liability of €4 and still meet its minimum reserve requirements and other criteria. In practice it’s more likely the bank processes the loan first and then looks for the additional reserve-account-money afterwards. In any case, Joe signs a contract confirming that he will repay €4 plus interest over a period of five years. This legally binding contract represents a future income stream for the bank and it will be included as an additional asset on their balance sheet worth €4. The interest Joe agrees to pay isn’t recorded on the bank’s balance sheet. Once the contract is signed AIB is in a position to create a liability on itself in the form of an increase in Joe’s current account balance, thus creating a new ‘deposit’ and brand new money. The balance sheets start as per Box 1 overleaf:

---

6 Alan Holmes, then Senior Vice President Federal Reserve Bank of New York (1969) said “In the real world, banks extend credit, creating deposits in the process, and look for the reserves later.”

The Bank of England’s mandate states that “If there is a shortage of liquidity the central bank will (almost) always supply the need”.

Victoria Chick (1992) states “Banks are now able to meet any reasonable rise in the demand for loans. Deposits will rise as a result and the shortfall of reserves is met by the system”.

Kydland and Prescott, Federal Reserve Bank of Minneapolis, (1990) state “There is no evidence that the monetary base or M1 leads the cycle, although some economists still believe this monetary myth. Both the monetary base and M1 series are generally procyclical and, if anything, the monetary base lags the cycle slightly”.

Distayat, Bank for International Settlements, (2010) states, “If anything the process works in reverse, with loans driving deposits”.

Furthermore Keynes argued that if the rate of bank lending is similar between all banks in the system a restraint in reserve-account-money may have no restraint on the creation of money by banks because the net difference of daily money exchange between banks can remain the same. It is evident that there is no limit to the amount of bank money which the banks can safely create *provided they move forward in step*.”
And they finish as per box 4 below:

### Box 4: Creating Bank-Account-Money Through Loans

<table>
<thead>
<tr>
<th>Central Bank of Ireland</th>
<th>Allied Irish Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assets</strong></td>
<td><strong>Liabilities</strong></td>
</tr>
<tr>
<td>Lending to Credit Institutions</td>
<td>30 Liabilities to Credit Institutions</td>
</tr>
<tr>
<td>Intra Euro System Balance (if net asset)</td>
<td>0 Intra Euro System Balance (if net liability)</td>
</tr>
<tr>
<td>Remaining Assets Not Listed</td>
<td>270 Remaining Liabilities Not Listed</td>
</tr>
<tr>
<td>Total Assets</td>
<td>300 Total Liabilities</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Assets</strong></th>
<th><strong>Liabilities</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lending to Irish Residents</td>
<td>890 Deposits from Irish Residents</td>
</tr>
<tr>
<td>Central Bank Balance</td>
<td>10 Borrowing from the Eurosystem</td>
</tr>
<tr>
<td>Government Debt Securities</td>
<td>20</td>
</tr>
<tr>
<td>Remaining Assets Not Listed</td>
<td>180 Remaining Liabilities Not Listed</td>
</tr>
<tr>
<td>Total Assets</td>
<td>1104 Total Liabilities</td>
</tr>
</tbody>
</table>

The money supply increases although no money was transferred or taken from any other account; banks create the money they lend. As such, banks are not the financial intermediaries which many models of the economy assume they are. The vast majority of the euro zone’s money is created as described above and this is why almost every euro has a corresponding debt to the financial sector. Indeed because interest is charged on loans banks create more debt in the economy than they do bank-account-money with each loan.
1.3 How banks destroy money

It is also the case that when a loan is repaid to a bank the money used to do so no longer exists. In the example above Joe borrowed €4 conveniently at 25% interest such that he ultimately owes €5. For simplicity's sake let's imagine the loan is repaid in one lump sum, rather than in instalments as is usually the case. Recall the situation from Box 4 directly after Joe secured the loan: the bank had an additional asset of €4, which is Joe's promise to repay the loan, and new liabilities totalling the same amount. Imagine Joe is paid €6 by his employer who banks with National Irish Bank (NIB). When Joe's employer transfers €6 to Joe's account, NIB will transfer €6 in reserve-account-money to AIB.\(^7\) Thus the banks' balance sheets start as follows:

<table>
<thead>
<tr>
<th>Box 6: Processing a Loan Repayment Starting Position</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>National Irish Bank</strong></td>
</tr>
<tr>
<td><strong>Assets</strong></td>
</tr>
<tr>
<td>Lending to Irish Residents</td>
</tr>
<tr>
<td>Government Debt Securities</td>
</tr>
<tr>
<td>Central Bank Balance</td>
</tr>
<tr>
<td>Remaining Assets Not Listed</td>
</tr>
<tr>
<td><strong>Total Assets</strong></td>
</tr>
</tbody>
</table>

\(^7\) If interbank payments happened in real time then NIB would transfer €6 instantaneously to AIB. Of course the banks wait until the end of the working day and transfer the net difference in reserve-account-money between each other and this is what allows the banks to practise fractional reserve banking.
As a result the money supply is down by €4 overall and that amount of bank-account-money has effectively been canceled out of existence through the loan repayment. If the economy repays more debt to banks than it takes on in the same time period, the money supply will decrease. This is the main reason why there can be less money during a recession. People saving rather than spending can make it seem like there’s less money in circulation too. This is the common explanation favoured by economists for the apparent lack of money during a recession. Note that the €1 interest that Joe paid still exists and is initially owed to the bank’s shareholders. Ultimately the bank may instead transfer this liability to its staff’s current accounts as a means of paying their salaries etc.

### Part 2: This time it really is different.

The current recession is lasting longer and is deeper than any other in recent memory and we feel an explanation as to why can be found by analysing the nature and rate of growth of the money supply. As recently as the 1960s around a fifth of the money in the economy existed as cash & coins. The remaining money in the economy existed as the sum total of people’s bank balances recorded on the ledgers of the banks but this could only be used as money under the limitations of the trust involved in a chequebook transaction. Today we have efficient and trustworthy means of exchanging bank-account-money and according to the UK think tank, Positive Money, electronic money is now used for 99.9% of transactions by value. And yet the digitisation of money has happened through arbitrary advances in technology and not through careful consideration and planning by economists. Indeed its rise in prominence has largely been missed even by those working in the financial sector and the media who
constantly focus on the printing of money by the ECB.

The graph below demonstrates the increase in bank-created money in the UK over time since the 1960s.\(^8\) Although unclear from the graph the amount of cash in the economy at the starting point was 21%.

![Money Supply 1960-2010](image)

Printed cash is effectively debt-free money since the difference in the cost of printing to its face value results in a source of non-tax revenue for the Department of Finance; it is money which neither the Government nor anyone else has had to borrow into existence. Hence the amount of cash in the economy acted as a debt-free ‘buffer’ to the remaining bank-created money carrying an interest-bearing debt. As a result it was far more feasible in the 1960s for all bank loans to be repaid. Thus the economy did not have to deal with as many disturbances like bankruptcies, repossessions, etc. Indeed Paul Krugman has noted the rise in frequency and severity of financial crises in recent decades\(^9\):

> “It’s hard to imagine now, but for more than three decades after the second World War, financial crises of the kind we’ve lately become so familiar with hardly ever happened. Since 1980, however, the roster has been impressive: Mexico, Brazil, Argentina and Chile in 1982.

\(^8\) The UK money supply graph is used over the Irish equivalent for 2 reasons. The Irish version involved no less than 3 changes in definition, and hence measurement, of M1 and M3 and a currency conversion from punts to euros. Also, the Bank of England is independent but the increase in central bank reserves in 2009 coincides with a decrease in the commercial bank created money. Source: Bank of England statistics.


We would suggest that the main cause of said crises is that the financial system in inherently unstable at its foundations due to almost all money being created electronically in tandem with an even higher debt.

As more efficient ways of transferring bank-account-money through computers have been developed, the amount of cash in the economy declined as a percentage of the amount of bank-account-money as can be seen by the graph. By the mid 1980s cash comprised just 5% of the total money supply. Bear in mind that every electronic euro not only has a matching debt to the banks but it has an interest-bearing one too. As such an economy in which 95% of money exists as bank-account money will owe more to the banks than exists due to the effects of compounding interest. Doing business under such a system is very different from that of the 1960s since bankruptcies are now systemically inevitable. This would also be the case even if banks lend sparingly only to those with the highest credit rating.\(^\text{10}\)

It could be argued that this system has functioned reasonably well since the 1960s and a huge factor towards this is the rate at which the money supply has increased since then. Doubling around every ten years, the money supply has exploded in recent decades. This ‘explosion’ may explain the apparent functionality of the economy in recent times since it is possible for all loans to be repaid under such a rate of expansion. If a debtor takes out a loan and over the course of the following twenty years the money supply quadruples, the loan can be very manageable to repay. It seems a ‘decade doubling’ of the money supply is the rate of expansion that’s needed to keep an economy, in which 97% of its money is created with an interest-bearing debt, achieving its full potential with near-full employment. It appears to us that such a rate of expansion is unfeasible for the foreseeable future and so this recession is quite unique in that regard.

Another important point to note is that mortgages have always been able to increase in duration but have approached their natural limit in taking two incomes around thirty years to repay. This is quite significant because house buyers have always been in a position to introduce larger and larger sums of money into the economy while the loan repayments which destroy said money are spread out over many years. In 2007, for example, over 36% of the

\(^{10}\) Although banks create only the principal of each loan but expect the principal plus interest back it is theoretically possible for all loans to be repaid. First, banks only ‘delete’ the principal of the loan upon repayment and could recirculate the interest paid to them at a sufficient enough pace for the all loans to be repaid. As well as this there are several complicating factors; if a debtor defaults on a loan they leave debt-free money in the economy. Conversely if a government bails-out the banks the net result is a deletion of money from people’s account while the debts remain the same. If banks purchase an asset off a non-bank they create the money for the purchase and it’s not necessarily the case that new debt is created in the process. If banks sell an asset to a non-bank they delete the money for the sale from the buyer’s account and it’s not necessarily the case that debt is canceled out of existence in the process.
money supply in Ireland originated through mortgages.\textsuperscript{11} We’ve effectively lost this highly significant source of new money for the economy with no obvious means of replacing it. In already taking two concurrent careers to repay a mortgage, homeowners can no longer be expected to become ever increasing carriers of debt.

Other recessions have been resolved through either Governments, businesses or households introducing more money into the economy through loans but it seems Governments and households have approached their debt capacity limits. Hence this time it really is different.

**Part 3: The Consequences for Ireland in Recent Decades**

The effects of this system of money creation and destruction

3.1 Financial Crises and the Current Debt Crisis

Since almost every euro is created with an even higher debt it’s no surprise that most economies, developed or otherwise, are over-indebted. For there to be money in the economy there has to be a corresponding debt to the banks. If the economy reduces its level of personal and business debt, the money supply drops by the same amount and so the debt crisis cannot be resolved under this system indefinitely. However, if sufficiently delayed, through perpetually increasing borrowing this system can function well in the interim between financial crises.

The central banks have little or no control over the amount of money in the economy. Referring to Graph 1 above we can see that the amount of central bank money was somewhat in proportion to the remaining money in the economy in the build up to the crisis of 2008/2009 giving the impression that money creation by banks is somewhat reactive to central bank stimulus. However, it is likely that the central bank reacts passively to requests for increased liquidity from banks lest it be accused of holding back growth or causing a financial crisis\textsuperscript{12}. Equally, when the Bank of England created an abundance of central bank money in 2008 and beyond, the amount of bank-created money in the economy actually decreased. We could conclude from this that the central bank has no control over something as important as the quantity of money in the economy. If there is a single factor which determines this it is the confidence of the banks in the system. The creation/destruction of money by the collective mood swings of bankers has been haphazard and the system is inherently unstable.


\textsuperscript{12} Footnote 6 has already argued why this is the case.
As Lord Adair Turner, former chairman of the UK’s Financial Services Authority, put it\textsuperscript{13};

“The financial crisis of 2007/08 occurred because we failed to constrain the private financial system’s creation of private credit and money.”

“The impact of fractional reserve banks is thus to make the financial system and the overall economy inherently more vulnerable to instability, creating risks which have to be balanced against the economic advantages which can arise from the risk pooling and maturity transformation which banks perform.”

“Banks which can create credit and money to finance asset price booms are thus inherently dangerous institutions.”

3.2 Higher Taxes

The printing of cash is demand driven so in the approach to Christmas, for example, banks exchange reserve-account-money for newly printed cash. As previously explained, the profit from the sale of cash to banks becomes a form of non-tax revenue for the Department of Finance known as seigniorage. Prior to our use of computers at least 20\% of the money supply existed as cash and the central bank’s ability to print money was quite significant. With the decline in our demand for cash the Government has lost this appreciable source of non-tax revenue due to the completely arbitrary level of use of electronic money. For this reason the Government is in a position whereby it wishes to invent new taxes or increase existing ones.

Measuring seigniorage, and its effects, is not as simple as it might seem and Leen (2011) describes three methods of measurement, 1. The change in the monetary base. 2. The interest earned by investing resources obtained by the past issuance of base money in interest-bearing assets. 3. The inflation tax (Buiter 2007). Method 2 seems to be the most appropriate for our analysis and it would consist of the proceeds of the investments of over 800 billion euro; the amount of euro banknotes in circulation in the eurozone in June 2013. Leen notes the huge variation in non-tax revenue gained from seigniorage and of the mean across the eurozone he writes;

“The average reliance of governments all over the world, measured as the ratio of seigniorage revenue to governmental expenditures, varied, e.g., for the period 1965-94 from a minimum of 1\% to a maximum of nearly 31\% (Haslag and Bhattacharya 1999). In Europe, it was on average a little above 5 percent in the sixties and seventies of the last century (Klein and Neumann 1990). As a percent of Gross Domestic Product (GDP) for the period 1971-1990 for countries in Western Europe it was about 0.5 percent (Click 1998, Gros 1993; cp Cukrowski and Stavrev 2001; Hochreiter, Rovelli, and Winckler 1996).”

The amount of seigniorage a government receives hugely affects its budget and it too is primarily decided by the arbitrary ratio of cash to bank-account-money. At 0.5 percent of GDP seigniorage is no longer a significant source of non-tax revenue. Higher taxes are paid as a result.

3.3 Unaffordable housing and the mortgage arrears problem

When banks are deciding what project to create money for it is in their interest to have the borrower's debt repayments supported by a real world asset. Hence banks are more likely to issue new money towards housing and building projects since the asset can be sold to reclaim some or all of the debt in the event of default. This pushes house prices up, creates a bubble and leaves us in the situation whereby house prices defy the laws of supply and demand. It’s also worth noting that despite technology allowing houses to be built in a matter of weeks they require two incomes almost their entire careers to repay and this is counter intuitive. These points are demonstrated by the graph below.

![Graph 2: House prices and lending towards mortgages relative to population and housing stock growth](image)

At the heart of the mortgage arrears problem is the systemic impossibility for all loans to be repaid. Once the economy can’t take on ever increasing amounts of debt the money supply starts to contract. Ultimately what’s in circulation is the small amount of cash plus the partial principal of every recent loan. What’s owed to the banks is the principal plus compound
interest. It’s just not possible for all loans to be repaid and this is the root cause of the mortgage arrears problem. Even if banks created money only for those with the highest credit rating it’s still systemically inevitable that many in the economy will have to default. We cannot blame the banks’ for irresponsible or excessive lending since the banking system cannot behave prudently even if all the intentions to make it do so are there.

3.4 Unemployment

We always have work to do and people willing to work. Often, the only thing missing is an adequate medium of exchange to facilitate all trading/employment opportunities simply because not many are willing or able to organise a bank loan. The correlation between unemployment and the rise in use of debt-based electronic money is demonstrated very well by the graph below which was compiled by Social Justice Ireland.

![Chart 2.1 Unemployment rate in the EU-15, US and Japan, 1960-2010](image)

Source: AMECO, 2013.

First, the trend is for unemployment to increase over time. Second, the graph shows how volatile unemployment rates are in developed economies under the debt-based system.

3.5 Environmental damage

How the current economic system contributes to environmental damage is not straightforward and we don’t claim that monetary reform could resolve our environmental problems but there are some observations we will make below.
First, Governments and people ‘forget’ about the environment when they’re dealing with financial crises.

Second, in order for the current system to operate smoothly we need to continuously take on more debt than we repay and this is often accompanied by growth in what we produce. We already have an incredible productive capacity and we cannot expect it to increase as described on our finite planet. Continuous growth as a basis of economic stability is an unnecessary policy. The chart below demonstrates the correlation between CO$_2$ emissions and GDP. It seems perpetual growth in GDP, required for economic stability under the present system, is not conducive to lowering CO$_2$ emissions.

Finally, every country’s attempt to become a net exporter, a direct result of the debt-based system, adds pressure to produce more and sell it further away and yet perpetual growth in GDP cannot be maintained forever on a finite planet.

3.6 Extreme inequality and many of our social problems

Ultimately 97% of euros have a corresponding debt to the banking sector. Although banks delete the vast majority of euros they receive through loan repayments the financial sector benefits greatly from the interest which must be paid on each euro it creates, or the assets which it acquires if not. Professor Margrit Kennedy estimates that prices of commodities and services are an average of 40% higher than they otherwise would be if producers didn’t have to factor interest-bearing loan repayments into prices. As a result this system continuously redistributes wealth and income from the majority to the minority leading to extreme inequality.
The chart below demonstrates the rate at which income inequality grew in Ireland from 1987 - 2009, a period of almost continuous expansion in the Irish economy to the detriment of all but two deciles.

![Chart 1: Change in Ireland’s Income Distribution, 1987-2009](image)

**Source:** Calculated from CSO, 2010:24-25


The ill-effects of increased inequality within a society are well documented elsewhere but one chart from *The Equality Trust* which we will include is overleaf.
On an international level any underdeveloped country is so as a direct result of banks creating money as debt. Economies in which few citizens are willing or able to acquire loans cannot compete with economies at different stages of this system which are going through self-perpetuating expansion of money and debt. America is considered rich because many Americans can borrow from banks.

With extreme inequality, poverty and unemployment comes undesirable social consequences.

3.7 Weakened democracy

The banks are in a uniquely powerful position since they have the ability to issue and to allocate new money. This power has happened through the loophole of their accounting entries being accepted as money. In fact the last time that parliament ever debated whether banks should have the power to create money or not they wrote the 1845 Bank (Ireland) Act which outlawed the creation of (legal tender) paper money by banks.

The central bank still has the power to issue cash for the Government but it’s an insignificant ability given the proportion of digital money in the economy. Democratically elected politicians
may have good intentions but are restricted in what they can achieve through a lack of money, and power to create it.

CONCLUSION

This paper set out to analyse the effects of the increased use of electronic money over cash on Irish society in recent decades as this is an area of minimal research in economics. We describe the accountancy procedures by which banks create the majority of the economy's money in tandem with debt. We also show how banks destroy money through processing loan repayments as this is not taught in most undergraduate courses.

The end to many recessions has coincided with either governments, businesses or households taking on ever increasing amounts of debt. However mortgages have approached their natural limit of duration in taking two incomes around thirty years to repay. It's unviable that the electronic money supply will increase at the rate it has done in the last 4 decades and so the current monetary system will be unfit for purpose for the foreseeable future.

We find evidence that this debt-based system leads to many of our financial, social and environmental problems.

REFERENCES


GOODMAN J. C., KOTLIKOFF L. J., 2009, *Solving Our Nation's Financial Crisis with Limited Purpose Banking*, Boston University and the National Centre for Policy Analysis


The Basel Committee on Banking, 2010, Basel III: International framework for liquidity risk measurement, standards and monitoring

The Basel Committee on Banking, 2011, Basel III: A Global regulatory framework for more resilient banks and banking systems

Central Bank of Ireland, 2012, Documentation for Monetary Policy Instruments and Procedures


Positive Money, 2010, Banking 101

Social Justice Ireland, 2012, Shaping Ireland’s Future; Securing Economic Development, Social Equity and Sustainability