

# How money is created and destroyed: A guide to the euro zone monetary system

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*Abstract:* First, this paper attempts to address any confusion there may be over how money is created and destroyed in the euro zone. The accountancy procedures involved in money creation and destruction are described from the point of view of the balance sheets of the institutions involved. We also attempt to address some common misconceptions and incomplete descriptions of how the monetary system operates and we critique some theoretical limits to the money creation process.

*Note:* This paper borrows heavily from some UK-specific publications of how money is created and these have been adapted to suit the euro zone. In particular we wish to thank Positive Money for their *Banking 101* document and The New Economics Foundation for their book, *Where Does Money Come From?*

## I INTRODUCTION

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

### 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).<sup>1</sup> The profit that the NCBs of the euro zone receive 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.<sup>2</sup> Cash makes up less than 9% of the euro zone's M3 money supply.<sup>3</sup>

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<sup>1</sup> 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.'

<sup>2</sup> 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

## 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.<sup>4</sup> This type of money is only available to those organisations which have accounts at the NCBs i.e. financial institutions. It is not in general circulation and isn't counted as part of either the M1, M2 or M3 money supplies of the euro zone.

## 3. Bank-account money

The third type of money accounts for approximately 91% of the euro zone M3 money supply.<sup>3</sup> This money exists as the balance of all current accounts and/or savings 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. Today, this type of money is created electronically by typing a higher bank balance into a borrower's account. Prior to computers, banks created the vast majority of money in the economy by writing a higher bank balance to a loan recipient's account which was recorded on their ledgers.

## II CREATING RESERVE-ACCOUNT MONEY AND CASH

Under normal circumstances, reserve-account money is created by the NCBs of the euro zone in order to facilitate payments between the commercial banks.<sup>4</sup> The ECB ultimately creates very few Euros, printed or otherwise, as it does not create any bank-account money.<sup>5</sup>

In the following example we will show how the Central Bank & Financial Services Authority of Ireland (CBI) creates reserve-account money for use by a commercial bank, in this example Allied Irish Bank (AIB). Initially both institutions' balance sheets start as follows:

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population and gross domestic product of the EU. These two determinants have equal weighting.'

<sup>3</sup> ECB historical monetary statistics 1980 - 2012.

<sup>4</sup> The Treaty on the Functioning of the European Union (The Lisbon Treaty); Article 123 ff facilities all 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.

<sup>5</sup> (H. K. Scheller 2004) History, Role and Functions [of the ECB], on p103 states that 'The ECB issues 8% of the value of banknotes issued by the Eurosystem' which themselves form only 3% of the M3 money supply. The ECB can't create bank-account money.

### Box 1: Starting Position

Central Bank of Ireland		Starting Position					
Assets	Liabilities			Allied Irish Bank		Assets	Liabilities
Lending to Credit Institutions	30	Liabilities to Credit Institutions	30	Lending to Irish Residents	890	Deposits from Irish Residents	890
Intra Euro System Balance (if net asset)	0	Intra Euro System Balance (if net liability)	170	Central Bank Balance	10	Borrowing from the Eurosystem	10
Remaining Assets Not Listed	270	Remaining Liabilities Not Listed	100	Government Debt Securities	20	Remaining Liabilities Not Listed	200
<b>Total Assets</b>	<b>300</b>	<b>Total Liabilities</b>	<b>300</b>	<b>Total Assets</b>	<b>1100</b>	<b>Total Liabilities</b>	<b>1100</b>

AIB requests €10 in reserve-account money. The usual method by which the CBI facilitates such a request is through a sale and repurchase agreement (an RP or repo). Essentially AIB sells an existing asset to the central bank, usually a government bond (Government Debt Securities on the above balance sheet), in exchange for brand new reserve-account money (Central Bank Balance on the above balance sheet), while agreeing to repurchase said asset for a specific higher price on a specific future date.<sup>6</sup> If the repurchase price is 10% higher than the purchase price (i.e. €11) then the 'repo rate' is said to be 10%. Once the transaction is complete the CBI has gained €10 of government bonds, but it now has a liability to AIB of €10. The CBI's balance sheet expands by €10 and it creates new reserve-account money in order to pay for the €10 in government bonds. AIB has simply swapped one asset for another. The balance sheets look as follows:

<sup>6</sup> CBI published *Documentation for Monetary Policy Instruments and Procedures* in 2012. p290 defined a repurchase agreement and states 'The Eurosystem uses repurchase agreements with a fixed maturity in its reverse transactions.'

## Box 2: Creating Reserve-Account-Money

CBI creates Reserve-account-money for AIB							
Central Bank of Ireland				Allied Irish Bank			
Assets		Liabilities		Assets		Liabilities	
Lending to Credit Institutions	30	Liabilities to Credit Institutions	(+10) 40	Lending to Irish Residents	890	Deposits from Irish Residents	890
Government Debt Securities	(+10) 10	Intra Euro System Balance (if net liability)	170	Central Bank Balance	(+10) 20	Borrowing from the Eurosystem	10
Remaining Assets Not Listed	270	Remaining Liabilities Not Listed	100	Remaining Assets Not Listed	180	Remaining Liabilities Not Listed	200
Total Assets	(+10) 310	Total Liabilities	(+10) 310	Total Assets	1100	Total Liabilities	1100

A repo transaction may seem like a convoluted way of creating reserve-account money. To complicate matters further the CBI's balance sheet shows the government bonds as an asset of only €10 even though AIB has agreed to purchase them for €11 in the future.<sup>7</sup> The additional €1 isn't recorded on either balance sheet but once paid it would momentarily be recorded as profit for the CBI and as a loss by AIB.<sup>8</sup> But only momentarily; the reason being that the CBI pays interest on reserve-account money that the commercial banks hold with it and they match the interest rate to the repo rate, 10% in the above example. The interest rate in question is called the 'deposit facility' and it's set for all NCBs of the euro zone by the Governing Council of the ECB. The CBI could also create the reserve-account money and lend it to AIB. In this case the assets side of the CBI's balance sheet would show a €10 loan to AIB rather than €10 of government bonds in *Remaining Assets Not Listed*. A sale and repurchase agreement, involving each party matching accrued interest to the difference in value of an asset over time, is a somewhat strange arrangement. However it has developed for two reasons.

First of all, it means that banks are not penalised for holding reserve-account money. If they exchanged assets for reserve-account money and agreed to repurchase said assets for a higher price they'd be continuously recording a loss on holding reserve-account money. They receive interest on reserve-account money to compensate them for having to repurchase assets for a higher price in the future.

<sup>7</sup> CBI published Documentation for Monetary Policy Instruments and Procedures in 2012, p99 states 'The Bank shall arrange for any payments of interest, dividends or other distributions or any receipts [...] arising on any securities which [...] are held by or for the Bank on behalf of the counterparty, to be paid to the counterparty as soon as possible.'

<sup>8</sup> Positive Money UK published Banking 101 (2012). Section 3 explains 'The extra £1,000 does not appear on either balance sheet.'

However the main reason for this situation is that the ECB uses the 'deposit facility' in conjunction with its 'marginal lending facility' to influence the rate at which banks will lend reserve-account money to each other. For example, the Governing Council of the ECB could dictate that the CBI will pay an interest rate of 0.25% per annum, the 'deposit facility rate', on reserve-account money to the commercial banks. Hence AIB would not lend reserve-account money to another bank for less than 0.25% per annum. On the upper scale the Governing Council may decide that the CBI will charge 1.75% per annum, the 'marginal lending facility', to any bank that wishes to borrow new reserve-account money from them at short notice, i.e. overnight. In this case there's no way another bank would borrow reserve-account money from AIB for an interest rate of more than 1.75% per annum and ultimately the banks agree to lend reserve-account money to each other at somewhere between the two limits. The Euro Interbank Offer Rate (Euribor) tracks a summary of the average of previous rates that banks agree between themselves. Whatever rate the banks decide will be similar to the interest rates that the banks offer to potential borrowers for new bank-account money. Longer term borrowing of reserve-account money, still usually limited to a week, can be agreed at a lower interest rate with the NCBs than their overnight marginal lending facility.<sup>9</sup> This is done through the ECB's 'main refinancing operations' as either a 'fixed rate tender' or 'minimum bid rate'. A fixed rate tender is the interest rate at which the NCBs will charge the commercial banks for new reserve-account money for such week long repos. At other times the ECB prefers to have the banks bid for how much they are willing to pay for new reserve-account money. In this case the ECB would set a minimum bid rate that banks will have to offer. Banks may offer above the minimum bid rate because the NCBs process the most competitive bids more promptly.<sup>10</sup>

The process by which the CBI sells new cash, €8 in this example, to banks is similar to that used for reserve-account money. The balance sheets may start as per Box 1 above. If AIB decides it is expecting an increase in demand for cash, during a bank holiday weekend for example, then it may wish to exchange some of its reserve-account money for physical cash. The process by which it does so is very simple – AIB exchanges €8 of its reserve-account money for €8 cash which the CBI has had freshly printed once granted the permission to do so by the ECB. The CBI's liabilities change from €8 in AIB's reserve account to €8 of 'cash outstanding' essentially to balance the books.

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<sup>9</sup> ECB defines 'Main Refinancing Operations' as 'A regular open market operation executed by the Eurosystem (in the form of a reverse transaction) for the purpose of providing the banking system with the amount of liquidity that the former deems to be appropriate. Main refinancing operations are conducted through weekly standard tenders (in which banks can bid for liquidity) and normally have a maturity of one week.'

<sup>10</sup> ECB defines 'Tender Procedure' as 'A procedure in which the central bank provides liquidity from the market in the basis of bids submitted by counterparties in competition with each other. The most competitive bids are satisfied with priority.'

### Box 3: Creating Cash

CBI Creates Cash for AIB							
Central Bank of Ireland				Allied Irish Bank			
Assets		Liabilities		Assets		Liabilities	
Lending to Credit Institutions	30	Liabilities to Credit Institutions	(-8) 22	Lending to Irish Residents	890	Deposits from Irish Residents	890
Intra Euro System Balance (if net asset)	0	Cash Outstanding	(+8) 18	Central Bank Balance	(-8) 2	Borrowing from the Eurosystem	10
Remaining Assets Not Listed	270	Remaining Liabilities Not Listed	260	Cash in Hand	(+8) 8	Remaining Liabilities Not Listed	200
Total Assets	300	Total Liabilities	300	Total Assets	1100	Total Liabilities	1100

Note that neither balance sheet has expanded or contracted; it is just the nature of assets and liabilities that have changed. When the cash is worn out, damaged, or not needed anymore, the transaction is reversed and AIB simply sells back the cash to the CBI at face value, receiving €8 in reserve-account money in return.

### III HOW BANKS CREATE AND DESTROY MONEY

This section describes how commercial banks create and destroy 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. In practice it's more likely the bank processes the loan first and then looks for the additional reserve-account money afterwards.<sup>11</sup> In any case, Joe signs

<sup>11</sup> 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'.

a contract confirming that he will repay €4 plus interest over a period of five years. This legally enforceable 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. Again, starting from Box 1, the balance sheets finish as follows:

Box 4: Creating Bank-Account-Money Through Loans							
AIB Creates Bank-Account-Money for a Customer							
Central Bank of Ireland				Allied Irish Bank			
Assets		Liabilities		Assets		Liabilities	
Lending to Credit Institutions	30	Liabilities to Credit Institutions	30	Lending to Irish Residents	(+4) 894	Deposits from Irish Residents	(+4) 894
Intra Euro System Balance (if net asset)	0	Intra Euro System Balance (if net liability)	170	Central Bank Balance	10	Borrowing from the Eurosystem	10
Remaining Assets Not Listed	270	Remaining Liabilities Not Listed	100	Government Debt Securities	20	Remaining Liabilities Not Listed	200
Total Assets	300	Total Liabilities	300	Remaining Assets Not Listed	180	Remaining Liabilities Not Listed	(+4)
				Total Assets	1104	Total Liabilities	1104

The M1 money supply increases although no money was transferred or taken from any other account; the bank created the money it lent. As such, banks are not the financial intermediaries which many economic models 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 than they do bank-account money with each loan transaction.

Banks also create bank-account money when they buy assets, be they real or financial. For example, if AIB wished to buy an existing €6 government bond from a pension fund company the transaction could proceed as follows. For simplicity let's assume that the pension fund company have an account with AIB although if this isn't the case the transaction can still go ahead through the exchange of reserve-account money with the pension fund company's bank as described in section IV. Initially AIB's balance sheet appears as per Box 1 and it finishes as per Box 5 below:

### Box 5: Creating Bank-Account-Money Through Purchasing an Asset

AIB Creates Bank-Account-Money through purchases							
Central Bank of Ireland				Allied Irish Bank			
Assets		Liabilities		Assets		Liabilities	
Lending to Credit Institutions	30	Liabilities to Credit Institutions	30	Lending to Irish Residents	890	Deposits from Irish Residents	(+6) 896
Intra Euro System Balance (if net asset)	0	Intra Euro System Balance (if net liability)	170	Central Bank Balance	10	Borrowing from the Eurosystem	10
Remaining Assets Not Listed	270	Remaining Liabilities Not Listed	100	Government Debt Securities	(+6) 26	Remaining Liabilities Not Listed	200
Total Assets	300	Total Liabilities	300	Total Assets	(+6) 1106	Total Liabilities	(+6) 1106

AIB has to manage its liabilities in certain ways and the amount of bank-account money it can create is limited somewhat by its own liquidity and solvency management criteria. It also has to comply with rules set out by the ECB and most recently by the Basel Committee on Banking Supervision (Basel Accords III). Assuming it is well capitalised with 'excess' reserve-account money it can take on the additional €6 liability. Between December 2011 and February 2012 the ECB created and lent over a trillion euro of reserve-account money, via the NCBs, to the commercial banks at a low rate of interest repayable over three years. The banks, being well capitalised, were then able to create money through purchasing assets, usually government bonds, rather than processing loans. For clarity the commercial banks can't use reserve-account money to purchase anything from any institution other than another bank. Rather, they create the money they use to purchase assets by typing it in to the seller's account as described above.

Why do banks need depositors and savers?

This is an interesting question since banks don't need a depositor or saver before they can lend money. However, banks need customers and hence they need depositors to bank with them. Many 'depositors' originate through the loan process also. Banks sometimes encourage customers to open up savings accounts and they do so to manage the maturity of their liabilities and 'free up' some reserve-account money. If a savings account is opened by an existing customer the bank swaps a short-notice liability (the customer's current account balance) for a longer term one (the customer's savings account balance). No money/asset is created but the bank will know the customer can't transfer this money for some time and so no other bank will come looking for a portion of it in reserve-account money. The M1 money supply decreases for an equivalent increase in the M2 or M3-M2 money supply. Even though

the bank hasn't acquired any extra reserve-account money it's still in a better position to create new bank-account money. If a customer banks with Bank A and opens a savings account with Bank B, money will leave their current account at Bank A and enter their savings account at Bank B. Bank A would transfer some reserve-account money to Bank B to settle this transfer as described in section IV below. Bank B would then have gained reserve-account money and a long-term liability which means the additional reserve-account money won't be transferred to another bank for the foreseeable future. And so Bank B would be in a better position to create new bank-account money than before.

### 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. The principle is the same for all electronic money including reserve-account money. This section explains it in terms of bank-account money. In the example above Joe borrowed €4 conveniently at 20% interest such that he ultimately owes €5. For simplicity 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.

<sup>12</sup> Thus the banks' balance sheets start as follows:

Box 6: Processing a Loan Repayment Starting Position							
AIB's and NIB's Balance Sheets Prior to Processing Loan Repayment							
National Irish Bank				Allied Irish Bank			
Assets		Liabilities		Assets		Liabilities	
Lending to Irish Residents	180	Deposits from Joe's Employer	20	Lending to Joe	4	Deposits from Joe	4
Government Debt Securities	20	Deposits from Other Residents	160	Lending to Other Residents	890	Deposits from Other Residents	890
Central Bank Balance	10	Borrowing from the Eurosystem	10	Central Bank Balance	10	Shareholder's Equity	10
Remaining Assets Not Listed	190	Remaining Liabilities Not Listed	210	Remaining Assets Not Listed	200	Remaining Liabilities Not Listed	200
Total Assets	400	Total Liabilities	400	Total Assets	1104	Total Liabilities	1104

<sup>12</sup> 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.

And finish as follows:

Box 7: Processing a Loan Repayment							
AIB's and NIB's Balance Sheets Post Processing Loan Repayment							
National Irish Bank				Allied Irish Bank			
Assets		Liabilities		Assets		Liabilities	
Lending to Irish Residents	180	Deposits from Joe's Employer	(-6) 14	Lending to Joe	(-4) 0	Deposits from Joe	(+6-5) 5
Government Debt Securities	20	Deposits from Other Residents	160	Lending to Other Residents	890	Deposits from Other Residents	890
Central Bank Balance	(-6) 4	Borrowing from the Eurosystem	10	Central Bank Balance	(+6) 16	Shareholder's Equity	(+1) 11
Remaining Assets Not Listed	190	Remaining Liabilities Not Listed	210	Remaining Assets Not Listed	200	Remaining Liabilities Not Listed	200
Total Assets	(-6) 394	Total Liabilities	(-6) 394	Total Assets	(+2) 1106	Total Liabilities	(+2) 1106

As a result *Deposits from Customers* and hence the M1 money supply are 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, the money supply can decrease. This is the main reason why there can be less money during a recession, although people saving rather than spending can make it seem like there's less money also. 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.

Banks also destroy money through selling assets, again be they real or financial. Recall from Box 5 that AIB effectively created €6 to purchase government bonds from a pension fund company. If AIB later sold the asset the transaction would reverse and again *Deposits from Customers*, and the M1 money supply would each be lower by €6.

#### IV TRANSFERRING MONEY

We'll now describe the accountancy procedures which occur at the various institutions as Joe transfers money in a number of ways. Recall the situation after Joe had secured a loan and he had €4 in bank-account money to spend. In order to make a purchase joe must transfer money from his account at AIB to the seller's bank account. If the seller also banks at AIB it is a very simple process to transfer the money. Joe simply instructs his bank to make a payment of €4 from his bank account to the seller's account. AIB then deducts €4 from Joe's

account, and adds it to the seller's account in house. However if Joe and the seller bank with different banks the transactions will have to be settled using cash or reserve-account money. Joe could withdraw cash, give it to the seller who could then lodge it into another bank, Permanent TSB in this example. Both institutions balance sheets are affected as follows:

Box 8: Settling Payment Through Exchange of Cash							
AIB's and Permanent TSB's Balance Sheets							
Permanent TSB				Allied Irish Bank			
Assets		Liabilities		Assets		Liabilities	
Lending to Irish Residents	180	Deposits from Joe's Seller	(+4) 24	Lending to Joe	4	Deposits from Joe	(-4) 0
Government Debt Securities	20	Deposits from Other Residents	180	Lending to Other Residents	890	Deposits from Other Residents	890
Cash in Hand	(+4) 14	Borrowing from the Eurosystem	10	Cash in Hand	(-4) 16	Shareholder's Equity	10
Remaining Assets Not Listed	190	Remaining Liabilities Not Listed	190	Remaining Assets Not Listed	190	Remaining Liabilities Not Listed	200
Total Assets	(+4) 404	Total Liabilities	(+4) 404	Total Assets	(-4) 1100	Total Liabilities	(-4) 1100

Payments for large amounts of money tend to be made electronically using reserve-account money. So if Joe and the seller bank with different banks, the payment could be made by electronic transfer of reserve-account money. The balance sheets are affected as follows:

Box 9: Settling Payment Through Exchange of Reserve-Account-Money							
AIB and Permanent TSB							
Permanent TSB				Allied Irish Bank			
Assets		Liabilities		Assets		Liabilities	
Lending to Customers	180	Deposits from Joe's Seller	(+4) 24	Lending to Joe	4	Deposits from Joe	(-4) 0
Government Debt Securities	20	Deposits from Other Customers	180	Lending to Other Customers	20	Deposits from Other Customers	880
Central Bank Balance	(+4) 14	Borrowing from the Eurosystem	10	Central Bank Balance	(-4) 16	Shareholder's Equity	20
Remaining Assets Not Listed	190	Remaining Liabilities Not Listed	190	Remaining Assets Not Listed	1060	Remaining Liabilities Not Listed	200
Total Assets	(+4) 404	Total Liabilities	(+4) 404	Total Assets	(-4) 1100	Total Liabilities	(-4) 1100

Of course the two banks don't transfer reserve-account money for each individual interbank transaction. The banks wait to the end of the working day and if €8 is transferred in one direction and €6 is transferred in the other, the banks exchange the net of €2 in reserve-account money between them. This allows banks to practise fractional reserve banking. For payments across the euro zone the Trans-European Automated Real-Time Gross-Settlement Express Transfer (TARGET2) system is used to transfer reserve-account money between the NCBs. If Joe were to transfer the €2 from his bank account to someone who has an account with a branch of BNP Paribas in France the two banks would settle the payment through TARGET2 and then adjust each customer's account accordingly. From AIB's point of view it would lose a liability since Joe's account reads zero but would also lose an asset in the form of €2 of reserve-account money. From the CBI's point of view they would no longer owe this reserve-account money to AIB but would instead 'owe' the ECB €2 who in turn 'owe' it to the French central bank, Banque de France. The CBI and AIB's balance sheets are affected as follows:

Box 10: Settling Payment Through TARGET 2							
CBI and AIB's Balance Sheets							
Central Bank of Ireland				Allied Irish Bank			
Assets		Liabilities		Assets		Liabilities	
Lending to Credit Institutions	30	Liabilities to Credit Institutions	(-2) 28	Lending to Joe	4	Deposits from Joe	(-2) 2
Intra Euro System Balance (if net asset)	0	Intra Euro System Balance (if net liability)	(+2) 172	Lending to Other Customers	20	Deposits from Other Customers	880
Remaining Assets Not Listed	270	Remaining Liabilities Not Listed	100	Central Bank Balance	(-2) 18	Shareholder's Equity	20
Total Assets	300	Total Liabilities	300	Remaining Assets Not Listed	1060	Remaining Liabilities Not Listed	200
				Total Assets	(-2) 1102	Total Liabilities	(-2) 1102

While the ECB and Banque de France's balance sheets are affected as follows:

### Box 11: Settling Payment Through TARGET 2

ECB and BdF's Balance Sheets							
European Central Bank				Banque de France			
Assets		Liabilities		Assets		Liabilities	
CBI's Intra Euro System Balance (if net asset)	(+2) 172	BdF's Intra Euro System Balance (if net liability)	(+2) 322	Lending to Credit Institutions	110	Liabilities to BNP Parabis	(+2) 32
Remaining Assets Not Listed	530	Remaining Liabilities Not Listed	380	Intra Euro System Balance (if net asset)	(+2) 92	Liabilities to Other Institutions	70
				Remaining Assets Not Listed	2300	Remaining Liabilities Not Listed	2400
Total Assets	(+2) 702	Total Liabilities	(+2) 702	Total Assets	(+2) 2502	Total Liabilities	(+2) 2502

Note that the CBI does not have to 'repay' the ECB nor does the ECB have to repay Banque de France. These Intra-Eurosystem Balances between the NCBs and the ECB are not physically settled at any point partially due to their continuous nature. They effectively record the net flow of money to date between between the euro zone countries.<sup>13</sup> It is also worth noting that the commercial banks can transfer money between each other in real time. However TARGET 2 balances aren't updated after each individual transaction. Instead they are updated periodically by the ECB with the net difference being added to each NCB's balance sheet.<sup>14</sup>

### V MODELING THIS SYSTEM

The system of money creation and destruction described above is different from that described in most universities. Many economics courses don't teach anything about the origin/destruction of money and those that do tend to teach the *money multiplier* model of how banks create money. A brief description is as follows; a customer will deposit money with a bank. The bank will keep aside an amount which satisfies the reserve requirement set by the central bank and they will lend out the rest. The bank indirectly creates money for the economy under this system because the original customer can still write cheques to the

<sup>13</sup> O'Brien M. (2012), states in *Understanding Eurosystem Central Bank Financial Statements* published on p75 of Quarterly Bulletin Q3 2012 'the Central Bank of Ireland does not have to 'repay' the ECB nor does the ECB have to 'repay' the Bundesbank. These TARGET2 related balances between the NCBs and the ECB are not physically settled at any point in time due to their continuous nature and that they mostly reflect the flow of funds between private entities. Their appearance on the NCB balance sheets arise from the fact that the NCBs host and operate TARGET2 as part of the mandate of the Eurosystem to provide a reliable payments system.'

<sup>14</sup> Bailey S., Harran P. (2012) wrote *Analysis of Recent Monetary Operations & TARGET2 Developments*, for the CBI in the Quarterly Bulletin (Q3 2012) . On p126 they confirm 'The balances are aggregated and, at the end of each day, netted out throughout the Eurosystem'

amount deposited with a bank while the borrower can also spend a portion of the money. This system is often depicted as a pyramid, at the base of which lies all the cash of the economy. The central bank is said to have control over the money supply because they can either adjust the monetary base (cash or nowadays reserve-account money) or they can adjust the 'steepness' of the sides of the pyramid by adjusting the reserve requirement. However this model of banking hasn't applied for many decades, if at all, for a number of reasons. It would only apply as described above if banks processed loans in cash form and kept the reserve on each deposit out of circulation. Even if the model is extended to banks creating non-cash money only to a predefined multiple of the amount of reserve-account money they have, the model would only apply if the reserve-account money was taken out of circulation from inter-bank payments.

## VI LIMITS TO EXCESSIVE CREDIT CREATION

### 1. Reserve requirements

As noted above banks don't take in deposits, keep some on reserve and lend out the rest so immediately the traditional model of the reserve requirement system breaks down. Rather banks have an amount of reserve-account money and (supposedly) can create bank-account money only up to a certain multiple of this (The multiple is the inverse of the reserve requirement). In theory, the central bank could limit the amount of money in the economy by creating reserve-account money sparingly and strictly enforcing reserve requirements. However in practise that doesn't happen. For a start, in the euro zone reserve requirements are very small and don't apply to every deposit.<sup>15</sup> As well as this, during a period of expansion a bank can always borrow whatever reserve-account money it needs to meet its requirements because banks can always post acceptable collateral at the central bank during times of expansion. If a bank requests reserve-account money it is a sign that the economy is doing well and the central bank isn't in a position to refuse, especially not as the 'lender of last resort'. However during a period of contraction the banks' reserve accounts can be relatively low and this can discourage the creation of money by banks at a time when new money is needed most. In conclusion reserve requirements are small, don't fully apply, are ineffective at controlling the creation of money by banks during a period of expansion but may discourage money creation during a period of contraction.

### 2. Liquidity coverage ratios

While the ECB maintains that 'the liquidity needs of the banking system result from the minimum reserve requirements'<sup>16</sup>, the Basel Committee on Banking Supervision (Basel Accords III) is not so confident and recommends the implementation of a Liquidity Coverage

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<sup>15</sup> According to the ECB's monetary policy, under *Instruments* and *minimum reserves* the ECB confirms that reserve requirements were lowered from 2% to 1% on 18th January 2012 and they only apply to 'overnight deposits, deposits with agreed maturity or period of notice up to 2 years, debt securities issued with maturity up to 2 years, money market paper.'

<sup>16</sup> See *Liquidity Analysis* under The ECB's Monetary Policy

Ratio (LCR) to supplement the reserve requirements. The aim of the standard is to 'ensure that a bank maintains an adequate level of unencumbered, high-quality liquid assets that can be converted into cash to meet its liquidity needs for a 30 calendar day time horizon'.<sup>17</sup> The definition of a high-quality liquid asset can be summarised as cash, reserve-account money and most government bonds although corporate bonds, bank bonds, and indeed claims to any of the above may be used in some cases.<sup>18</sup> LCRs are similar to reserve requirements and, in terms of controlling the money supply, if a bank held a lack of high-quality liquid assets they may be discouraged from creating bank-account money. The main reason why such ratios have been so ineffective at limiting excessive credit creation during periods of expansion is because the amount of such liquid assets tends to expand in line with an expanding money supply. The amount of reserve-account money, for one, should expand in proportion to the money supply by definition. A similar trend can be noted with the absolute value of government bonds also. LCRs can, however, restrict the creation of money during a period of contraction as governments issue less bonds, central banks issue less reserve-account money and so on. In conclusion, liquidity coverage ratios can't restrict money creation in times of expansion, even in theory, but may do so in times of contraction.

### 3. Capital adequacy ratios

The capital adequacy ratios are designed to raise 'the resilience of the banking sector' since 'it is critical that banks' risk exposures are backed by a high quality capital base'.<sup>19</sup> The ratios primarily help to ensure that each individual bank remains solvent by requiring them to hold adequate assets available for sale to cover losses in the event of mass default from its debtors. Under the rules, banks should hold a certain amount of assets which are considered very safe before they can create a liability on themselves (in the form of bank-account money) matched by the addition of a new asset on the bank's balance sheet. The new asset, normally the borrower's debt and/or collateral, will be at a certain risk of becoming less valuable than it is at the present day and the 'safe' asset should cover this risk. The rules may or may not be fit for purpose in this regard but in terms of limiting the amount of money which banks can create the ratios are certainly ineffective. This is because the 'safe' assets, primarily shares, which banks are supposed to have before creating a loan also tend to increase in proportion to the money supply.<sup>20</sup>

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<sup>17</sup> Quoted from *Basel III: International framework for liquidity risk measurement, standards and monitoring* published by The Basel Committee on Banking, December 2010

<sup>18</sup> *Basel III: International framework for liquidity risk measurement, standards and monitoring*, sub-categorises high-quality liquid assets into Level 1 and Level 2 assets. Level 1 assets include cash, central bank reserves and 'marketable securities representing claims on or claims guaranteed by sovereigns, central banks, non-central government PSEs, the Bank for International Settlements, the International Monetary Fund, the European Commission, or multilateral development banks'. Level 2 assets consist of marketable securities representing claims on or claims guaranteed by sovereigns and others entities. They are subject to a 15% 'haircut' of their current market value and cannot comprise more than 40% of a banks high-quality liquid assets.

<sup>19</sup> Quoted from *Basel III: A Global regulatory framework for more resilient banks and banking systems* published by The Basel Committee on Banking, December 2010 (revised June 2011).

<sup>20</sup> For a full list of the type and amount of assets which should form an adequate capital base for banks see *Basel III: A*

In conclusion the regulatory requirements and procedures described above may be helpful for other purposes but have been, and will be, ineffective at controlling a period of excessive credit creation. A period of excessive credit creation initiates a positive feedback loop for all the institutions involved in the system in which reserve-account money, government bonds, 'safe' corporate shares and hence the money supply all tend to increase thus maintaining acceptable ratios with each other.

#### 4. Imperpetual borrowing and the banks' confidence

Since there is no regulatory limit on the amount of money that banks can create what eventually stops excessive credit creation? We argue that the main factor is the public's inability to be ever increasing carriers of debt and this in turn affects the banks' confidence in getting a return on the money they create. Looking at an economy as a closed system and treating cash as negligible, what's in circulation is the principal, or partial principal, of every recent loan, while the debt to the banks amounts to the principal plus compound interest. The only way for this system to run smoothly is for the economy to continuously take on more debt to banks than it repays. Once this condition is not met the money supply decreases and it's inevitable that there will be many defaults on loans. This is the case even if, for example, banks created money and debt only for those with the highest credit rating. Of course businesses, households and indeed governments can't be perpetual carriers of debt and this is the main limit to the money creation process. Even a small contraction in the money supply will lower the banks' confidence in getting repaid and this can strongly discourage banks from creating money.

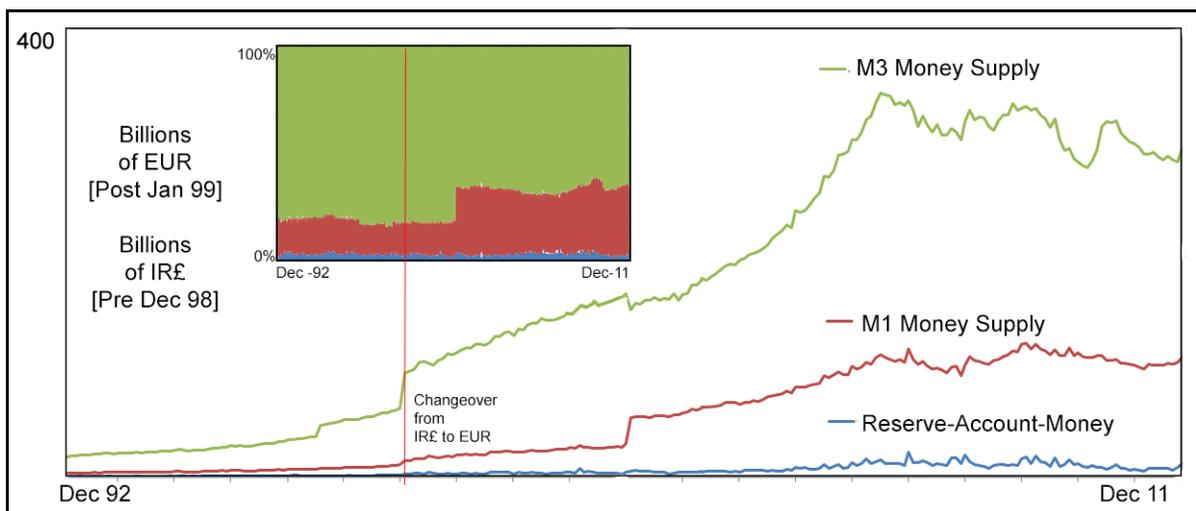
In Ireland, and in many developed economies, house buyers are significant carriers of debt primarily because mortgages have always been able to increase in duration. However, mortgages now take two incomes around 30 years to repay and as such they appear to have reached their natural limit of duration. This is a concern if the current system of money creation and destruction is expected to continue.

## VII THE ECB'S CONTROL OF THE MONEY SUPPLY

We will now analyse the performance of the ECB in controlling the money supply via a case study of The Central Bank of Ireland's performance over the last two decades. The ECB and the NCBs have little or no control over the money creation/destruction process. Even in theory the NCBs can only control the creation of bank-account money in one direction. By restricting the creation of reserve-account money it is possible that they could stop excessive credit creation. However in the other direction they can lower reserve requirements, lower interest rates, make less stringent regulations and increase the monetary base but they cannot force people to go into debt and this method of increasing the money supply is ineffective if no-one

is willing or able to borrow. Chart one below shows how ineffective the Central Bank of Ireland was in controlling the creation of money up to 2007. The M3 money supply doubled about every decade. The bar chart insert shows that reserve-account money did stay in line or increase somewhat relative to the M3 money supply. It is more likely the case that the central bank had to create reserve-account money to keep up with the creation of bank-account money rather than the other way around.<sup>21</sup> If a bank requests new reserve-account money the central bank isn't in a position to refuse.

Furthermore from January 2007 we can see that reserve-account money tended to increase and remain relatively high. However the M3 and M1 money supplies tends to decrease.<sup>22</sup>



Reserve-account money, M1 & M3 Money Supply in Ireland Over Time [Source: Central Bank of Ireland Statistics]

## VIII CONCLUSION

What we now use as money, the numbers in bank accounts, are accounting entries in the form of bank liabilities. These accounting entries make up over 91% of the M3 money supply in the euro zone today and are used to make payments for over 99.9% of all transactions by value according to Positive Money, an economic research unit based in the UK. In today's

<sup>21</sup> Piti Distayyat and Claudio Bori, Bank of International Settlements (2009) wrote; 'This paper contends that the emphasis on policy-induced changes in deposits is misplaced. If anything, the process actually works in reverse, with loans driving deposits. In particular, it is argued that the concept of the money multiplier is flawed and uninformative in terms of analyzing the dynamics of bank lending. Under a fiat money standard and liberalized financial system, there is no exogenous constraint on the supply of credit except through regulatory capital requirements. An adequately capitalized banking system can always fulfill the demand for loans if it wishes to.'

Vitor Constancio, Vice President of the ECB (2011) wrote 'In reality the sequence works more in the opposite direction with banks taking first their credit decisions and then looking for the necessary funding and reserves of central bank money. Lombra R. (1992), *Understanding the Remarkable Survival of Multiplier Models of Money Stock Determination*, states that 'The money multiplier model is....at best a misleading and incomplete model and at worst a completely mis-specified model.'

<sup>22</sup> Nobel Prize winners Finn Kydland and Ed Prescott of the Federal Reserve Bank of Minneapolis wrote in 1990 'There is no evidence that either the monetary base or M1 leads the [credit] 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 [credit] cycle slightly.'

digital world, the ability to print cash is of little benefit to the central banks or the departments of finance. Banks create/delete these numbers and hence the vast majority of each nation's money supply through loans and loan repayments respectively. Thus almost every euro has a corresponding debt to the banking sector. The charging of compound interest on issued money means the economy generally owes more to banks than exists. Once a loan is repaid to a bank the money used to do so no longer exists and this is the main reason why there can be less money in circulation during a recession. This destruction of money also explains why a reduction in personal and business debt doesn't leave the economy in a better position in relative terms. The regulatory requirements by which banks should comply with are ineffective at controlling excessive credit creation, even in theory. However, they may discourage the creation of money during periods of contraction. The inability of the economy to perpetually carry increasing debt to banks is the main limit to excessive credit creation. The banks' subsequent lack of confidence in the system is procyclical in this regard. The 'maxing out' of mortgage durations to two incomes and three decades is a concern if this system is expected to continue. Central banks cannot effectively increase the money supply under this system, even in theory, because they cannot force people to borrow.

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