

# Understanding and Resolving the “Big Crunch”<sup>1,2</sup>

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## Abstract

*The Big Crunch was the implosion of the global money supply on 15 September 2008, following the bankruptcy of the Lehman Brothers’ bank. It was a non-linear and sudden catastrophic event for the global economic system, unprecedented in scale in human history. The initial shock alone has been great enough to provoke at least a strong recession in several industrialized economies (e.g. US, UK, Japan, Germany) even with fiscal stimuli to offset reductions in real investment that are already evident in many economies, particularly in housing. If trust is not rapidly restored, the world economy may face a depression more severe than the Great Depression, 1929–1934. This paper starts by explaining the characteristics of money that are essential in understanding the Big Crunch and then outlines the likely sources and consequences of the crisis as based on loss of trust in money and the banking system. The paper concludes by outlining a seven-point plan for resolving the crisis, including a programme of real investment, which will also kick-start the long-term action needed to avoid dangerous climate change. Global GDP is expected to fall by 2.3% in 2009 and again by 2.3% in 2010 on policies announced as of January 2009. The 7-point plan is projected to limit the decline to 2009.*

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<sup>1</sup> This paper draws extensively on text in Chapter 3 of the revised edition of *Space-Time Economics*, (Barker, 1996). See Table 4 in the Appendix of this paper for a contrast between traditional and new thinking in economics. The article introduces some concepts rather briefly where they are covered extensively in the book, which is being prepared for a second edition. The text of the chapter on money is being revised in the light of the financial crisis and its effects on the world’s money and economy.

<sup>2</sup> This is a draft and comments are welcome. Thanks to Ramona Meyricke for comments on this draft and to Martin Sewell for checking the references. Thanks also to the Three Guineas Trust (one of the Sainsbury Family Trusts) for providing financial support for the development of the E3MG model and the global projections reported in the paper. And finally thanks to Athanasios Dagoumas, Hector Pollitt, Unnada Chewpreecha and Șerban Scricciu for the team-work involved with developing the projections using E3MG of the depression and its resolution.

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# 1 Introduction

The Big Crunch<sup>4</sup> in the global money supply of 15 September 2008 came about as a result of the declaration of bankruptcy of the global bank, Lehman Brothers, on that day. The value of the financial stocks of the bank had been falling on and off since the credit crunch began in the summer of 2007, along with the value of many other investment banks. Lehman Brothers was one of Wall Street's biggest dealers in fixed-interest trading and was heavily invested in securities linked to the US sub-prime mortgage market. In September 2008, after disclosing its largest net loss in its history and high levels of exposure to mortgage-backed securities, Lehman Brother's share price fell more than 95%. Although talks had been held over the summer of 2008 for Lehman to become a retail bank, it appears to have been chosen as a scapegoat by financial authorities to show that the banks could not automatically rely on bailouts, even if their bankruptcy threatened the system.

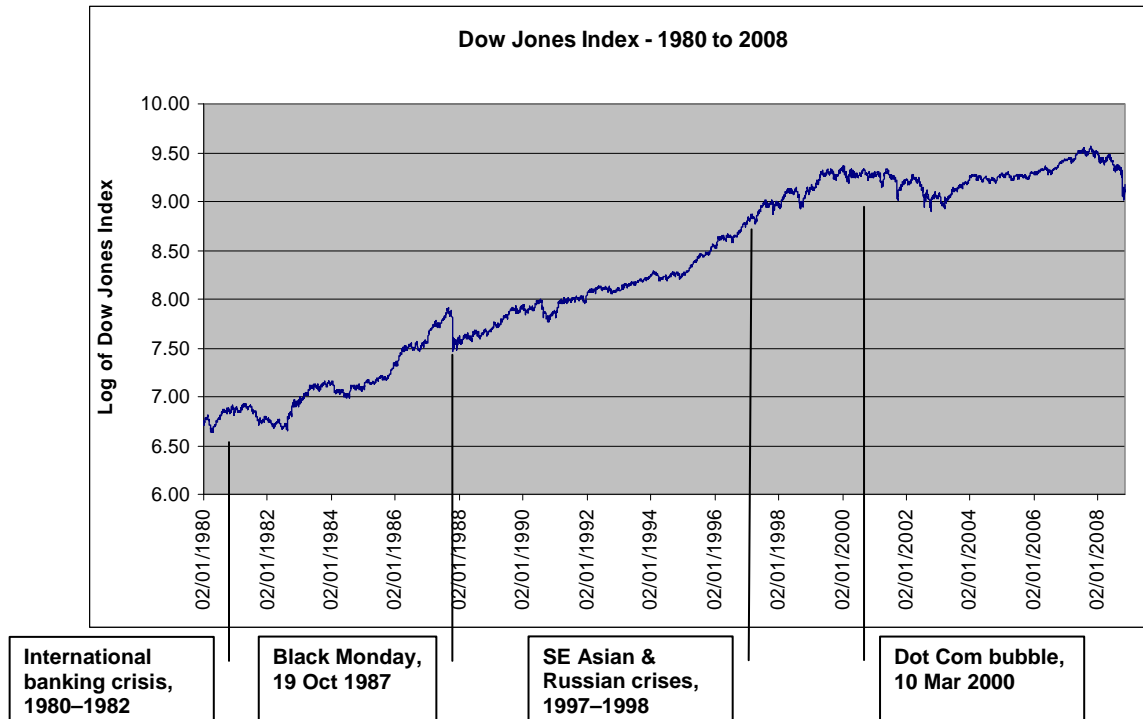
In fact the bankruptcy provoked the Big Crunch because it revealed the value of the realisable assets of the investment banking "model" and provided strong evidence that many, if not all, of the global investment banks were worthless. Since Lehman Brothers were engaged in massive money creation and hedging operations, the bankruptcy demonstrated that an unknown and potentially catastrophic amount of global money was "bad money", in the sense that its value was unknown if not worthless. Lehman Brothers was a "bankers' bank". Its operations and money had spread through the global banking system, so the whole system was seen to be laced through with bad money and bad debt.

In summary, the Big Crunch is an implosion of the money supply of an uncertain extent. Although it happened on 15 September 2008, its roots go back at least to the liberalisation of the financial markets 20 years earlier in the Big Bang<sup>5</sup>, which allowed the creation of supposedly risk-reducing monetary assets with fancy names such as "credit derivatives". These monetary assets eventually turned into the "toxic debt", or bad money, that poisoned the banks in which they were held after the Big Crunch. (See Figure 1.)

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<sup>4</sup> The name "big crunch" comes from cosmology, where it is used to describe the implosion supposed to happen at the end of the universe when matter condenses suddenly into an immense black hole. The term "Big Crunch" is used instead of "Credit Crunch" because the Lehman bankruptcy destroyed money through an implosion in the global quantity of money as evidenced by the massive amounts of liquidity the authorities, world-wide, were forced to inject into the system after 15 September 2008. For example, reportedly over \$700bn was injected by the US Federal Reserve on "meltdown Monday", 29 September, after Congress rejected the authorities' proposed bailout of the banks. In normal times the banking system creates money.

<sup>5</sup> The "Big Bang", used to describe the liberalisation of the financial markets in the last 1980s in the City of London, which in cosmology refers to the beginning of the universe. Aptly, some of those in Wall Street at the height of their prestige described themselves as "masters of the universe".



**Figure 1: The Big Crunch: history**

This paper explains the characteristics of money relevant to understanding the Big Crunch and considers exchange rates and interest rates as spatial and temporal prices of money (section 2). It goes on to explain the Big Crunch in the light of its effects on the world's money supply and its likely consequences under current policies (section 3). The risks of a liquidity trap are then explored as a possible outcome of current policies (section 4) and finally (section 5) a seven-point plan is developed to resolve the crisis. Brief summary conclusions are given in section 6.

## 2 The Characteristics of Money

Money is a resource at the heart of the economic system. It is the blood of the system, diffusing ever more finely throughout the body politic, bringing energy and supporting life. It reaches extremities such as the hidden and criminal economies that few other resources can touch. Interestingly, it is also like blood in that there is something strangely indecent about money. It is normally kept hidden from view in everyday life, in wallets and purses, just as blood appearing in public is normally quickly cleared away. Talk of it is exciting and often full of energy and dreams. It is closely related to sex in its power to motivate us<sup>6</sup>.

<sup>6</sup> Economists, artists and theologians have compared money to many things. Hume (1752) said that it is the oil that lubricates the wheels of trade. Bizarrely, in some Christian medieval art it is identified with sin and excrement.

The discovery of money is one of the great achievements of human society, comparable to the discovery of fire. The use of some form of money—closer to a commonly-accepted product used in barter than to a credit card in a modern economy—appears to have been used in human societies for a very long time. Modern money was invented as coin and paper notes in ancient Chinese civilization and its use has become pervasive in economies throughout the world, with global currencies such as the dollar, the euro and the yen being almost universally recognized<sup>7</sup>.

More formally, ‘money’ is given many meanings in economic literature and discourse, ranging over its identification with notes and coin in circulation, a set of monetary assets with particular characteristics, and wealth in general as when we say ‘she has money’. At its most general, money is ‘*the symbol of the spirit, forms and thought of modern civilization*’ (Frankel, 1987). Money is a resource created by human society. It is a social construct, being used and accorded value by human society. One social group, namely the banking community, has as its main function the creation and management of money in the economy. The banks can also destroy the money they have created, by ceasing to behave as banks.

For the purpose of the analysis that follows, ‘money’ will be defined precisely as a ‘resource with a set of characteristics that are embodied in different combinations in monetary assets’; examples of such assets are notes and coin, bank deposits, credit and debit cards, bank loans and various government-backed, short-term bills of exchange. Previous to the Big Crunch, the various credit derivatives created by the banks were also monetary assets. The important distinction between the characteristics of money or its ‘essence’ on the one hand, and the forms of money or monetary assets on the other, was clearly set out by Simmel in 1900 (1978 translation, pp. 119–120), who also emphasized the innumerable errors that arise if this basic distinction is not made.<sup>8</sup>

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<sup>7</sup> Paper money first came into use in China, in the Ninth Century AD according to Needham and Tsuen-Hsui (1959). Temple (1986) remarks that its original name was ‘flying money’ because it was so light it could blow out of one’s hand. As ‘exchange certificates’ used by merchants, paper money was quickly adopted by the government for forwarding tax payments. Real paper money, used as a medium of exchange and backed by deposited cash (a Chinese term for metal coins), apparently came into use in the tenth century. China still leads in the use of money, being apparently one of the first countries to remove coins from the money supply, replacing them by small paper notes. The first Western money was issued in Sweden in 1661. America followed in 1690, France in 1720, England in 1797, and Germany not until 1806.

<sup>8</sup> *The neoclassical approach* to money, based on the quantity theory of money, does not make this distinction and is both confusing and confused. Essentially neoclassical money is treated as a means of exchange. As the excellent New School discussion puts it ‘Walras’s story [about the role of money] is full of holes’ (<http://cepa.newschool.edu/het/essays/money/encaisse.htm>) and ever since Walras’s work was recognised, neoclassical writers have been trying to sort out the inconsistencies and contradictions in the theory. Walras himself thought that money was a kind of capital needed for future payments (it is an asset after all, but so is human education, a forest ecosystem or expert-system software) whose services entered the consumers’ utility function. If so, money could be treated with the same mathematical apparatus as all other products e.g. there is a marginal utility of monetary services. The problem with this treatment (as stressed by Patinkin, 1956) is that money is also *required* for transactions. How is money to be treated both as an asset with desired services and as a requirement for exchange? An even greater problem with the Walrasian treatment is that if money is needed solely in order to make future payments, and the agents holding it have perfect foresight, why do they need to hold it at all, because as an alternative they could hold an interest-bearing asset? Hahn (1983, p. 1) writes: ‘*The most serious*

The characteristics that form the set that describe ‘perfect money’ include the following seven distinct items.

1. Complete trustworthiness

If money is to be accepted as a means of exchange, then those who are to receive it will be willing to do so only to the extent that they trust that it will have effective value in current and future exchange.

2. Perfect divisibility

Money has to be divisible in order to allow exchange with integral goods and services of any value. Perfect money has the characteristic of complete non-integrality<sup>9</sup>.

3. Complete invariance over space and time

Money is most useful if its value remains constant over space and time. This can be seen as an aspect of the trustworthiness on money. Invariance is a key concept in economics as explained below.

4. Complete limitation of supply

A freely available asset is no use as money. Only those assets that are scarce by nature (e.g. gold or silver) or by design (e.g. government-printed notes) can be used as money, unless social conventions or taboos are sufficiently strong. If supply is not limited and managed, then money will not be completely invariant over space and time.

5. Complete acceptance as a unit of account or *numeraire*

Money is used in pricing as a measure of value, and in accounting as a unit of account.

6. Perfect convenience and attractiveness as a means of exchange

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*challenge that the existence of money poses is this: the best developed model of the economy cannot find room for it. The best developed model is, of course, the Arrow-Debreu version of Walrasian general equilibrium.*

*The monetarist school does not normally distinguish the characteristics of money and the monetary assets which embody these characteristics. Friedman (1987, pp. 8–9) states that money has three properties: a means of exchange, a store of value, and a unit of account.*

*The Keynesian treatment is also incomplete. Keynes (1921, 1937) also did not recognize fully the divisibility property of money. Weatherson (2002) contains a summary of Keynes’ views on money: ‘Keynes distinguishes four motives for holding money (General Theory (GT): Ch. 13; Keynes 1937: 215–223). Two of these, the transactions motive and the finance motive, need not detain us. They just relate to the need to make payments in money and on time. The third, the speculative motive, is often linked to uncertainty, and indeed Keynes does so (GT: 201). But ‘uncertainty’ here is just used to mean absence of certainty, that is the existence of risk, which as noted above is not how I am using ‘uncertainty’. As Runde (1994b) points out, an agent who is certain as to future movements in interest rates may still hold money for speculative reasons, as long as other agents who are not so certain have made mistaken judgements. The fourth motive will hold most of my attention. Keynes argues that we may hold money for purely precautionary reasons.’*

<sup>9</sup> Economic indivisibility or *integrality* is defined as ‘that property of resources which gives them economic value such that if they are divided they lose value to some significant extent.’

Since it is to be used in both everyday transactions and multimillion dollar deals, money has to be available in convenient and attractive forms, facilitating those transactions of very low value as well as those of very high value. This is a practical aspect of the divisibility property of money. Modern money has become electronic. So that when governments want to create huge quantities of money, they can simply use a computer rather than working the printing presses overtime as in the past.

#### 7. Attractiveness as a physical object

Since money is used by everyone in an economy, perfect money is also physically alluring and attractive.

Some of these characteristics are mutually exclusive, e.g. a perfectly divisible and attractive asset such as mercury is no use as money because it is inconvenient to carry about or to divide, apart from being poisonous. And some characteristics imply others, e.g. invariance if experienced for long enough yields trustworthiness. And some are much more important than others, with divisibility, invariance and convenience being key properties. Simmel (1978, p. 137) has an amusing ‘recorded fact’ concerning Russian silver coins of several centuries ago of such minute size that they could not be picked up by hand. Following an exchange, the purchaser had to tip the coins out of the purse on to a surface, and divide them, and both the purchaser and the seller had to pick up their own coins with their tongues and spit them into their respective purses. Convenience and hygiene were sacrificed for exchange and divisibility.

Although we think of money in physical terms—gold, silver, notes and coins—it is the services that monetary assets offer that are important, not their physical form. Most of these services are yielded when money is exchanged, but one of these services (money as a unit of account) is a general service yielded through time, allowing the valuation of all goods and all other services in an economy<sup>10</sup>. The services are attached to certain assets, usually financial (pieces of paper and certificates, promises to pay or contracts), known as monetary assets.

There is no single asset that embodies all the characteristics of money. Various monetary assets, such as US dollar bills, come close, but with the following qualifications. They are not limited in supply, being under the control of the US Treasury; they are not convenient for very high value transactions, because one would need suitcases full of notes; they are not *perfectly* divisible, but are practically divided into quarters, nickels, dimes and cents; and they are not invariant over time, since the average price of the basket of goods and services bought by the dollar-bill user is liable to rise, a feature also known as price inflation.

Government-backed monetary assets are in fact the principal means of exchange throughout the world today. Governments and central banks create and regulate money via the banking system on behalf of their citizens and have done so for hundreds of years. Often, several different monies (e.g. gold and silver, dollars and roubles) may be in circulation at the same time (e.g. when their citizens opt to use another country’s money),

<sup>10</sup> This is why Beinhocker (2006) is wrong to treat money as a “social technology”. Money is in a class of its own, since it can be used to value or even to buy social technologies.

but governments and central banks are usually in the position to manage only one of these monies.

Character	Notes & coin	Debit cards	Bank current accounts	Savings & loans	“Toxic debt”	Index linked government loans	Foreign exchange
Trustworthiness	●●●	●●●	●●●	●●		●●●	●●
Divisibility	●●	●●	●●●	●●	●●●	●	●
Invariance	●●	●●	●●	●	●	●●●	●
Supply limitation	●●●	●	●●	●		●●●	●
Numeraire							
Convenience	●●	●●	●●●	●●	●●●	●	●
Attractiveness	●●●	●●●					

Key: ●●● almost perfect  
 ●● viable  
 ● not very good  
 (blank) “non-existent”

**Table 1: Characteristics of money and monetary assets**

Table 1 lists the key monetary characteristics of the main monetary assets. Since there is no perfect money, it is impossible to give an unambiguous and precise definition to key concepts in the management of money. For example, changes in the ‘money supply’ have to be defined in terms of changes in the total of a set of monetary assets. If notes and coins are added to bank deposits, different combinations of monetary characteristics are added together, yielding an incoherent total. Such a procedure is like adding apples to oranges in the definition of the ‘fruit supply’: in obtaining an index of the value, supply or price of fruit, each type of fruit is weighted together using some conventional procedure. Only in the case of measuring the total value of money at a particular time, would the values of the different monetary assets be simply summed. In order to compare the stock of money at two different times, it is usual to distinguish quantity and price (unit-value) changes. If the change in the stock of money is interesting, then some procedure allowing for the different unit-values of the different kinds of money would be useful, but too problematic to be explored here. Instead, since trustworthiness is impossible to measure adequately over time, money supply and demand is treated as endogenous, as determined by the needs of the system.

### *1. Complete trustworthiness of money*

The importance of money and the trust in the quality of goods and services that money can buy, and the reputations of the bankers who create money and of other market players, leads on to the concept of trust. Trust by definition cannot be bought and sold. Rather, trust is a central feature of social relations, a moral resource. Trust is similar to, but not the same as, compassion, love, altruism and care for others. Trust can no more be bought and sold than compassion can be bought and sold. It is quite obvious that the purchase of compassion is meaningless, because compassion is, by definition, expressed without the expectation of reward; trust is in the same category.

Trust is closely related to reputation. Trustfulness is an inherent characteristic of people; it is instinctively assessed when people meet and is revealed by experience; it represents consistency in behaviour and has the connotation of integrity in behaviour. Some individuals may be very charming, but also very untrustworthy, or some firms may seem to offer a very good bargain in the goods and services they sell but be untrustworthy in that they are liable to sell goods and services with negative characteristics that only emerge when the goods are in use.

This suggests that the treatment of trust as a commodity, whatever that means, is one of Boulding's 'errors of taxonomy'. Clearly, trust is not a characteristic of goods and services but an inalienable characteristic of people and social groups, although there is a sense in which the quality of replicated goods correspond to the trust in the group, usually the company that produces these replicated goods is fully aware of this fact.

Goodwill, however, *is* sold when, for example, banks go bankrupt: their reputation is assessed, a value put on it, and then it can be put on the market and sold; however, after the Big Crunch, many banks have gone bankrupt without any goodwill whatsoever. Normally goodwill is exchanged in private deals before the bankruptcies are arranged. Normally, the goodwill that is associated with reputation of a bank and the quality of life of the employees, and the general social standing of the bank, can be very valuable, especially for service providers where there is no physical good to be measured. When a bank has ceased to function as such and is found to have broken the bond of trust between banker and client, as when it invests in Albanian-type pyramid schemes (e.g. the HSBC and other banks investing in Bernard Madoff's scheme and receiving 'hefty fees' for doing so—the scheme collapsed in late 2008), goodwill is destroyed wholesale, and may cease to be an important part of the value of a bank or a firm, for example when the bank is sold.

### *2. The perfect divisibility property of money*

This critical aspect of money is discussed extensively in Barker (1996, Chapter 3) and since it is not particularly relevant for the analysis here, this property is not discussed further.



### *3. Complete invariance in the value of money over space and time: exchange rates and interest rates*

This section explores the effects of external events on exchange and interest rate changes and the relationship between the two rates: exchange rates allow exchange of monetary assets over space; and interest rates allow the exchange of monetary assets over time. The section explains the asymmetrical expectations regarding interest and exchange rate changes as interest rates approach zero are discussed. These expectations become important in the sequence of events following the Big Crunch, as the bankrupt bankers respond to the crisis and seek to restore their balance sheets by exploiting interest rate differentials between their borrowing rates from the central banks and their lending rates on loans to customers that are set above the borrowing rates. The expectations of falling interest rates and prices in general imply the eventual potential ineffectiveness of reflationary monetary policy, with the likelihood of unstable real rates over space and time, as the economic system falls into a Keynesian liquidity trap.

Economic variance<sup>11</sup> is ‘the tendency for resources, including individuals, social groups, institutions, money, goods and services, their characteristics and their values, to change over space and time’. Perfect invariance as a property of money and of any resource is the persistence of the resource characteristics as completely unchanged over space and time. On the time-scale of the human race, the daily cycle of sunrise and sunset is perfectly invariant.

#### *The Invariance of Money*

The economic invariance of money over space means that at any given moment large numbers of simultaneous and identical transactions can take place over a monetary area. Millions of people can buy National Lottery tickets across a country, paying the same price, and each person can be sure that every other person has the same chance—per unit of stake—through the fact that money has the same value throughout the monetary area. Similarly, it may be important that all the people in a profession, say primary school teachers, are paid on the same salary scale on the same day, for the same work, throughout the country; the invariance property of money over space allows this to happen.

However, it is usually the case that many replicated goods and services have different prices in different locations in the same monetary area at the same time. The invariance-over-space property of money and the fact that some of these goods and services are replicated (i.e. they are exactly the same in all characteristics other than location) allows us to know that they have different economic values depending entirely on location, and hence to deduce the favourable and unfavourable locations in particular markets. Since the attributes of locations normally change relatively slowly over time, a

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<sup>11</sup> I am indebted to Michael E. McIntyre for suggesting the name for this property. The term invariance is used in mathematics and physics, e.g. in the term automorphism invariance, meaning a special type of transformation which leaves a relation unchanged (Narens and Luce, 1987). Faden (1977, p. 56) uses the term isomer, borrowed from chemistry, to indicate a resource not tied down to a specific region or time instant, i.e. invariant over space and time; the word invariance has more appeal and is used here with a less precise meaning than that given to isomer.

comparison of the prices of replicated units in different monetary areas, allows for the measurement of international comparisons of purchasing power.

This invariance is a fundamental concept in economics, allowing plans to be made and helping to make predictions easier, both for producers in designing their goods and services with the expectation of a market, and for consumers in feeling confident that their purchases will give satisfaction when eventually consumed.

#### *The Spatial Role of Money in Space-Time Economics*

In a modern economy, with innovations such as telecommunications and the internet, the role of money becomes even more important simply because at any instant of time, e.g. when using a telephone or a fax, individuals or groups can transact at a distance purchases and sales with confidence in the stated monetary value in the different parts of the economy, in the different parts of economic space. For example, if I wish to send flowers to someone in another part of the country, I can effectively negotiate with a distant florist the exact value of the flowers, using the function of money as a means of exchange over economic space.

Crucially for economic growth, money allows production and consumption to be separated. Without money, the producer of a particular good or service must first seek out those who wish to use that particular good or service and is then limited to barter trade. Money widens enormously the scope of barter exchange, for it is then enough for the producers to accept money in exchange for their goods and services. On the consuming side of the transaction, no longer do the consumers need to seek out particular producers in order to conduct trade, or indeed offer something else immediately useful for exchange. Instead, the consumers can use money to go to the global market and buy the goods and services as and when they wish.

The existence of money allows the separation of production and consumption not only across time but also across space.

*'The extent and intensity of the role that money plays...is...manifested as the conquest of distance. .... [It] makes possible those associations of interests in which the spatial distance of the interested parties is absolutely negligible.'* (Simmel, 1978, p. 476)

It is this characteristic of money that allows the great financial markets of the world to operate together as a single system, with London, Frankfurt, Hong Kong, Tokyo, Sydney, Chicago and New York overlapping in their hours of opening. The spatial invariance of money has allowed a continuous global trading environment to develop for trading financial assets such as stocks and shares.

#### *The Role of Money in Continuous Pricing*

The lowest value coin, that is to say the smallest indivisible unit of money, is a unit of almost negligible value in the economy; thus money is as divisible as required. The divisibility function of money allows prices to be virtually continuous for individual goods and services so that a replicated good can have one price in one location, and a different price in another.

The possibility of almost continuous changes in price across economic space may be illustrated by the prices of a replicated good sold at various stations along a railway line running across the US, from New York on the Atlantic to San Francisco on the Pacific. Assume that time can be ignored, that there is a certain amount of competition between the suppliers of the good, that normal profits are made, and that there is a market at each station along the route. The price of the replicated good can and will vary according to the distance from its origin, say New York, along a continuum according to the transport costs. Assuming rational behaviour, and allowing for overhead costs, it would be expected that the gradation of price-change would be more-or-less in proportion to the distance.

A similar phenomenon can be observed in the price of a fixed quantity of gasoline or petrol that varies according to the distance from the refinery. This is a more complicated example because there are many refineries, many companies, many petrol stations, and different degrees of competition within the different markets. However, by-and-large the further the distance of the sale of petrol from the refinery, the greater the increase in price of the replicated good compared with its price at the point of production.

### *The Temporal Role of Money*

*'Rhythm may be defined as symmetry in time, just as symmetry is rhythm in space... Rhythm is for the ear what symmetry is for the eye... The development of money...exhibits certain rhythmic phenomena...'* (Simmel, 1978, pp. 488–493)

Money is a convenient, and indeed, efficient, means of exchange over time. This is particularly obvious over short periods (days, weeks and months) in economies with low inflation, when monetary assets are treated as invariant over time. In these periods, the temporal invariance of money allows wages to be paid once a week or once a month, invoices to be raised and subsequently paid, credit of all sorts to be issued, and contracts to be made including payment at future dates.

Perfect money can allow the separation of activities over time; it can allow specialisation at an early stage of production by one social group, and at a later stage by another; it can allow the separation of production and consumption, of investment and saving. One of Keynes' achievements was to explore and analyze the invariance-over-time property of money, i.e. money as a store of value. Keynes' insight (1936, pp. 233–234) was that, in some circumstances, the benefit of holding wealth in the form of current account balances to take advantage of money as a store of value, might well completely outweigh the benefit of holding the wealth in the form of interest-bearing assets. If individuals and social groups become extremely concerned about the future and the value of non-monetary assets, or if interest rates approach zero (the liquidity trap), they may well be prepared to forego all interest and other receipts and hold all their wealth in non-interest-bearing monetary assets in order to take advantage of the invariant value of money over time. Table 2 shows the use of money as a store of value over the seasonal cycle.

#### 4. Complete limitation of the supply in relation to its endogenous demand

By definition the demand and supply of money are equal, but the potential or desired demand is not necessarily equal to the supply. Perfect money retains its value because it is limited in supply, by fiat such as the assets of notes and coins, or by physical restriction such as gold as a monetary asset. However, if the supply is sufficiently below the desired demand, users will begin to create their own, usually imperfect, money. Here the factors determining the demand for money are considered, followed by a discussion of the reasons for it being endogenous is explained, with a conclusion regarding the possibilities of limitation in supply.

	Goods	Services
Spring	purchase of seed	sowing
Summer		spraying
Autumn	sale of crops	harvesting
Winter		repairing of tools

**Table 2: Money as a store of value**

##### *The Demand for Monetary Assets*

The demand for money cannot be directly observed, except by introspection, although it may be measurable by the technique of hedonic functions. However, the demand for monetary assets is measurable and is widely measured and, through understanding the nature of this demand, the roles of the rate of exchange and the rate of interest rate can be explained.

The market for monetary assets has the following features. Each monetary asset combines different characteristics of money. All are divisible in space but with varying degrees of divisibility or liquidity over time. The three characteristics of convenience, return and risk are important for the analysis. *Convenience* refers to divisibility and use in exchange; *return* is the monetary benefit or cost of holding the asset, including the foreign exchange conversion, interest or other return; and the *risk* is that of monetary gain or loss in the case of illiquid assets.

As a result of economies of specialization and scale, these assets are available only in a finite number (i.e. there is no continuous spectrum of assets), each with a different and fixed combination of characteristics. The following five assets, rated in domestic currency (GBP) are chosen for the purpose of this analysis: notes and coin or 'cash'; debit cards, current account balances in commercial banks; balances in saving and loan accounts; time-deposits in banks; and balances in a fictitious current account index-linked to inflation which holds its value in spite of inflation by means of a rate of return *guaranteed* at the rate of inflation. An additional asset, a current account in USD, is also included to show how exchange rates enter into decisions.

The assets are desired for their characteristics, not for themselves. For ease of understanding, all characteristics are expressed as positive ones, which the holder is assumed to desire: more convenience, higher return and lower risk. The holdings and the market are in a state of flux in time with cash being spent, cards being used, cheques being written, balances being run down and replenished, and time-deposit accounts maturing. There is a cost in collecting information and making transactions in the rebalancing of the portfolio of assets to satisfy some criterion, such as a legal requirement, or the need to avoid an overdraft, or the accumulation of liquid assets to permit a house purchase. Because of economies of scale and indivisibilities, the rebalancing is not continual, but periodic; and in many organizations the rebalancing is done regularly by specialized departments. To offset the costs of rebalancing, there are monetary gains from shifting the portfolio towards assets with higher returns and away from the accumulation of losses.

A freely available asset is no use as money since it will not then be completely invariant over space and time. The attempted control of the growth of one or a combination of monetary assets as means of controlling the ‘supply of money’ or even as a means of controlling the rate of inflation, is liable to become increasingly ineffective as the financial system switches to existing or new monetary assets that are not controlled. This is Goodhart’s Law<sup>12</sup>, named after Charles Goodhart, a former Chief Adviser to the Bank of England.

#### *The Explanation for Goodhart’s Law*

The Law is defined as ‘Any observed statistical regularity will tend to collapse once pressure is placed upon it for control purposes.’ (Chrystal and Mizen, 2003, p. 223)<sup>13</sup>. The purpose of controlling the “money supply” was ultimately to control the rate of inflation, following the acceptance of the monetarist analysis of the causes of inflation in the 1980s, e.g. by the UK Government under Prime Minister Margaret Thatcher.<sup>14</sup> One of the best examples of the Law in action relates to the attempt by the UK Government to control the rate of inflation by controlling the measure of broad money £M4 in the late 1970s. £M4 appeared to be a good leading indicator of inflation, so it was controlled without imposing any other measures to control aggregate demand (Chrystal and Mizen,

<sup>12</sup> The Law is generalized in (Barker, 1996) in the discussion of economic instruments and targets. McIntyre adds ‘Professor Marilyn Strathern FBA, following Hoskin (1996), has re-stated Goodhart’s Law more succinctly and more generally: “When a measure becomes a target, it ceases to be a good measure.” Goodhart’s law is a sociological analogue of Heisenberg’s uncertainty principle in quantum mechanics [but with crucial differences—see Chapter 6 below on the observed and the observer in the social sciences]. Measuring a system usually disturbs it. The more precise the measurement, and the shorter its timescale, the greater the energy of the disturbance and the greater the unpredictability of the outcome. See also the extended discussion by Hoskin (1996). Hoskin’s article illustrates the wide applicability of Goodhart’s law, and provides an illuminating historical discussion of what ‘accountability’ has come to mean today. See Strathern’s (1997) discussion. <http://www.atm.damtp.cam.ac.uk/people/mem/papers/LHCE/goodhart.html>

<sup>13</sup> Chrystal and Mizen (2003, p. 222–226) give an excellent assessment of the Law and point out that it was first formulated and demonstrated in relation to the control of monetary aggregates by means of interest rates.

<sup>14</sup> The theory was developed by Friedman and the Chicago School. It has since been partially repudiated by Friedman (2003).

2003, p. 225–226). The attempt failed and inflation rose sharply in 1979 and 1980, following the second world oil price shock.

The problem is that any particular monetary asset only imperfectly supplies the services of money, and the financial system may be adept at creating new assets to perform particular functions of money. In other words, different monetary assets may be highly substitutable in terms of the monetary services they provide, and indeed these services are largely unmeasurable. This in turn implies that attempts to control a specific set of monetary assets (the target), for example by controlling interest rates (the instrument), may well fail, because the financial system is sufficiently flexible in providing the underlying monetary services demanded by social groups. This will be especially true if the financial system is being deregulated and new financial services and institutions are being created and tested as in the UK in the 1980s.

The analysis implies further that if a control variable, or instrument of policy, such as a tax rate on a product such as a carbon tax on fossil fuels, cannot be substituted by other tax rates, because all are subject to the legal control of the governments, then as long as the product being taxed cannot be replaced easily by untaxed products, the generalized Law will not become operative.

#### *The Supply of Monetary Assets and the Level of Economic Activity*

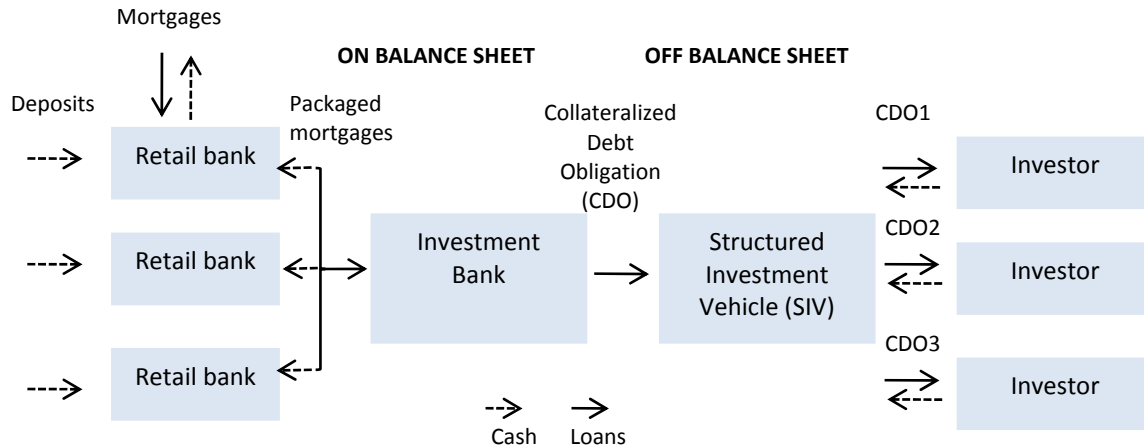
One of the principal services required of monetary assets is their use as a means of exchange, e.g. as a way of buying and selling goods and services. It seems reasonable that the stock of assets required for this purpose should be related to the total value of the transactions involved. However, this value includes not only transactions in the current flow of goods and services as might be measured by gross output, but also those involving transfers between people (such as gambling), the exchange of houses and other second-hand physical assets, and the exchange of financial assets, such as stocks and shares and foreign currencies. This total value will be very much larger than gross output, and in countries such as the UK and the US, changes in its price level are likely to be dominated by changes in prices of financial assets. If the economy is growing smoothly so that the value of gross output is closely correlated with the total of monetary transactions, then a relationship between the value of some monetary aggregate and the value of gross output might appear for a short period in an economy, but it is unlikely to be stable. It seems even less likely that the effect of reducing the supply of some monetary asset will of itself reduce the general price level for the flow of new goods and services.

#### *5. Complete acceptance as a unit of account or numeraire and 7. Perfect convenience as a means of exchange*

Money is used in pricing as a measure of value, and in accounting as a unit of account. It also should be attractive and convenient. These properties are again discussed in more detail in (Barker, 1996, Chapter 3).

### 3 The Big Crunch: Sources and Consequences

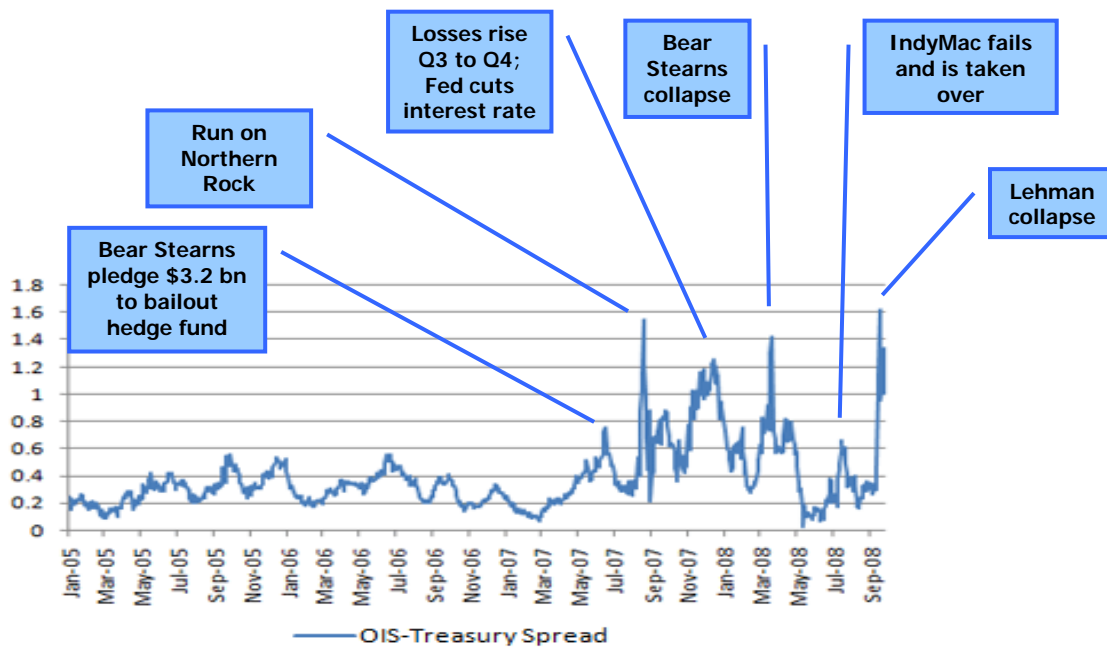
The Big Crunch can be seen as having, at the time of writing in January 2009, four stages. *The first stage* was the period of financial liberalization and the orthodox money creation that occurred after the US left the gold standard in 1971 and exchange rates gradually became more free to fluctuate against each other (although fully free exchange rates were never achieved because key developing countries, e.g. China, remained on a fixed rate system). The first stage ended some time in the 1990s.



**Figure 2: Securitisation and leverage**

*The second stage* (see Figure 2) involved a period of financial innovation and credit expansion during which wholesale banks discovered ways of creating money and increasing their leverage via “off-balance sheet” items, a terminology suggesting that this money was outside national monetary jurisdiction and not subject to any regulation apart from that of prudent banking enforced by the banks themselves. This stage reached its apogee in 2007, when total US consumer debt (which includes credit-card debt and non-credit-card debt but not mortgage debt) reached \$2.55 trillion and loans were obtained on worthless property and unsustainable income flows. An extraordinary feature of stage two is that the excesses continued as a result of institutional inertia and bonus incentives that rewarded excessive risk taking.

*The third stage* was a systemic quarterly spiral of asset write downs, loss of confidence and panic selling, which shall be termed a “dance of death” and which began in June 2007. Trust in the banks and in the money they hold and create is essential to the working of any economy and to the conduct of international banking and inter-bank banking. It is trust in this money that has been eroded, starting most obviously in August 2007 with the bankruptcy of the Wall Street investment bank, Bear Stearns.



**Figure 3: The Big Crunch: history of the OIS spread**

Key indicators of inter-bank trust are the LIBOR<sup>15</sup> and the Overnight Indexed Swap<sup>16</sup> (OIS) rates, which reflect banks' expectations of credit risk in inter-bank lending.

Figure 3 shows the peaks and troughs in the OIS rates over the last two years. The sudden rise in 2007 indicates the emergence of the mistrust between the banks. The dance started in June 2007, with the Bear Stearns (a leading, eminent and long-established Wall Street wholesale bank) pledge of \$3.2bn to bailout its hedge fund. The bailout shocked the market by revealing the potential for catastrophe for all banks exposed to mortgage default. It continued in Europe with the UK Northern "run on the Rock" in September 2007, the losses leading to the Fed interest rates cut in December 2007, the eventual bankruptcy of Bear Stearns in March 2008, the failure of IndyMac in June 2008 and finally the Big Crunch bankruptcy of Lehman Brothers in September 2008. The timing of these failures was driven by quarterly reporting requirements which revealed progressively larger losses as asset values were "marked to market". Each failure deepened the mistrust between banks as evidenced in the LIBOR and other rates for inter-bank current and futures lending. The degree and length of the mistrust was unprecedented and forced the monetary authorities to act, since complete (or very significant) mistrust and zero inter-bank lending would lead to monetary collapse.

The Big Crunch destroyed the viability of the investment banking model and on 15 September 2008 removed an unknown amount from the stock of international money. The loss of money takes the form of a loss of trust (characteristic 1 above) that increased stock market volatility, instability in interest and exchange rates, which in turn led to

<sup>15</sup> LIBOR: London Inter-Bank Offered Rate. By convention the LIBOR rate is quoted for many major banking markets, and this is justified because in normal times the hedge funds essentially arbitrage away any differentials between rates across the international financial markets.

<sup>16</sup> An overnight indexed swap exchanges a fixed level of interest for a floating level of interest, usually the central bank rate plus a premium, over the term of the swap. The counterparties to the swap make payments based on the difference between a fixed rate and a stream of variable rates.



price fluttering (provoking a further loss in supply from characteristic 3 above) and finally apparently unlimited increases in liquidity granted to the banks in response to their requests for help to avoid “meltdown” and hence unknown changes in the money supply (characteristic 4).

*The fourth stage* is ongoing, post-15 September 2008. The main response to the crisis by the authorities has been a creeping, country-by-country, “bankers’ solution”, a bankers’ ramp<sup>17</sup>, in which the bankers dictate policies to governments<sup>18</sup> to safeguard their position, but at the expense of further loss of trust in the money supply. The bankers’ solution has been first a succession of bailouts, and when these proved too costly, various recapitalization schemes to restore the banks’ balance sheet viability via massive injections of liquidity and capital, by the “good money” created by central banks or government treasuries. The problem with these solutions is that they increase the distrust in the system and in the money supply; in other words they add to the problem they are intended to solve. The reason is that the public impression (right or wrong) given by the bankers’ solution is that governments are using taxpayers’ money to bail out the bankers. Since the banks primary objective at present is to restore the quality of their balance sheets, in general they will hold on to the good money, rather than lending it to businesses and households. As a result, banks are seen as even more untrustworthy. If they refuse to pass on interest rate cuts to their customers, the trust is further eroded. The outcome is a feedback process leading to accelerated collapse of trust and the money supply.

The irony of the bankers’ solution is that there are clear and fairly recent examples of alternative solutions that seem likely to be much more successful. Perhaps the most successful at a country scale, was the resolution of the Swedish and Norwegian banking crises of 1992 (Ergungor, 2007). The source of the crises was the deregulation of the banks followed by a real estate speculative boom, which burst after real interest rates rose following German reunification in 1990. Ergungor and Thomson (2006, quoted by Ergungor, 2007, pp. 7–8) set out four features of a successful resolution of such financial crises: (1) transparency in identifying the toxic debt, (2) the resolution handled by a politically and financially independent agency, (3) the maintenance of market discipline and (4) repairing the damaged creditworthiness of the real economy. None of these features characterize the bankers’ solution to the 2008 crisis: (1) the toxic debt remains in obscurity, (2) the bankers themselves appear to be organizing the resolution in the US and UK at least until mid-January 2009, (3) since the main wholesale banks have avoided bankruptcy, partly by turning themselves into retail banks and further infecting the system with toxic debt, market discipline in the form of bankrupting the bad banks has not been enforced, and finally (4) the collapse of the real economy has not been checked—in fact it appears to have been accelerated.

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<sup>17</sup> See Williamson (1984) for a discussion of the 1931 London bankers’ ramp, led by J.P. Morgan.

<sup>18</sup> The Governments of Switzerland and China are notable exceptions: in Switzerland, bankers have been “named and shamed” by the press and any assets obtained by fraud are being at least partially recovered; in China, the bankers are subject to state control and are not allowed to dictate policy.

Period	Duration	Reason	Features
The Great Depression	1929 – 1939	Bad policy	Supply of gold backing currencies fell Failure to prevent spread of panic and drop in money supply when bubble burst
The Golden Years	1939 – 1971	Good policy	Tight international monetary policy Fixed exchange rates (US\$ gold standard) and restricted international capital flows
Globalisation and liberalisation	1972 on	Old policy	Gold supply limited liquidity, US\$ overvalued and lost trust B-W System needed adjustment
Crisis	Duration	Reason	Features
International Banking Crisis	1980 – 1982	Bad policy	US tight money supply and high spending increased interest rates, Mexico defaulted.
Black Monday	1987	Speculation	Financial innovations e.g. program trading, index futures and portfolio insurance
Swedish Banking Crisis	1991 – 1993	Easy credit	Restructured tax and economic slowdown burst housing/finance bubble
Japan's Lost Decade	1992 – 2002	Easy credit	Government increased interest rates, housing/finance bubble burst
South East Asian Crisis	1997	Easy credit / Speculation	High interest rates attracted FDI and a large inflow caused a run-up in prices
Russian Crisis / LTCM	1998	Speculation	Low price of oil reduced revenue: Russia defaulted on govt bonds, LTCM collapsed
Dot Com Boom	2000	Speculation	Speculation on technology stocks

**Table 3: History: 1929 to present**

The lessons of the recovery from the Great Depression after 1932, and of later successful resolutions of financial crises, have not all been learned, or (as seems more likely) the bankers have successfully claimed that there is no alternative to their preferred solution (see Table 3 for a brief history on financial crises since 1929). The bankers, the governments that follow their advice, and the traditional economists who advise them, all intend to promote a rapid return to normal, or in traditional economics-speak a return to “equilibrium”. There is a remote chance that this desirable outcome will emerge, but more likely is a deeper and more prolonged depression, exacerbated by the attempts to

restore the banks' balance sheets (recapitalization is the Fed's term for the policy). However, the financial and economic collapse seems likely to stop only if and when policies are radically changed, or if a massive fiscal reflation accompanies the bailouts. This fiscal reflation has to be sufficient (or seen to be sufficient) to offset the (unknown) deflationary effects of the fall in bank-funded expenditures, both directly in their own buildings and equipment, or indirectly in their customers' investments and consumption.

One other aspect of current monetary policies is the gradual country-by-country incremental reductions in interest rates by the central banks. It too seems to be exacerbating the crisis, if not leading to further economic disaster in the form of a global liquidity trap. Such a trap is the result of a convention that nominal interest rates cannot fall below zero<sup>19</sup>. However, the result of current policies is to set up expectations in global financial markets that interest rates will continue to fall. If so, the system will eventually become trapped at near-zero rates with price deflation yielding increasing real rates, adding to the economic forces reducing investment and where conventional market policies will not work. These forces can be summarized as: (1) higher real interest rates, when nominal rates are zero and price levels are falling (rather than fluttering about as at present), (2) reductions in investment by the banks' behaviour, and (3) reductions in investments because future economic activity is expected to be lower.

The global system post-Big-Crunch is fixed into a non-linear catastrophic feed-back loop, which unchecked could lead to global economic collapse. The features of a collapse are evident in leading indicators<sup>20</sup>: falls in gross investment and imports in the most exposed economies, e.g. US and UK so that house-building, construction in general, vehicles, machinery, even IT investment is reduced; these reductions then affect other countries' exports (Germany and Japan as leading equipment exporters) and output, with the effects reverberating back and forward throughout the globalized trading system undermining even the more robust high-growth economies, such as those of China and India; global expectations of the effects of the crisis add to the reductions in investment, and output falls further; and the authorities' efforts to reflate are seen generally as ineffectual and as responses to crisis rather than solutions. The potential speed of the collapse is held back partly by expectations of a return to normal, this being the hope of the private bankers in the attempt to save their banks from bankruptcy, the central bankers in controlling the system and the policy makers in addressing the increasingly evident failure of policy and increase in unemployment.

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<sup>19</sup> Despite the textbook warnings and the experience of the liquidity trap in Japan in the 1990s, it can be avoided by changing the convention that interest rates have to be positive, allowing central banks to provide interest subsidies on loans (i.e. negative interest rates) and restricting the availability of such beneficial credit. Interest rates can be made sufficiently negative both to restore the banks' balance sheets to normal levels and to encourage borrowing from the banks to restore investment to "normal" levels. However this solution to the crisis, besides being so unorthodox as to be not credible, has the disadvantage of having highly uncertain effects on the supply of money and the level of real investment. Not only do we have no historical information on responses to negative nominal rates, but we have little information on how the system will respond by increased investment, since the main drivers for investment are activity rates, which are collapsing, rather than levels or changes in real interest rates.

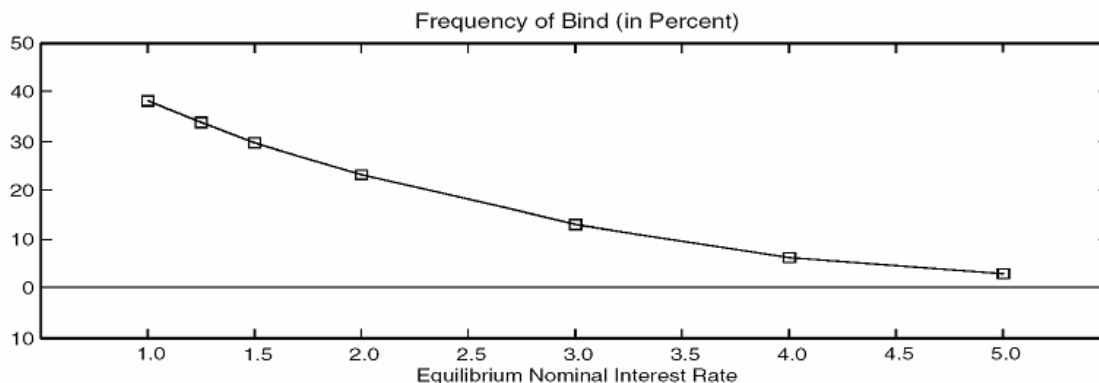
<sup>20</sup> See Figure 7 in the Appendix for some OECD leading indicators of November 2008. Source: <http://www.oecd.org/dataoecd/38/52/41642499.pdf>

## 4 The Risk of a Liquidity Trap

### *Asymmetric Expectations when the Rate of Interest approaches Zero (the liquidity trap)*

When interest rates are well above zero, say above 3%, ('interest rates', as other prices in this paper, are always taken to be defined as *nominal* interest rates) then expectations will normally be such that social groups will be divided as to whether the next movement for whatever reason will be up or down. These expectations can be managed by the banks to reflate or deflate the economy. However when interest rates approach zero, and since zero is regarded as a floor, expectations become increasingly deflationary: at zero, any interest rate change can only be upwards, therefore deflationary and this will have potentially catastrophic effects on the holding on monetary assets for speculative purposes, a situation identified by Keynes as a liquidity trap. When interest rates can only rise, bond prices can only fall, so all bonds will be potentially converted into money at unpredictable rates. Expectations themselves become unstable because the monetary regime is in uncharted territory as reflationary monetary policy becomes increasingly ineffective, and all social groups do not know how the banks and the governments will respond. Command-and-control policies become the main means by which the authorities can manage the system, giving a pronounced advantage to systems, such as the Chinese one, which can respond quickly and effectively to restore effective demand.

### *The Japanese Liquidity Trap, 1995–2002*



**Figure 4: ECB Analysis of risks of a liquidity trap**

The Japanese economy fell into a liquidity trap in the early 1990s, so there is recent experience of how it will affect the global economy in 2009. Figure 4 shows the outcome of a set of stochastic simulations of an econometric model of the global monetary system operated by researchers at the European Central Bank (Coenen and Wieland, 2003). The figure shows the chance of Japan falling into a liquidity trap (the zero bind) at various 'equilibrium' rates of interest, with equilibrium defined as the long-run solution for interest rates. The chance is about 20% for a 2% rate of interest.

The US had interest rates at around 2% in mid-2003, so that if the US monetary system is at all similar to the Japanese one, there was already an appreciable chance of the US falling into the trap before the financial crisis took hold, with the risk increasing by any chance series of deflationary shocks. Monetary and fiscal policy proved ineffectual to push or pull Japan out of the trap over the 8 years since 1995, so there was a serious risk that the US would join Japan in a global liquidity crisis that could, on past evidence, last for years.

### *The Risks of Falling into a Global Liquidity Trap in 2009 and 2010*

The risk of a liquidity trap has now become substantial at the global level in 2009 and 2010, a far more serious situation than Japan in the 1990s since there are no external sources of reflation and optimism to help pull the different world economies into strongly positive expectations and growth rates. Any economy that seeks to reflate strongly alone, e.g. China in 2009, will see an appreciable proportion of any extra effective demand leaking to imports, making the policy more difficult to succeed.

The full theoretical and quantitative analysis of the global liquidity trap requires the understanding, firstly, of how the economic system in particular fixed investments, responds to interest rates and changes in stocks of monetary assets, and, secondly, of how economic policy, both monetary and fiscal, operates in small and large open economies and in the world economy. Here the main reasons for concern are listed, then a brief reference made to the Cambridge Econometrics' analysis of the potential outcomes for the world economy 2009 to 2012, published in January 2009<sup>21</sup>.

### *Reasons for Concern for the World Economy in late 2008*

Under the policies being promoted by many governments and bankers in late 2008, the risks of a liquidity trap appear to be increasing and various central banks reduce interest rates towards zero. It is clearly in the interest of individual private banks to promote the liquidity trap because they can borrow at near zero interest rates and lend at higher rates and hence restore their balance sheets and restore profitability. However it is very much not in the interests of all banks or the system as a whole because once in the trap, it

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<sup>21</sup> An international workshop was held at the Chinese Academy of Social Sciences (CASS) in Beijing, 14–15 January, 2009, on “Modelling, Forecasting and Resolving the 2008 Global Recession”. The workshop concluded that the financial crisis is emerging as one of the most serious since the 1929–1934 Great Depression. The organisers were The Centre for Urban and Environmental Studies (CUES) in CASS, [www.rcsd.org.cn](http://www.rcsd.org.cn), Cambridge Econometrics, [www.camecon.com](http://www.camecon.com), and The Centre for Climate Change Mitigation Research (4CMR), Department of Land Economy, University of Cambridge, [www.4cmr.org](http://www.4cmr.org). A follow-up workshop was held at Madingley Hall, Cambridge, 27 January 2009, with alternative projections being presented by different groups of the global economy under various assumptions about business-as-usual and the effectiveness of proposed solutions. The workshops were organised at short notice in January 2009 to avoid any risk that the data bases of the models and the assumptions are affected by actual annual outcomes for 2009, i.e. the projections will all be almost pure forecasts, a scientific requirement for any future *ex post* analyses of the comparative success of the different approaches to modelling and assumptions behind the forecasts.

becomes very difficult for policies to provide sufficient traction to pull economies out of the trap, certainly at a country level.

There are several reasons for concern that the liquidity trap will close in early 2009:

1. The private banks have slowed their own investing. Typically social groups facing bankruptcy will not invest as much as before for the future, which has become much more uncertain. Since the banking and finance sector's investments world-wide are substantially larger than those of, for example, the electricity sector, the global economy will experience a recession if the banks behave as if they are bankrupt.
2. The private banks are encouraging savers to save and not consume (a reversal of their earlier money creation). It is now in their interests to promote saving rather than consumption as in the pre-crisis periods.
3. The banks are cutting their lending and forcing real-economy companies and households into bankruptcy. In their efforts to restore their own balance sheet profitability, they are withdrawing loans and adding stricter conditions for new lending, so actively reducing growth investment throughout the global economy.
4. Investors are in despair, prices are unpredictable, and carbon prices tend to zero, hence real investment is in "free fall". This is despair in the 'animal spirits' of investors in Joan Robinson's vivid language.
5. Householders are also very concerned and are seeking to restore their own saving rates, after they have fallen in the US and UK to near zero. The recovery of these rates to normal levels of about 7% or higher over the next two or three years will alone bring about a global depression.
6. Governments are also concerned about their long-term balance sheets, and some are seeking to cut future spending to reduce potential deficits. However, in order to get out of a liquidity trap, governments must take radical action: print money, spend aggressively, and hopefully restore the system to stable growth.
7. Globalization accelerates and spreads the reductions in national effective demand in a "classical" multiplier process. The equipment exporters (e.g. construction, vehicles, Japan, Germany) suffer first and most. This is perhaps the most serious deflationary force of all.

Provisional projections of the world economy using the E3MG model<sup>22</sup> suggest that on present policies global GDP will fall by as much as 7% below what it might have been without the financial crisis. Global GDP growth was 3.4% in 2007, 2.4% in 2008 and is

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<sup>22</sup> E3MG is a sectoral econometric model for 20 world regions that has been developed with the intention of analysing long-term energy and environment interactions within the global economy and assessing short and long-term impacts of climate-change policy. The model consists of an in-depth treatment of changes in the input-output structure of the economy over the forecast period and incorporates the effects of technological change, relative price movements and changes in the composition of each industry's output. The projections were presented at the Madingley Hall workshop and later revised. See Figure 8 in the Appendix and [www.E3MGmodel.com](http://www.E3MGmodel.com).

expected to be -3.4% in 2009. Employment is expected to continue to fall rapidly, especially in the USA, but also in many OECD countries.

## 5 Resolving the Big Crunch

World governments in 2008 appear not to understand the depth and scale of the financial crisis. The situation remains unresolved beyond the governments taking over the risks to the banking system and meeting to decide new rules on transparency and integrity, much needed but too late. The key fact is that the co-ordinated actions over 10–12 October 2008 to the time of writing have not yet restored LIBOR and OIS rates to “normality”.

One solution after another has so far failed to calm the markets for more than a day or two since the scale of the problem was revealed by the bankruptcy of Lehman Brothers on 15 September 2008. There is a risk that the crisis will continue to get worse, that the partial nationalisations will reveal debts toxic even at the scale of government debt. It may be that in order to restore trust in markets, to get the global economy back on an even keel, and to lance the political animosity building up against the banks, something even more radical needs to be done. This section briefly summarises the cause of the crisis as discussed above, but mainly focuses on a global plan to solve it.

### *The LIBOR Rates*

The LIBOR and OIS rates are obvious indicators of mistrust between the banks and this mistrust will end only when the toxic debt is identified and somehow removed from the system. The proposed solution of flooding the banks with good money (government-backed liquidity) will not help because the good money is being added to untold amounts of the bad money, which has accumulated nearly everywhere with access to the investment banks' toxic debt<sup>23</sup>. (There are no major investment banks left at this stage in the crisis, because the stock markets have valued them as worthless, or they have been turned into retail banks and given access to liquidity and the retail banks' small depositors' cash.)

Therefore the governments' guarantees on commercial terms will not restore trust. The bad banks will remain bad and the bad money will remain diffused through the system. The state is flooding the system with good money hoping that this will drive out the bad money, but it is the bad money that appears to be keeping the ex-investment banks afloat. The end result of adding good money to all this bad money may be a USD crash and

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<sup>23</sup> An extended analogy of the situation is as follows. In the global village, the bankers are in charge of the well of clean water needed for health and growth in the global economy and the governments are in charge of the springs of clean water that all flow into the well. When the banks report that the well and indeed the ground water are full of toxic debt, that poisons the economy, the governments provide a tanker of clean water. However, when poured down the well, this proves ineffective and the water remains poisoned. The bankers request a second tanker, but this time after they have received it, they refuse to pour it down the well, saying that they need it for themselves; otherwise they too will be poisoned or bankrupted. The rest of the economy is starved of funding and forced into lower growth and potential bankruptcy.

global hyperinflation. The extra liquidity is therefore potentially catastrophic for the real economy.

### *The scale of the financial catastrophe*

Those managing the money supply understand that we are living through and observing a non-linear catastrophic event in the global monetary system that requires fundamental changes in the system to restore trust. However, many bankers are in denial: they think their banks are “really” solvent; “the markets have gone haywire and are not to be trusted”; “the herd is panicking”; and we should as soon as possible return to “normal”. However, a wider assessment of the policy events of the last year suggests that the bankers themselves have been seeking to support their banks, via interference by central banks and governments in the operation of the financial markets to change the rules and take on the private risks.

There is probably a temptation to close the markets, as has been done in Russia several times since the big crunch. Another temptation may be to suspend bank shares, to avoid market valuations in a switch from mark-to-market valuation to “fair” valuation<sup>24</sup>. Again these solutions will not work because the fundamental problem of the bad money diffused through the system is not being addressed.

### *Fundamental reform of the system*

No one knows what will work to stop the collapse and restore order. We are in uncharted territory. A crisis of this magnitude is unprecedented in scale, although not in relation to previous bank failures and their effects on economies. The problem is global, a systemic market failure whose correction must involve all the major parties including at least the main OECD economies and Brazil, India, Russia and China.

A seven-step co-ordinated and sequenced plan is proposed.

1. ***Allow the markets to work without more interference.*** Let the markets work, and let the ex-investment banks go bankrupt. When the potentially bad banks are declared bankrupt (if that is the market verdict), then the bad money would be flushed out of the system. The institutional knowledge in the banks can be preserved by maintaining the employment structure, but replacing the Boards of Directors by Independent Government auditors. Independent authorities would investigate their current and past Directors for misdemeanours to enforce market discipline a key feature of successful resolution of the Nordic 1992 crisis. If actual bankruptcy is too unpalatable (it is much to be preferred), then government could try a “shadow” version, mimicking as far as possible the legal process. Small depositor and shareholder protections should be instituted or kept in place for equity reasons.

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<sup>24</sup> Such a move would signal the end of the capitalist system, since market valuations would be replaced by the banks’ valuations of their worth, rather like the Marxist theory of value in which goods and services are to be valued by their labour content, not their market values.



2. ***Set global interest rates to near zero.*** Announce a coordinated cut in interest rates to near zero. If the level is indeed too low, the authorities can easily raise interest rates. The point is to restore control. There remains a good chance of avoiding a global liquidity trap, (e.g. Japan in the 1990s), or hyperinflation if the dollar collapsed. The near-zero rates will allow the good banks remaining in the system to rapidly build up profits and business, taking over some of the physical infrastructure and employees of the failed bad banks. Importantly, it would jump-start the markets and allow different central banks to raise interest rates appropriate the local inflationary conditions. If there is to be a co-ordinated bankruptcy, close the markets briefly after cutting rates to near zero.
3. ***Return temporarily to a fixed exchange regime with capital controls.*** At the same time as the interest rate cut, institute a new regime of fixed exchange rates and temporary capital controls, making explicit the huge behind-the-scenes fixing that may be going on. A modest USD and GBP devaluation is probably wise, calculated to restore balance (eventually) to the balance of payments. It would greatly help to establish simultaneously other global prices as signals to support accelerated decarbonisation of the global economy, namely the carbon price and the prices of the main fossil fuels. This involves recognising existing and instituting new cartels, but it will encourage consuming countries to compete for carbon rents by raising carbon taxes and tightening their targets in trading schemes. It could also be extended to encourage the supplying countries to lock undeveloped fossil resources into the ground and biomass sinks in place, given new rents for untouched fossil and forests.
4. ***Consolidate the toxic and weak debt into regional bad banks.*** The debt should be frozen until it is either restored in value as the economy recovers, or shown to be worthless. The Norwegian/Swedish 1992 model is a good one.
5. ***Reflate via agreed global scale investment, supported by the good banks, especially the newly nationalised banks.*** Announce massive investment programmes (but not in banking and associated services) of the scale of the failing-bank investment and let the remaining banks consolidate and retreat from their past excesses. The new investment should be justified by cost-benefit analysis expanded into multi-criteria analysis, allowing for risks, effects on human health and life, and effects on the environment. The investment programmes should be co-ordinated in macro scale but of course tailored by governments to specific regional and national needs and conditions.
6. ***Institute/reform global regulatory authorities.*** Reform global regulatory standards and institute a World Regulatory and Standards Authority with the power to name and shame instances of national regulatory capture that are repeatedly in evidence in the current crisis. The Standards Authority could also usefully consolidate many other proposed and existing standards to support low-greenhouse gas products and processes.
7. ***Reform international company law.*** Reform company law to require all companies to take into account “internalities”, i.e. the effects of their actions on

the global biosphere over the indefinite future. We clearly need a strong signal that unethical and self-interested behaviour is unacceptable for companies as for people. The ratings agencies should explicitly include environmental performance in rating companies.

Without such coordinated action it seems very likely that the crisis will continue to deepen and develop into a twenty-first century Greater Depression. The plan involves (1) allowing the financial markets to work and the banks to go bankrupt, rather than being saved by government bailouts and recapitalisation. The other six points are (2) setting global interest rates to near zero, (3) fixing exchange rates temporarily along with key global commodity prices, followed by (4) a massive investment programmes, but not in the banks. Point (5) is a consolidation of toxic debt into regional good banks, as done by Sweden in its 1992 crisis. Point (6) involve a global procedure to name and shame instances of “regulatory capture” and point (7) involves the rapid establishment of global legal and technological standards and procedures to regulate banks and lower the costs of the coordinated investment programme.

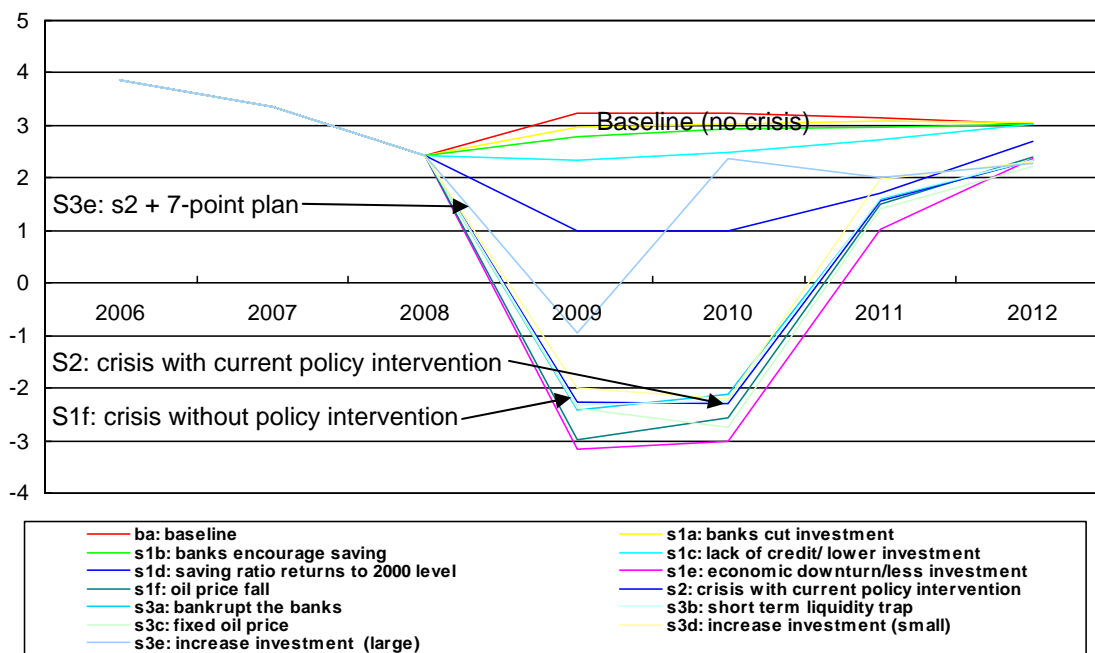


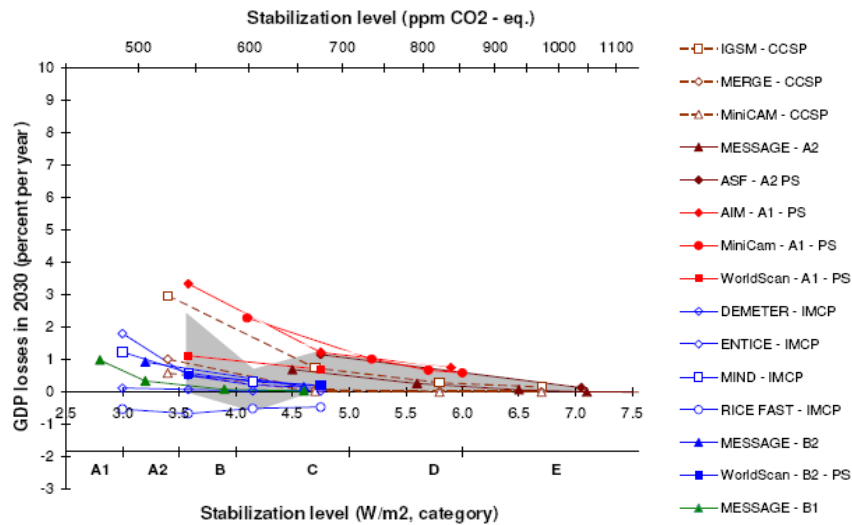
Figure 5: World GDP growth (%pa) as modelled by the 4CMR project

Provisional projections<sup>25</sup> of the world economy using the E3MG model suggest that, on present policies, global GDP will fall by as much as 13% by 2012 below what it might

<sup>25</sup> The first comprehensive quantitative analysis of the resolution of the crisis under this plan was published in February 2009 by Cambridge Econometrics and 4CMR, University of Cambridge, using the global model E3MG developed in association with the Tyndall Centre. This section briefly reports the highlights of the projections. E3MG is a sectoral econometric model for 20 world regions that has been designed with the intention of analyzing long-term energy and environment interactions within the global economy and assessing short and long-term impacts of climate-change policy. The model consists of an in-depth treatment of changes in the input-output structure of the economy over the forecast period and incorporates the effects of technological change, relative price movements and changes in the composition of each industry’s output. See Figure 8 in the Appendix and [www.E3MGmodel.com](http://www.E3MGmodel.com).

have been without the financial crisis. Global GDP growth was 3.4% in 2007, 2.4% in 2008 and is expected to be -2.3% in 2009 and again by -2.3% in 2010 before a very slow recovery (see Figure 5). This implies that the global depression brought about by the collapse of confidence in global money seems likely to reduce global GDP by some 10% below what it might otherwise have been by 2011, a much greater reduction than what has been estimated at the maximum cost of achieving a stringent stabilisation target for greenhouse gas concentrations by 2030 (see Figure 6). Employment is expected to continue to fall rapidly, especially in the US, but also in many other OECD countries.

Most studies for stringent stabilization (categories A1 and A2) show costs less than 3% →



Source: IPCC AR4, WG III Report 2007, Chapter 3, Figure 3.25 (a)

**Figure 6: 3% maximum global cost by 2030 in context**

This is then a global depression that is not quite expected to be on the scale of the Great Depression, 1929–1932 (except in the UK, many other EU countries and Japan). The developing world is not expected to save the situation. For example, China’s GDP is already growing more slowly. In 2007, GDP rose by 13% in 2007, according to newly revised data from China’s National Bureau of Statistics. Recent data suggest that GDP is expected to grow as an annual average by 9% in 2008, but the growth rate was falling through the year. China’s GDP is projected to grow by between 4% and 7% in 2009, according to the E3MG model’s projections, allowing for the global financial crisis, but without including the \$600bn Economic Stimulus Package announced by the Chinese Government. India is expected to fare worse.

The risk is that the weak and damaging policies being followed in many countries will exacerbate the dynamics of the crisis and generate a much worse depression. This may be the direct consequence of falling into the liquidity trap, apparent in the US and Japan, and imminent in the UK.

The 7-point plan was also modelled for resolving the crisis and returning the global economy to normal growth rates. This involves radical coordinated action at the global level. Provisional projections suggest that the global decrease in employment of some 55

million by 2012 could be reduced to 21 million if such a coordinated plan were put into operation over the next 3 months, to take effect from 2010.

The resolution of the global financial crisis is an opportunity to kick-start a rapid shift to a low-carbon economy, which is absolutely necessary in the coming decades if we are to avoid dangerous global climate change.

## **6 Conclusion: The Need for International Coordinated Action**

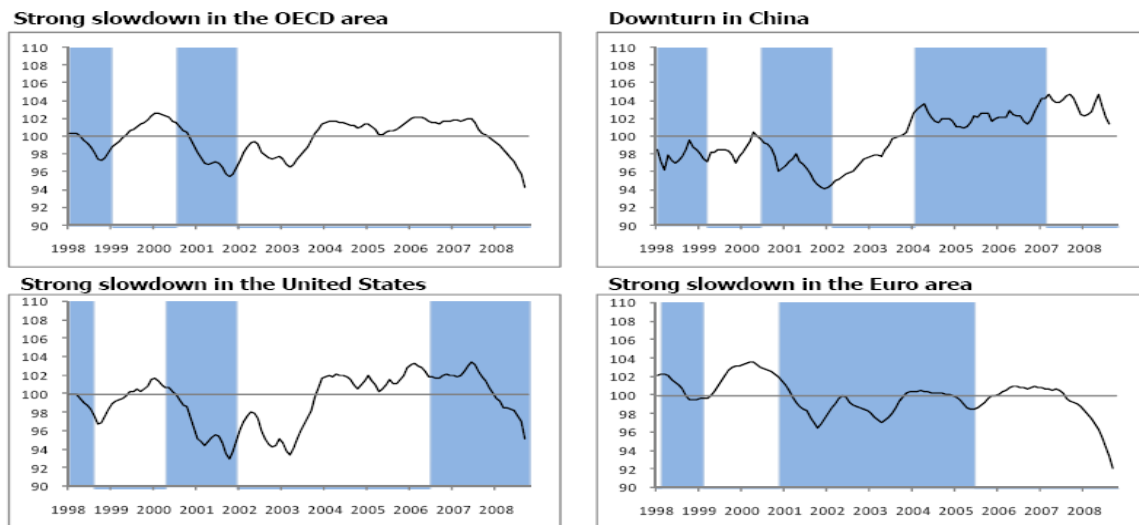
Without drastic action the crisis may continue indefinitely until trust in money is restored: the ensuing depression could be worse than the Great Depression 1929-1934 and could engulf the global economy for years to come (“the 21<sup>st</sup>C Greater Depression”); co-ordination of policies between governments will weaken and fail since the currency flows will become unstoppable; the price system will not provide reliable signals for investment; and investment will collapse because of uncertainty about stable future prices and expected outputs and profits.

If trust is rapidly restored, and the authorities act at scale to maintain effective demand to stop the contagious pessimism spreading from the banking sector, then the depression can be contained, shallow and short-lived.

## Appendix

Concepts and jargon	Traditional economics	New economics
Ethics and society	Utilitarian: social welfare function	Observed: emergent properties
Time	Equilibrium: short vs long run, in or out of equilibrium	Arrow of time: history matters & outcomes are emergent
Institutions	Simple: representative agents in groups with fixed maximising objectives and transaction/information costs	Diverse: groups with reflexive, negotiable objectives and institutional behaviours
Externalities	Monetized: non-market effects valued and traded off for maximum "utility"	Intrinsic: people respond and institutions adapt to their environment

**Table 4: Traditional vs new economics**



**Figure 7: The Big Crunch: implications for the world economy**

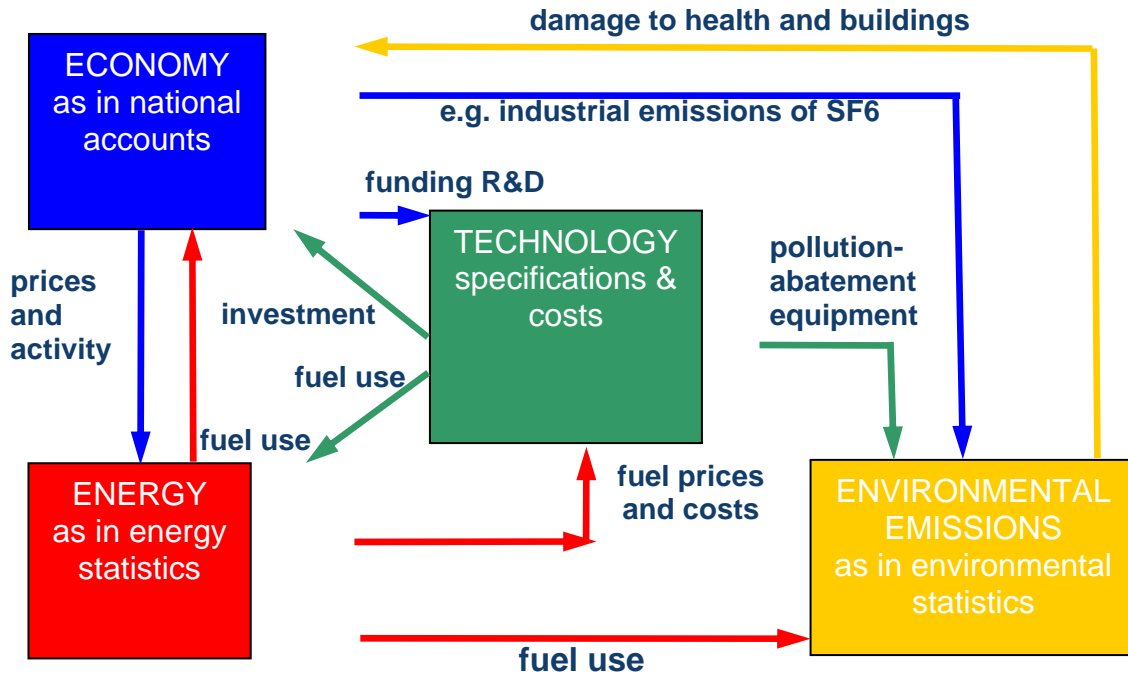


Figure 8: E3MG: E3 Links

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