PART FIVE: FINANCING THE FUTURE

Part Five sets out how to finance the transition to a zero carbon society:

- First, the general use of financial derivatives on the price of electricity, fossil fuel or carbon is outlined.
- Second, specific proposals for guaranteed electricity prices are outlined
- Third, proposals for the built environment are outlined: specifically carbon taxes grandfathered to households.
- Finally, the general system of banking and the recent financial crisis are investigated. A new proposal for a 'good bank' is outlined.

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THE USE OF FINANCIAL INSTRUMENTS IN CLIMATE POLICY (NOTES)[1]

Long-term climate change policy requires various parties to make long term credible commitments into the future. Financial instruments such as bonds or derivatives, are ideal instruments to do so. We investigate the potential for guaranteeing the future carbon, electricity and post-tax energy prices.

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The Need for Investment

Investment in low-carbon technologies can be promoted by a stable or smoothly increasing price of carbon, or by derivative instruments that guarantee the future price. Such investment would liberate the economy from a 'blocking circle' of existing fossil-fuel and national interests preventing the policies needed to promote investment in new low or zero-carbon energy supply. Measures to guarantee the future price of carbon would be financial contracts similar to government bonds, and thus have the further advantage of being more credible instruments than international treaties that have ratification and compliance issues.

Financial Instruments based on otherwise-determined price

It might be possible to commit future governments to carbon policy through financial instruments. If there is an international-instituted price of carbon, then the government could enter into derivative contracts on this price. Options or futures could be used. The simplest approach is to use contracts for difference, a derivative that pays the difference between a strike price and the price of the reference entity. An option is formulated as a ’one-sided-contract for difference’.
A one sided contract for difference would pay out if the future carbon price falls below the strike price in the future. There is one important condition for this to work: there needs to be a credible carbon price. Although I have presented here reasons why a coordinated tax might be preferred, an alternative proposition would be a cap and trade system where a proportion of permits are held back and then auctioned by a central global agency, the World Bank or the IMF for example.

Derivative Contracts - Issues

Thus there are challenges in instrument design. An important design feature of derivative contracts is the reference quantity. It needs to be something observable and permanent. In this particular case, this reference entity is the price of carbon: in the near term the EU ETS. Since the terms are long and the concurrent danger is institutional lock-in, the derivatives need to be structured so that they are flexible to future system changes: for example replacing the ETS with a European carbon tax.

What Is Credible? Issuance of Long-term Government Bonds

Even if they do sign, they can refuse to ratify those agreements, and even if they ratify they can refuse to be bound by them. Nevertheless governments of nation-states do bind their future incarnations everyday in a trustworthy fashion. They do so by issuing financial instruments such as bonds. By loans which factor in the money now, the present government commits future government to paying the money back with interest. Furthermore, this commitment is credible; western governments do not generally default on their debt.

Further Reasons In Favour of Price - Investment Guarantees

Prices are also highly relevant to investment. It is prices that determine outcome, not quantities. Volatile prices will lead to investment being delayed. Stable long term carbon prices will promote low carbon investment; uncertain prices may lead to delay. If agreement is being blocked by the well-organised fossil fuel lobbies, then the level of low-carbon capital stock may well be highly relevant to the politics of any agreement. We may need, in effect, to create the elements of a low-carbon electricity supply while phasing out high-carbon capital.

What Price?

Price works. Increasing the price of energy that releases greenhouse gases will reduce the consumption of such energy. This is known from basic economics. Assuming that individuals wish to satisfy their desires with the least effort, increasing the price of one commodity will mean that

more desires can be satisfied by another commodity than this one. Increasing the price of carbon will have a number of effects. One example of the importance of increasing the price of energy is in the realm of financing energy efficiency improvements.

Carbon Price Guarantees

What do governments do best? Security. The first purpose of the state is to provide protection of the person against violence; the second is of protection of the rights of private property. So the most obvious purpose to the state in regard to climate change mitigation is as protector of certain rights. The rights that the state is best in protecting are the rights that *it itself* grants.[2]

2 Fossil Energy Price Guarantees

- Post-tax prices of coal, natural gas, and oil would be guaranteed
- Coal price falls below this point, we
- If the post-tax retail price of natural gas falls below X, then you will be paid the difference.

Household borrows money and purchases a price guarantee, ensuring that the investment makes sense.

Making it positively framed:
Guaranteed Returns - (Partly Self Fulfilling Prophesy, partly subsidy) - Link with
Financing - New (good) Banks -- e.g national investment bank
Boom of real activity keeps the whole economy afloat

- international thinking
- positively framed
- binding
- laws and protocols
- price not quantity
- Unifying Climate Change Targets and Investment Opportunities
- Avoid rent Seeking
- Avoid 'unnatural tragedy of the commons'

FINANCIAL OPTIONS TO PROMOTE LOW-CARBON ELECTRICITY GENERATION[3]

This paper considers policy to promote investment in low-carbon electricity generation capacity. Here we develop a class of financial options that directly or indirectly guarantees the revenues of a new investor in electricity generation by means of a *put option* on the price of electricity or carbon. A call *option is the right but not the obligation to sell a unit of commodity at a certain price (the strike price)*. Such options may be attractive because they are likely to promote investment as they reduce the volatility of the electricity price and therefore the financial risk for a project.

A financial option to guarantee the minimum price of carbon (or electricity) is a contract whereby the government commits, in the event of the future price of carbon (or electricity) falling below a certain level, to pay a counterpart the difference between the realised price and that which was guaranteed. Such one-way contracts for difference have been proposed (Ismer & Neuhoff 2006) as instruments for improving the credibility of climate policy, and for promoting investment in low-carbon technologies. By affecting directly expectations and thus the relative risk of low- and high-carbon alternatives, there might be a significant effect on the carbon intensity of new investment.

We evaluate such instruments as means to promote the switch to a low-carbon economy through large-scale decarbonization of the electricity supply and electrification of other sectors. In particular we consider the transitional costs of system change and the relative political risks and constraints compared to a system of high current carbon prices alone. We also consider other risks inherent in such a system, including the lock-in to specific institutional structures and the potential for economic inefficiency.

After considering the relation between carbon and electricity prices, we compare guaranteed minimum prices to other systems such as contracts for carbon reduction (Helm & Hepburn 2007), the Renewables obligation, and feed-in tariffs, and consider whether financial options could or should be extended to support less mature but higher-cost technologies. We find that financial options have considerable advantages and can be considered complementary to conventional carbon pricing. However, there may be challenges in designing long-term contracts that are both legally watertight and flexible to potential future institutional changes.

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Why Support Low-carbon Electricity?

Coal Oil and Gas, make up (85%) of global primary energy supply and are available as respectively solid, liquid and gaseous *fuels*. Electricity is the most carbon intensive form of energy at present (in terms of greenhouse gases released per unit final energy), so decarbonizing the electricity sector is particularly effective at reducing carbon emissions.

If we are to convert our energy system away from fossil fuels and towards less damaging forms of energy, we need to shift from **fuels** to **electricity**. Our current energy system is dominated by **fossil *fuels*.** All forms of energy that don't produce significant amounts of greenhouse gases are electricity generation technologies and/or low grade heat. For example, renewable energy schemes such as: Hydroelectric power, Wind, Tidal, Wave and Photovoltaic Solar produce electricity produce electricity. Thermal power stations with low or zero carbon emissions include Concentrating Solar, Nuclear Fission, Coal with Carbon Capture and Storage produce Electricity (plus some low-grade heat).
In order to solve the climate problem, we will need to low-carbon electricity to convert not only the *existing* electricity sector (as Sweden and France have done), but also the energy sectors that currently use fossil fuels directly such as transportation (oil) and home heating (gas).

Some countries will decarbonize their economies more quickly than others. There is also the potential for a High Voltage DC Super-grid. In this case, low carbon energy produced in one part of Europe can help to displace carbon-emitting generation in another part of Europe. All low-carbon energy is helpful for reducing carbon emissions.

Investment is Needed: To convert our economy, we will need investment in low-carbon energy infrastructure - electricity generating capacity in the form of nuclear, renewable energies and perhaps coal with CO_2 sequestration. All these forms of electricity generation are **capital intensive**, that is, the majority of the cost of a unit of electricity is the upfront investment cost, very little is paid in the cost of fuel and ongoing maintenance. In the case of renewable energy, fuel is free; for nuclear energy, fuel is very small part of the cost of electricity.

Current Policy is Inadequate and Costly: Present policy is dominated by costly direct subsidies to renewable energy producers (Renewables Obligation), and heavy direct subsidies to legacy nuclear generators.

Very little carbon reduction is bought for this substantial cost. There is a grandfathered cap and trade system (the European Emissions Trading Scheme), which does not aid long term investment and does not reduce carbon emissions

Changing Public Discourse: Public discussion is dominated by the notion that decarbonization is difficult and costly. If this were true, it is unlikely that such policies would be adopted globally. But well designed policies need be neither difficult nor costly.

Coordination Problems with System Change and Uncertainty: Moving to a near-zero carbon economy will require system change. This will involve large-scale investment in electricity generating technology. Policy uncertainty will reduce investment.

Political Blockages: Higher investment gets round political blockages of a carbon tax or all-inclusive emissions trading scheme.

Learning by Doing: There is a case for specific policies to encourage deployment of technology and thus reduce its cost through the learning-by-doing effect. This is in particular the case for supporting renewable energy at the early stage of its development. This policy would complement niche support schemes such as feed-in tariffs; it is intended to create a level playing field to support large-scale technologies once fully commercialised (e.g. Wind).

Credibility and Investment

New investment depends on investors expectations of future carbon prices. Therefore, what matters for new investment is the credibility of the carbon price.

Credibility matters. If I hope to put together a party to scale a tall dangerous mountain, then whether I can find a team to do such a difficult to undertake such a difficult mission, will depend on my credibility: whether I have the tools and experience available to do so; fundamentally whether I appear likely to be successful. If I am not credible, then I am not going to make it, because people around me will fall away.

It is the same with investors. Investment decisions are typically modelled as a Net Present Value (NPV) Calculation. An investor will consider all the cash flows in a particular market; and determine what should be the cost and benefits of that policy. If the financial inflows are greater than the outflows, once discounting has been taken into account, then the investor will take the project.

The reasons that he will take the project are financial. Suppose the project is funded by debt finance. If the interest rate is less than the rate of return on the project, he can borrow some money from the bank; invest that money in the project, and then when the project returns revenue, the investor can pay off his loan and still be left with a profit.

Now let us introduce risk and uncertainty into the decision. If risk and uncertainty are important, then these need to be taken account of in the policy decision. There are a number of representations of how the decision should be taken when the outcome is uncertainty. In the case of uncertainty, the pay-offs for different options will depend on the future state of the world, which is uncertain. There are various possible decision rules.

Important examples of decision rules include: optimistic/maximax (what maximizes the best that can happen), conservative / maximin (what minimises the worst that can happen), minimize regret - maximin (the difference between what actually happens and what the best decision would be); and take the best average pay-off (assuming each is equally likely).

However, it seems likely, that actors' estimation of the probability attached to different outcomes plays an important role in their decision. Many things in life are possible however; many of the possibilities are not particularly likely.

It seems therefore that probability has a large impact on the decision. A straightforward decision role is to take the option with the greatest expected pay-off. An agent who works in this way is said to be risk neutral, taking the highest weighted average pay-off of the options.

Most agents are not risk neutral; a bird in hand is valued more than a 50/50 chance of catching two. Certainty is usually valued because it allows us to make more decisions and to finance our decisions with low-cost forms of capital such as bank lending. Uncertainty over future outcomes means that more money or resources need to be set aside to protect against a potentially adverse future

Under certain conditions (cross-ref other paper where I develop this in detail - maybe the electricity book), the outcome of different functions can be represented by a utility function. Risk aversion can be represented by a utility function that has curvature.

The Theory of Investment

Economic theory and investment. Standard neo-classical theory suggests that investment will take place if the net present value is greater than zero.
From Dixit and Pyndyck (1994):

"Neo-classical economic theory recommends investing in a project if the net present value is greater than zero. In the formulation by Tobin (1963), investment will take place if the capitalised value (which may sometimes be observed in the market or it can be imputed by the expected value of imputed profits) is greater than the cost of investment."
"The rate of expansion or contraction is found by equating the marginal cost of adjustment (?? e.g. the rate of expansion in capital stock) with the costs of adjustment, which depends on (q-1). Adjustment costs - investment above the current amount will require more investment to take place. Capital stock is flexible over 10 years or so."

NPV Criterion in Private and Social Decision Making: The net present value adds up the costs and benefits of an action. The NPV criterion is this:

An action should be taken if it has a positive net present value.
Two examples are the following:

- *Social Planner* (Economic Cost-Benefit Analysis): A policy should be adopted if it has positive NPV to society
- *Firm* (Financial Analysis): An investment should be made if it has positive NPV to the firm.

Costs and benefits in the future are *discounted* using appropriate long-term discount rates. The net present value depends strongly on the *discount rates* used.

Discount Rates: The discount rate determines how much one should value *future* costs and benefits relative to *current* costs and benefits. If I receive £1 today, what is an equivalent amount that would be just as good to receive in 1 year's time? If I believe that £1.10 in 1 year is equivalent to £1 now, then I am implicitly using a discount rate of 10%.

What discount rate should be used for infrastructure projects such as investment in electricity generation capacity?

Public Discount Factors (Economic Cost-Benefit Analysis): Economic and ethical arguments over discounting have been investigated extensively in the Stern review of climate change, and subsequent literature. Stern suggested a *pure rate of time preference* of 0.1%; the discount rate implied by this assumption depends further on assumptions over future growth in consumption. It approximately implies a 10 year discount rate of 3% falling to 2.5% over 40 years.

The treasury green book suggests 3.5% as a discounting rate for public infrastructure projects.

Private Sector Discount Rates (Financial Analysis): However, the private sector is likely to use a much higher interest rate than the socially optimal one. In general, the private sector will discount to take account of the *risk* in an investment. The riskier an investment, the higher the interest rate charged.

The discount rate used in the Energy White Paper cost benefit analysis is 10%, close to a likely *financing rate.* The cost benefit analysis is therefore at least in part a *financial* analysis rather than an *economic* cost benefit analysis.

> *This means that less investment will take place than is socially optimal.* It will therefore be useful to consider ways of reducing the financing rate.

Levelized Cost Of Electricity: A calculation of the relative NPVs of different options depends on the price of electricity. To compare the relevant costs of different technologies without referring to this we can use the levelized Cost of Electricity Approach**.**

Financial Risk and Investment in Low Carbon Electricity

What are the sources of risk for an investor?

The following financial risks are generated by the structure of liberalised electricity markets:

1. Policy Risk - that policy towards carbon or electricity may change
2. Mismatch between revenue (electricity prices) and costs (fixed).
3. Price risk - electricity prices in the future will be lower than expected, especially if investment is high.

Since these risks are largely the government's responsibility, it is appropriate that the government should act to mitigate them.

The government should also provide assurances over the following:

1. Regulatory risk - that regulations concerning the plant's operation will change

The following sources of financial risk are independent of this policy:

1. Construction risk - that the plant will cost more than expected
2. Back end costs - for nuclear, decommissioning and waste disposal
3. Operational risk - e.g. due to plant malfunction
4. Risks due to financial structure and financial management

These risks are largely the responsibility of the firm itself and therefore it is not the responsibility of government to intervene.

Mitigated Risk: Electricity Price Volatility

A *highly volatile* electricity price will tend to suit low capital intensity (low fixed cost, high variable cost) electricity generators

Mitigated Risk: Gas-Carbon-Electricity Correlation
In a spot electricity market, the price of electricity is determined by the 'swing' producer of electricity, usually gas. The price of this electricity is determined by the **price of gas**. Gas producers have a good deal - their revenues and costs move together. Capital intensive zero carbon energy (wind and nuclear) do not.
The market fails because it creates volatility and then passes it on to consumers.

Moral Hazard?

A danger of insuring investors against loss is that companies are encouraged to behave recklessly. This is not a major danger here. In this instance, a revenue stream is being guaranteed, not the business. The businesses could certainly sustain higher levels of leverage against a certain cash flow, but in this case would clearly have to pay higher interest rates from investors.

Assessing the relative economics of various energy technologies purely in terms of their levelised cost, fails to take account of the revenue risks. A gas turbine may seem to be uncertain in terms of it's levelised cost, but the net present value is relatively stable since the cost of fuels provides a natural hedge.

- Levelised Cost – gas looks risky, nuclear less so
- Net Present Value – nuclear risky, gas less so

Source (Blyth 2006)

Investment under Uncertainty

Investment is key to reducing emissions; and credibility in investment is closely related to

credibility in Climate Policy
(Neuhoff 2007) provides a summary of some approaches to investment uncertainty.

Here we focus on the real option approach, as outlined by Dixit and Pindyck (1994) To accurately represent the investment decision we need to consider the option value of waiting to find out more information rather than to invest.

Blyth (2006) points out that representing only the relative levelized cost of electricity technologies misses out an important part of the picture: the revenue risk from various electricity prices. He points out that the electricity price is driven by short run marginal cost, which is determined by the 'merit order' of plants available.

Source (Blyth 2006)

Purpose of Instrument

What Is Needed? Full Scale Deployment Support

The purpose of this instrument is to encourage investment in electricity generation capacity which:

1. is economic on a levelized cost basis (costs less than the long-run price of electricity);
2. is capital intensive;
3. is low-carbon.

It is an instrument to encourage 'mass-deployment' of low-carbon technologies of a low enough cost.

It is not, in the first instance, an instrument to encourage less economic technologies to reach market.

Why encourage large-scale deployment of low-cost energy sources in addition to 'learning support'?

Price support for already low-cost energy sources is extremely effective at reducing carbon emissions for the following reasons.

- Given that electricity generation capacity is needed anyway, the net cost (the additional cost of making electricity investment zero carbon) is small or even zero.
- If these technologies are already nearly-competitive with coal, a small learning effect can have a large impact on the global competitiveness of the technology
- It is unrealistic to expect governments to subside energy on a very large scale, and yet very large investment is required.

Existing Proposals To Encourage Electricity Generation

The following support mechanisms have been proposed:

- Renewables Obligation (UK policy)
- Feed-in-tariff (Policy in many continental EU countries including Germany)
- Auctioning of Carbon Reduction Commitments (new policy proposed by Helm)
- Carbon Price Guarantees (new policy proposed by Newbery and Ismer/Neuhoff)
- Electricity Price Guarantees/Auctioned Carbon Free Electricity Contracts

The Renewables Obligation: The Renewables Obligation is a legal requirement for UK licensed electricity suppliers to supply a proportion the electricity they supply from renewable sources. The obligation is set at 9.1% for 2008/09 (DBerr 2008). Suppliers who have generated their energy from renewable sources are granted a Renewables Obligation Certificate (1ROC=1MWh supplied of Renewable Energy). Each supplier most present ROCs equivalent to the 9.1%,or pay the 'buyout price' to a fund, which is distributed equally to those who have presented ROCs. The buyout price is currently £35/MWh (Ofgem 2008).

Feed-in tariffs: A feed-in tariff is a guaranteed rate paid for the producers of renewable electricity. It has been used extensively in Germany (Neuhoff & Butler 2004). This tariff was finally set at 8.7c/kWh for the first 5 years and at 5.55c kWh for the remaining 15 years. The guaranteed rate declines in nominal terms by 2.00% for each year the investment occurs after the year 2000. Higher payments are made for non-optimal sites.
It was found (ibid.) that the Feed in tariff has been significantly more effective at encouraging investment than the Renewables Obligation.

Auctioning of Carbon Reduction Commitments: Helm and Hepburn (2007) propose the auctioning of Carbon Contracts. Governments would purchase a set of emission reducing options in a technology-blind auction at the lowest possible price. The advantage of this proposal is price discovery. The disadvantage is that it is posed in the counter factual; possible emissions reductions.

Carbon Price Guarantees: A carbon price guarantee is a contract or other assurance to guarantee that the long-term price of carbon (i.e. the cost of permits plus, possibly carbon taxes or other fiscal measures) does not fall below a certain level. In the event of the carbon price falling below this level, the writer of such an option would pay the difference between the real price and the floor price, or agree to buy back permits. Such a measure could support low-carbon electricity generation by lowering the downside risk to deployment of low carbon technologies. However, the deterrence effect of higher carbon prices on high-carbon investment would be unaffected. Neuhoff and Ismer (2005) note that such commitments can begin to solve the internal commitment problem (for central government to commit to long-term carbon prices for investors), and the external commitment to other countries.

Electricity Price Contracts: Ekins and Hughes (2007) have proposed the auctioning of low carbon electricity contracts. These have an advantage over Carbon Price contracts in that they are contracts for a positive item, and thus a guaranteed market.

Proposal: Guaranteed Minimum Electricity Prices

We proposed **guaranteed minimum electricity price** (indexed and time-averaged over each 5 year period, for the design life of each project) for long-term investors in **carbon free** (<50gCO2/kWh) electricity generation capacity. An Electricity Price Guarantee, is a method to guarantee the price of electricity. It is similar to a feed-in tariff, but is an option which is more suited to investments at or near the wholesale price of electricity. The advantage over a carbon price guarantee is that it provides a guaranteed market, which may be useful when contemplating whole-system change.

How Would It Work?

There would be a long-term contract between the government and any investors that the time averaged electricity price over a certain period would not fall below a certain point. In effect this is an Asian option on the electricity price. At the end of each time period the government would provide **direct financial support** in the event of a price falling below a certain level.

Contractual Arrangements

There are various types of call options. For example, an American call option would allow the purchase of the commodity at the price of the commodity at the end point. Contracts can deliver physically or not.

The government would write a contract for difference on the *average price* of electricity in each future 5 year period. So there would be CFD on the average electricity price in the period 2015-2020, and one for the period 2020-2025.

Who would qualify?

Initially, all 'Zero Carbon' electricity generators- i.e. those with emissions below 50g/kWh. It could be extended to all 'Low Carbon' electricity generators - those with emissions below 200g/kWh.

What level to support prices?

- A low price floor would provide little direct support but would nevertheless reduce downside risks.
- A high price floor would provide considerable direct subsidy.

It is recommended that the price floor for the current period should be slightly below the current price of electricity. This should be indexed according to general inflation.

Analysis of Costs and Benefits of the Policy

An electricity price floor at or below the current price of electricity would have a relatively low cost.

Who Wins?

- Planet Earth (fewer greenhouse gas emissions)
- Renewable Energy Industry (more secure energy price)
- Nuclear Energy Industry (more secure energy price)
- UK Consumers (more security of supply and lower long-term energy prices)
- UK Industry (more security of supply and lower long-term energy prices)
- Investors & Banks (more secure cash flows)
- UK government/ UK as a whole (security over future investment, lower financing costs for long term investors)
- Pensioners (long term, secure assets to invest in for pensions)

Who Loses?

Nobody loses out directly. The policy is equivalent to a trust-building measure. Since the measure enhances trust, this is a positive-sum game where all can win without anyone losing heavily.

Banks are not able to charge such high interest rates, but this is reflective of the lower risk of the investment.

The government would in theory have to pay out in the future should the price fall below the floor level. However, since the government will have control over carbon policy such an eventuality is unlikely.

Further Considerations

A policy measure to reduce emissions

The government has set strong goals for climate change policy, but at present does not have strong policies to achieve these goals. For example the UK government does not have control over the carbon price at present; this is set by the EU.

Reducing the Cost of Energy for Industry

By guaranteeing a minimum price for investors, large amounts of investment in low-cost capacity would be encouraged. By providing a floor on the price of energy, in the long term enough investment will be encouraged so that the potential

Policy Uncertainty Produces Policy Delay

There is considerable uncertainty over the future price of carbon. Whether there will be a systematic carbon tax or a cap and trade system. It is well known from real options theory that in these circumstances, investment is **delayed**.

We need guaranteed minimum prices to **encourage investment** in the midst of policy **uncertainty**. Minimum carbon prices will aid **policy credibility**.

Little Investment will happen without more certainty

At present the future price of gas, carbon and electricity are highly uncertain. There is likely to be little investment in *either* high-carbon choices such as coal (because of the danger of high carbon prices in the future) or low carbon choices such as wind or nuclear (because of uncertain revenues against fixed costs). ***There is a danger of the lights going out.***

Dangers of this system.
Institutional Lock-in. If the price of carbon is guaranteed, then there is a danger of not being able to change system.

Policy Extensions & Variations

Extension 1: Inclusion of carbon capture and storage (CCS) in the scheme.

Extension 2: A limited number of electricity contracts available at a higher guaranteed price for those new carbon-free generators that are first to produce electricity to the grid (likely to be renewable, first-of-series nuclear and carbon capture and storage).

Variation 1: Auctioning permits to all market participants rather than giving them away to low carbon producers

Variation 2: Floor on carbon price in addition to that on electricity.

Related but separate policy 1: Research, development and deployment support for novel or undeveloped low-carbon electricity generation options.

Related but separate policy 2: Current Carbon Price (ETS permits/taxes).

Extension 1

Inclusion of electricity produced with Carbon Capture and Storage (CCS).

Extension 2

In order to further encourage investment quickly it would be possible to give away a limited number of higher price contracts for those who are first to produce electricity. This might include renewable energy on a large scale and the first-of-series nuclear and first full-scale carbon capture and storage plants. The price would be declining in cumulative installed capacity.

An environmentally friendly option would be to offer 6p/kWh for first 10GW capacity, 5p/kWh for next 20GW, 4p/kWh for next 70GW.

This policy, when combined with an immediate carbon tax of 4p/kg CO2= £40/tonne CO2 (Stern - which would raise the price of electricity by 2p/kWh) could be achieved without an initial cash subsidy.

Variation 1: Auctioning Permits?

The current proposal is to give contracts away to low-carbon investors, on the completion of plant. An alternative proposal would be to auction the permits on the open market. Although this would not specifically support low-carbon industries it would still be a beneficial move and would actually raise revenue for the government.

Variation 2: Carbon or Electricity?

A floor on the price of carbon has also been proposed as a measure to ensure greater certainty and to aid policy credibility.

A carbon floor or associated contracts for difference is a policy measure that would certainly be effective at locking-in commitments to a carbon price. Electricity price support would support electricity investment. Carbon price support would support low-carbon investment. It would specifically support carbon capture and storage (CCS) technology. There are advantages in both strategies.

Related Policies 1: Measures for learning support

The basic scheme is not intended to be a method of reducing the cost of more expensive forms of renewable energy such as wave energy.

However, it is important that such novel energy forms are encouraged and brought to market rapidly.

The Renewables Obligation is set up to encourage the development of these forms of energy so as

to reduce their cost. It has been recently banded to differentiate between technologies according to their level of market penetration.

Some have argued this method of support to be excessively costly. Greater direct research and development (R&D) support and feed-in-tariffs by energy type may be more efficient way to encourage these energy types. This is a different topic not part of the scope of this paper.

Related Policy 2: Why Not Just Impose a Carbon Tax?

A long term price on carbon should be the primary policy for carbon reduction. However, what determines low carbon investment is not the current price of carbon but the expectations of the future price of electricity. The effect of a carbon price is only that expectations of a *future* carbon price affects expectations of *future* electricity prices.

Economic costs of decarbonization will be reduced if there already exists significant alternative energy when carbon prices are raised.

Similarly, a significant carbon price may be being blocked politically by well-organised carbon intensive sectors such as fossil fuel extraction, electricity generation, aviation and heavy industry. It is necessary to *create* a significant well-funded carbon-free energy industry *before* punitive levels of carbon taxes are imposed so that industry has alternative energy sources available.

Conclusions

Probable Effects

There would be strong investment in all electricity generating capacity with low or moderate cost. The basic policy would encourage nuclear, onshore wind. The advanced policy would also encourage other forms of renewable generation and coal with carbon capture and storage.

Economic Justification

- Corrects market underinvestment arguably associated with liberalised electricity markets
- Corrects market underinvestment due to policy uncertainty
- Corrects a market failure by filling a gap in the market for risk instruments
- Reduces the financing rate for long-term electricity investment to closer to the social discounting rate without moral hazard
- Provides an extra policy tool to reduce carbon emissions

Political Justification

- Reduces carbon emissions
- Encourages investment and thus keeps the lights on
- Creates a low carbon industry and dispenses with political obstacles to a low-carbon future

Higher Prices for Quick Construction

- Provides incentives for first mover
- Rewards social advantages of first-of-build (cost information revelation, cost and time reduction)
- Provides credible signal that policy might be less generous in the future, thus further encouraging rapid investment.

Overall Conclusions

In order to encourage sufficient investment to decarbonize our energy system, we need to promote a more long-term framework for investors. This can be done by means of price risk mitigation for long term investors, such as a guaranteed minimum price for electricity or carbon.

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FINANCING HOME ENERGY EFFICIENCY IMPROVEMENTS[4]

Some options for the financing of energy efficiency improvements are outlined, including 'grandfathering for citizens'.

Greenhouse gas emissions (principally Carbon Dioxide) from home energy consumption constitute around one fifth of UK emissions. These emissions are not covered by the EU emissions trading scheme, nor are they currently highly taxed.

There are a number of things necessary in order to make energy efficiency improvements.

- Carbon or energy taxation.
- Financing of energy efficiency improvements; where interest payments are linked to future price increases.
- Make energy efficiency schemes 'opt-out' not 'opt-in';
- In tennant-landlord situations, sharing of savings between principal and agent.

Here we focus on Carbon taxes and discuss options that could be politically feasible. Stronger incentives for carbon price reductions are needed. In particular, an incentive to switch from high-carbon to low-carbon supplies seems important in order to scale up low carbon electricity generation effectively. A carbon tax provides both such incentives.There appear to be political barriers to higher fuel prices expressed as fuel proverty concerns. In the UK, an earler attempt to impose full-rate VAT on this sector was defeated politically, and domestic energy consumption currently enjoys a lower rate of VAT of 5%. This document sets out a proposal to impose a fixed carbon price that would be directly refunded by household, according to historical usage. We propose an upstream carbon price on all domestic energy consumption, proportional to carbon content. The revenues would be immediately redunded by property, proportionally to use of fuel in a historical period, likely the tax years 2008-9 & 2009-2010.

It is argued that this 'grandfathering' would be more justified in the case of taxes on domestic energy consumption than it would be in the case of emissions trading schemes, since the economic burden of carbon taxes would fall largely on individuals. The scheme would have the advantage of not making particular individual worse off, and is argued to be more politically viable than schemes that either put reciepts for carbon taxers into the general purse, or those that give back taxation receipts to individuals on an equal per capita basis.

Given that the incidence is on the householder/ the landowner; we will expect a lower rate of council tax, if you move it into full council tax. Therefore an alternative to the above scheme would be a volutary switch to a higher rate and allow people to opt in. The scheme could expand virally. How much extra you pay if you were paying the higher rate. This would give all the incentive of a high carbon tax. without paying a larger cost.

UK Average Energy Bills:

Payment type	Credit		Direct Debit		Prepayment	
	per kWh	Bill	per kWh	Bill	per kWh	Bill
GAS Great Britain Avg	2.63p	£474	2.36p	£424	2.77p	£498
ELECTRICITY UK Avg	10.24p	£338	9.48p	£313	10.88p	£359

Source of Stats: http://www.dti.gov.uk/energy/statistics/publications/prices/index.html

Average Size of UK Household: 2.36people

4 Author: Stephen Stretton <stephen@stephenstretton.org.uk> Last Updated: 11th March 2010

THE FINANCIAL CRISIS: "DIAGNOSIS, PROGNOSIS, AND OPTIONS FOR FURTHER TREATMENT"[5]

I discuss the nature of fractional reserve banks in the context of the 2008 financial crisis and I discuss a practical proposal for a new, good bank.

The basic[6] functions of a bank are outlined. A bank's function is intermediation; namely to take deposits of cash, and in return to promise to repay that cash when required; to allow the transfer of these promises and to lend money to individuals and companies. Banks are subject to two main regulatory constraints: first their assets, weighted according to risk, must amount to only a certain multiple of their regulatory capital (shareholder equity plus some subordinated debt)[7]; second, they must retain a certain proportion of their total assets as cash or other liquid assets such as government bonds. UK bank balance sheets are measured in the trillion pounds: larger than UK national debt and comparable to a few times UK GDP.

The current financial crisis was initially triggered by bank losses on sub-prime mortgage. These losses have caused a specific slowdown in credit markets. The implication of this slowdown are outlined, as are the dangers of a debt deflation.

Various aspects of the policy response are discussed. A new institution will be(!) outlined: an international, government-backed, 'new good bank'. This new good bank would provide additional low-cost financing during a recession, particularly to 'socially beneficial' projects such as low-carbon energy infrastructure and energy efficiency schemes. The concept of a 'good bank' is independent of, but is synergistic to, proposals for an 'energy refund for a climate club' and for guaranteed carbon and electricity prices (contracts for difference), the two main policy proposals outlined in the paper at the end of the book.

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5 Author: Stephen Stretton <stephen@stephenstretton.org.uk> Last Updated: 11th March 2010

6 No apology is made for the elementary level of this description: it is essential, for democracy, to be as simple and clear as possible about the current financial system.

7 As measured for regulatory purposes this includes 'tier 1' capital (shareholder equity) and 'tier 2' capital (subordinated debt).

An Introduction To Banking

The Functions of a Bank

The main purpose of a bank is *intermediation*: to *borrow*[8] money from customers (who in principle could demand their money back at any point[9]) and to *lend* money to customers with a fixed repayment schedule.

The first specific function of a bank is therefore to **accept cash** (banknotes and coins) from customers and, in exchange to **issue promises to pay cash**. The 'promise to pay' is represented by the customer having an increased bank balance. The customer has in fact *loaned* the cash to the bank: the ownership ('title') on the cash has transferred from the customer to the bank.

The offsetting second function of the bank is to **pay out cash in exchange for the erasure of a promise to pay cash**. Depending on the terms of the bank account, the money loaned to the bank can be recalled ('withdrawn') by the customer at any time that the customer wishes.[10]

The third function of a bank is to **cash cheques: in other words, to move promises to pay from one customer to another**. Let's say person A wishes to pay person B a certain amount of money. The straightforward way to settle this transaction would be for person A to give person B some cash (let's say £100). But cash is easily stolen; so instead person A writes person B a cheque for £100. What does that cheque represent?

Lets say first of all that both the individuals use the same bank ('X'). In this case, rather than transferring cash, it is possible for the bank to transfer *promises to pay*. The cheque is a promise from person A to pay person B. When the bank receives the cheque, and assuming that person A has a sufficient bank balance; bank X simply removes £100 from its obligation to pay person A and adds £100 to the obligation to pay person B.

If two banks are involved, the same principles apply. Person A (with bank X) gives person B (with bank Y) a cheque (in exchange for another asset, goods or services). The banks *transfer* of *promises to pay* from bank X to A to bank Y to B. In addition, to avoid bank Y being worse off, bank X transfers £100 in cash to bank Y.

Fourth, the bank can **create bank balances**, for example, as payment to its employees or shareholders. A deposit is simply an obligation for the bank to pay someone cash on demand.

Fifth, the bank can **lend money to customers**. The bank creates a deposit - a promise for the bank to pay you cash on demand - and an offsetting debt - a promise for you to pay the bank cash (or to remove an equivalent amount of the bank's obligations to pay you cash) .

Investment banks perform the traditional functions of banks and also perform various functions in relation to innovative financing, the structuring of financial derivatives and origination and underwriting of debt and equity issuance. These functions are of necessity hard to distinguish from their standard roles.

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8 In the typical system known as 'fractional reserve banking'

9 Except in typical bank panics; for example the 'run on the Rock'.

10 Other bank deposits require a certain amount of time notice before withdrawing cash.

The Bank Balance Sheet

The balance sheet of a bank consists of the *assets* (which are the loans that it has made - they are assets because they will usually be paid back – plus physical assets) and liabilities (which are the deposits that the banks has taken, plus those who have lent the bank money – the bond holders). It is known as a balance sheet, since the assets are equal to the liabilities plus the shareholder equity.

Assets: the bank owns cash (banknotes and coins) that the customers have lent to the bank. It also may own financial assets such as government bonds and fixed assets such as its own buildings. The bank is also owed money by its customers and, since these loan agreements represent a promise to pay the bank money in the future, they are also counted as assets, and in fact represent the majority of the banks total asset value.

Liabilities: the main liability on the bank is to pay back the money deposited by the bank's customers.

Shareholder Equity (net asset value): A bank is started by the investment of some money, known as 'shareholder equity'. Over time, any profit which is not distributed to the shareholders will increase that shareholder capital. Similarly a loss will reduce the banks shareholder equity. The bank's 'shareholder equity' is therefore the net asset value according to accounting rules. This is also known as bank 'capital'.

Insolvency: A company will be considered insolvent if either two conditions hold

- The shareholder equity falls to or below zero
- The company is unable to meet its obligations

Regulatory Constraints on Banks

It seems, from this more detailed picture, that the banks can create an unlimited amount of credit. Is this true?

In fact the banks are constrained in two important ways: a (financial) 'capital' requirement and a 'liquidity' requirement.

The (financial) capital requirement is a requirement on the *net asset value* of the bank. A bank's net asset value is the excess of the accounting value of its assets over the accounting value of its liabilities. Net asset value is often called the 'capital' of the bank. The capital requirement is that the bank should not lend out more than a certain multiple of its capital.
The liquidity requirement is a requirement that the bank has sufficient cash or deposits at the bank of England (monetary base) to cover any withdrawals of money.

Banks have capital requirements (it must not lend more than about 10 times it's net worth) and liquidity requirements (it must not have deposits greater than 20 times the amount of monetary base held).

The Banking Crisis

This section outlines the causes and consequence of the current global banking crisis.

Bank Losses, Capital Shortages and Possible Insolvencies

Causes of the Banking Crisis: US Sub-prime Mortgage Defaults
The initial trigger of the financial crisis was a fall in US house prices. US banks had up till this point been engaging in increasingly risky lending practices, in particular by lending to less and less creditworthy individuals. When house prices began to fall, delinquency rates on mortgages rose, leading to severe losses by the banks.

This risk spread throughout the financial system through risk-transfer financial instruments called Collaterallized Debt Obligations (CDOs). CDOs are financial derivatives constructed to insure the original bank against the risk that a number of these mortgage holders will simultaneously default. By constructing and selling 'tranches' of the CDOs, the bank that originates the mortgages is able to pass the risk of default on to the counterpart. The main advantage of these derivatives was that specific risk of default is diversified amongst institutions and so concentrations of risk are avoided. The disadvantages are that the original bank is encouraged to lend to more risky individuals, knowing that it will not pay the price later - that systemic risk to widespread defaults remains and is now spread throughout the system; and that the mathematics of 'tranching' these deals tends to obscure the level of systemic risk.

The Basic Problem: Bank Losses and Capital Shortages
The main consequence of the sub-prime defaults has been large losses taken by banks around the world. In 2007, some banks made very large losses.[11] Some banks (for example the Royal Bank of Scotland) might have become insolvent were it not for government intervention**.**

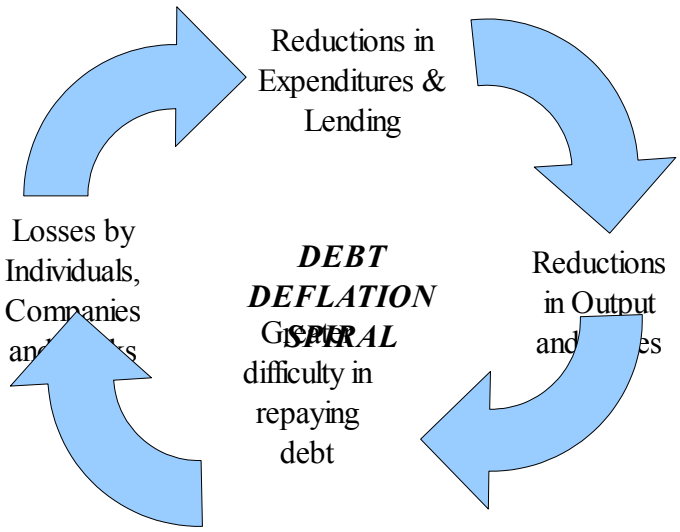
Effects of Bank Losses and Capital Shortages

The fall in net asset value and in some cases bank insolvency leads to a number of serious economic effects:

- *New lending is constricted*: The banks lending activities are constrained by their regulatory capital requirements and by prudent self interest (there are costs of financial distress that are to be avoided).
    - *Falls in asset values:* The reduced availability of bank credit affects both individuals and companies adversely. For example, reduced demand for housing may lead to an overall reduction in house prices.
    - *Companies behave conservatively*: The effect on companies of reduced access to lending is that both companies and banks will behave more conservatively. This may lead to some businesses being forced to scale back investment activities and others be put out of business altogether.
- *Confidence in bank deposits shaken*: There is concern that there will not be sufficient funds to pay back depositors, even if all the bank's assets were 'liquidized' (sold, called in, and turned into cash).
    - *Possible bank runs*: This perceived riskiness could cause a 'run' on the bank, where existing depositors withdraw their money *en mass.*
    - *Frozen credit markets*: The bank's perceived riskiness also makes it more difficult for

11 In other words it is a crisis about the banks' "balance sheets". The balance sheet of a company represents the company's assets on one side and it's and liabilities on the other. The assets of the company must by definition equal the liabilities plus the shareholder capital (or net asset value).

banks to attract new depositors or new investors, because the bank is inherently more risky.
    - *Interbank trust declines:* With the bankruptcy of Lehman Brothers in September 2007, the crisis became much more serious. In effect, banks ceased to trust each other. The effect of this is, in effect, to drastically reduce the amount of trustworthy 'money' in the economy.
- *A large negative shift in 'animal spirits':* The increased uncertainty engendered by the banking crisis has reduced confidence in the global economy. Overall the crisis can be described as a large global monetary and confidence shock significantly reducing global aggregate demand.
    - *Reduction in output and in asset and product prices*: Macroeconomics suggests that a reduction in aggregate demand will reduce both the growth in the economy and the inflation rate. The shock is great enough such that both output and prices may fall in specific countries or globally. Falling output combined with falling prices is known as *deflation*.
- *Potential for a debt-deflationary downward spiral*. The economic crisis also has a serious effect on the balance sheets of banks. The value of liabilities tends to be fixed in nominal terms. The bank has to give the depositors money back, come what may. The value of a bank's assets (the loans it has extended) is determined by the ability of (the bank's) debtors to pay back their debts. The ability to pay back debt depends not only on the *real* growth rate in the economy (when the economy is growing, companies and individuals find it easier to pay back debts), but also on the *inflation rate*. Inflation erodes the value of debt over time[12]. Negative real growth and negative inflation erode the ability to pay back debts and thus can lead to further defaults, further reductions in net asset value of banks and further falls in prices or in output. This vicious circle of a debt-deflation is described in detail for example by Fisher (1939).



12 Assuming that other things (and in particular the nominal interest rate) are equal. In principle, one could compare the effect of inflation on debt keeping the *real* interest rate equal; in this case, inflation does not have any effect, because we would be implicitly assume that the interest rate would be pushed up to counteract the inflation rate. However, there is a *nominal* floor on interest rates at zero percent, and, in a deflationary situation, the real interest rate could be constrained in *nominal* terms – making the original comparison valid.

Classification of Recessions

Here a classification of different types of recession is attempted[13]:

The most common recent type of recession (post-war period, 1979-81, 1990-2) could be characterised as *macroeconomic policy recession,* induced by monetary or fiscal policy introduced to fight inflation. Another type of recession is a *business cycle recession* (similar to a 'predator prey' cycle) of stocks and investment overshooting and then retrenching.

The final type of recession is to do with the assets and liabilities (liabilities) of individuals. When people feel suddenly much less wealthy they are likely to cut back on productive activity. A subset of these is when the balance sheets of financial institutions is impaired - when banks take serious losses and are constrained to lend. A final sub-subset of this final type of recession is one when the banks are in such trouble that the government takes full or partial ownership of them. In this case any losses on loans are directly transmitted to the government. An important feature of *balance sheet recessions* is that a proximate cause of them is a drop in the market value of assets, whereas the value of liabilities is unchanged. Certain actors may see extreme shifts or even reversals in their net worth. One way to get out of these recessions is to increase the value of assets through monetary policy (interest rate cuts and printing money to buy financial assets) or fiscal policy (purchase of physical assets). Reducing the nominal value of assets can in these cases make the recession worse.

A worse form of balance sheet recession is a *financial institution balance sheet recession.* In this case, the credit worthiness of financial institutions induces an inability to lend, which reduces asset values and so makes the credit worthiness of the institutions worse. In this case reducing the value of houses can lead to the banks becoming further impaired. Such recessions can lead to *great depressions* if global in scope. If the net worth of the banks becomes negative, banks will need to be taken into state ownership or control, leading to a *financial institution balance sheet recession with government ownership of the banks.* If repossessions are widespread, *a loss of value in houses can be reflected almost directly in losses for the government.*

In 'traditional' forms of recessions, bankruptcies can have a 'cathartic' effect, by removing excess capacity and readjusting prices. In the current recession it should be noted that every financial institutions debt is another financial institution's asset. Bankruptcy of all of the financial institutions is likely to be severely disruptive.

Future Prognosis

Without intervention: a self perpetuating crisis? The effects of the credit crunch may be self-perpetuating, and large losses cannot be ruled out in the absence of a strong policy response:

- House prices are linked to the availability of funds and the interest rate. House prices are also affected by expectations of future change ('momentum'). Major further losses on mortgages are possible if house prices fall and the economy enters a major recession.
- Major bank losses on corporate lending are possible if the recession is serious and the nominal growth rate is low or negative. Major bank losses on international lending are possible, but assumed to be largely out of our control.

The Banks' Problem or the Government's Problem? Once bank losses have eaten through bank capital they must inevitably fall on the depositors or the government. In order to prevent a run on the banks, it is likely that **the government would have to guarantee deposits, in which case the losses of the banks (after the shareholders and unsecured creditors have lost their investments) would fall mostly on the taxpayer.**

13 The terminology here is the authors and may be non-standard

Discussion: Lessons & Principles

Five Principles of an Effective and Equitable Solution

Principles 1 & 2: Get out alive but also ensure the crisis does not reoccur. It is clear that the current financial and economic crisis is very serious. In dealing with an emergency of any type; there are two main objectives. Firstly, 'get out of the crisis alive'; Secondly, 'ensure that the crisis doesn't happen again'. It may in principle that the short term solutions are different (or indeed even opposite) to the long term solutions. In any case, we need to consider each part separately. Policies should not be rejected if they satisfy only one of the criteria. My focus immediately is getting out alive; however, we should also now be thinking about long-term cures.

Principle 3: Where possible, transactions between the government and banks should be *fair.* Banks should not be subsidized, nor unfairly taxed. A fair exchange does not increase net worth except at the expense of the other party. Institutions with negative net worth cannot be turned into institutions with positive net worth except by a capital infusion or a pure subsidy. Government efforts to support near-insolvent banks are likely to be ineffective if they do not increase the bank's net worth. The government is correct to invest in banks.

Principle 4: Depositors money should, if possible, be protected (in the following of procedures or other actions of the state). If people cannot trust that they put their money in the bank it is safe, this would have three consequences: Firstly, the losses on 'safe' money would continue to ripple through the system leading to a series of domino effects on other banks. Secondly, a lack of confidence could cause a run on the banks, and the banks do not have sufficient money in order to continue. Thirdly, one of the pillars of trust in our society would collapse. Protecting trust requires that the interests of depositors should be protected. Depositors should be given their money back.

Principle 5: In cases of fraud, due procedure should be followed. If fraud has occurred institutions should be reorganised and taken under control of the regulators. Normal procedure (i.e. the rule of law) should be followed. Insolvent banks should be wound down using standard procedures, restructuring the unsecured creditors. Whether the banks are solvent or not is in principle a market decision, not a government one. General procedures written in law should be used, without the influence of special cases. If banks are insolvent they to be brought into government ownership (100% government owned) and the top level of management replaced. Junior bondholders of banks should be swapped for equity. Unsecured creditors should be converted to equity in a process of 'restructuring'. The remaining rump bank would amount to an essentially a high-risk high-return investment fund.

Four Lessons from the Preceding Analysis

Lesson 1: Supporting the existing banks is a good short-term palliative. It has prevented the banks from immediately going bankrupt, and has therefore (temporarily) protected depositors money. The short term crisis in confidence has led to a seizing up of the financial markets, and a breakdown in trust between the banks , so that they are reluctant to lend to one another. The measures to support the banks have been successful at preventing the immediate collapse of the financial system (runs on the banks etc.). The underlying profitability of the banks may help them to rebuild their capital positions. However, in the long run, further market power with a few banks will lead to even further 'financialization' of the economy.

Lesson 2: Supporting the existing banks may be an inefficient, ineffective and inequitable way to promote new lending or to support the economy generally in the long run. Anything other than direct subsidies or recapitalisations will not change the net asset value of the bank. A bank with uncertain assets will hoard cash and is unlikely to be trusted by potential depositors.

Lesson 3: The future outlook for the banks depends largely on the macroeconomic climate. The balance sheets of some banks *may* recover *if* nominal growth in global GDP is positive. Most banks make a healthy profit before bad loans. If these profits are retained, then over time their balance sheets will recover, so long as the factors leading to bad loans are not repeated. Nevertheless, insolvent banks *may* also continue to lose money, especially if nominal growth in global GDP is low or negative. In general organisations with negative net worth are likely to lose further money over time, because the value of their assets is negative and because the bank is unlikely to be able to arrange good terms with other market participants.

Lesson 4: Macroeconomic (and, if possible fiscal) policy should, in the short term, be strongly expansionary: Since bank losses and credit constriction are largely self-perpetuating problems, there is an incentive to keep the economy 'afloat' by strongly expansionary macroeconomic policy.

The Role of Keynes and Fisher

The work of John Maynard Keynes is pertinent to getting out of this crisis. Keynes wrote his book *The General Theory of Employment, Interest and Money* in the time of the great depression, publishing it in 1936. Keynes' work is intended to be 'general' in the sense in which it deals with the economy in a number of different conditions. Keynes viewed 'classical' economics as merely a special case; the case, broadly, when the economy is operating under full capacity. The insights of Keynes therefore differ most markedly to those of the classical economists in recessions, and in particular in deep recessions and deflations where both output and prices are declining.

Irving Fisher's work on debt-deflations is also extremely relevant to the current situation. Fisher described how deflation could make depressions that were originally caused by bank failures even worse.

Three Further Lessons from Keynes and Fisher

Lesson 5 (Debt Deflation): If highly indebted, avoid deflation like the plague. Debts get worse in deflation.

Lesson 6 (Paradox of Thrift): The approach to individuals (if you are in debt, save more) don't apply to the nation as a whole

Lesson 7 (Liquidity Trap): As interest rates approach zero, monetary policy becomes ineffective - Fiscal policy is needed. Avoid Deflation: As deflation kicks in, real interest rates (interest rate minus inflation) rise.

The Current Approach

There have been the following commitments (the banking 'bailout') in the UK

- A Special Lending Facility of £185bn
- Bank recapitalisations of £50bn
- Quantitative easing of approximately £150bn
- Interest rates cuts
- Tax cuts (e.g. VAT)

Considering the words and actions of the UK government, the following objectives can be discerned[14]:

1. An expansionary monetary position, increasing the amount and reducing the cost, of new lending to UK businesses and companies
2. Prevent a run on the banks
3. Protect deposits from possible insolvency of the banks

These objectives are laudable[15]. To these should be added:

4. Protect the long-term fiscal position of the taxpayer.
5. Protect the position of the UK as a whole on the international markets

14 The basic underlying objectives of sound economic management are to ensure a stable inflation rate. Additional points might include smoothing the economic cycle, avoiding 'boom and bust', and to conduct a prudent fiscal policy.

15 Good crisis objectives might be:

1) Increase finance to companies and individuals, and increase the amount of 'good' money in the economy*

2) Make concrete implicit guarantees of private domestic & other bank deposits

3) Avoid the socialization of private losses & risks

4) Limit the potential liability of the sovereign / taxpayer

Options for Resolution

Enhanced Liquidity

One function of the authorities generally is to provide liquidity to the markets. I'll call this role 'bigbank'. Bigbank's lending should be to other creditworthy institutions. It should it insure the loans it makes against the risk of default where possible, by buying credit default protection in the open market. Bigbank's role is to provide 'bridging loans' to other banks who might have temporary liquidity problems due to speculative attack. Bigbank could (say) have around £100bn of capital. The government providing the initial capitalisation, by buying shares, or by guarantee. So long as the risks on the loans that it makes can be adequately insured, Bigbank can lend many times its' capital. Bigbank can act commercially, by providing loans at rates that account for the inherent (although not the speculation-induced) riskiness of lending (because now-solvent institutions might become insolvent in the future). The main role of Bigbank is to offer liquidity and thus defend solvent institutions against speculative attack.

Insuring Against Systemic Risk

A new organisations could be created to formalise and eventually commercialise the government's role as 'lender of last resort' and 'insurer of last resort' to financial institutions. I'll call this institution 'Biginsure'. Biginsure's role is to be an 'insurer of last resort'. Biginsure will insure Bigbank against its counterpart going bust, if no other insurers can be found. Big insure could also insure against other major risks where at present. the government provides a guarantee (e.g. terrorism, natural disasters). Biginsure would be well capitalised, in order to cover quite large potential risks. Biginsure could grow (e.g. from an initial size of £100bn of government-owned shares to a size of £1tr) by selling shares to the public, so spreading risk broadly.

Dealing With Insolvency of Existing Banks

It seems now that the banks are not solvent; at least they will not be solvent in the foreseeable and credible event of further major losses on their assets (their loan books). What to do with insolvent banks is difficult. Fundamental way to deal with the banks include Bankruptcy, Restructuring, Nationalisation or 'propping them up'?

At one extreme is **full bankruptcy and liquidation of the bank's assets**. If a company is insolvent, generally they are declared bankrupt. The bank would be wiped out and its assets distributed to the creditors. One example of this approach is the bankruptcy and liquidation of Lehman brothers. Bankruptcy has risks; the main one being the huge 'costs of financial distress'. A bank has a lot of offsetting contracts of various kinds. Sorting out this huge complexity of this may lead to lots of money for lawyers.

Somewhat in the middle is **restructuring** of the existing banks. The bank's bondholders would see their debt swapped for equity. This is an important solution that doesn't seem to have been tried sufficiently.

At the other extreme is **nationalisation** with full reimbursement of those who have deposited money. The issue with this is that the banks may have very large credit risks, and the UK sovereign may not be able to bear all of these risks.

A final option is '**prop up**', by implicit subsidies, recapitalisations and increases in monopoly power. This has largely been the route taken by the UK and US. This route has important advantages. The dangers of this approach include increased financialization and regulatory capture.

Discussion

The most straightforward way to solve the current crisis is bank nationalisation. There are a few reasons why the government might not want to take this path, one of which is the large overseas assets and liability of UK-based banks. The sovereign has limited fiscal credibility; the key to avoiding future hyperinflation is not biting off more than it can chew. It should focus on the UK and on creating a 'good bank' to promote future lending.

The recapitalization of UK banks seems to have been a good plan. The systemic collapse of the banking system was forestalled. Of course, most of that money went into a black hole. But the government did end up by owning large parts of the banks' equity, which might be worth a lot in the future if the banks recover. £37 billion for pure upside on say £2trillion of assets isn't too bad a deal. And having an equity stake is clearly not the same as guaranteeing the banks liabilities for free. Limited liability still applies.
However, the government obviously has certain responsibilities in the UK banking system - it needs to guarantee the deposits of UK savers, and it needs the banks to lend enough to keep the economy going.

To summarise, the UK government has two clear requirements, both UK based
a) 'Get lending going again' to UK individuals and companies
b) Guarantee the deposits of UK individuals, charities and (probably) companies

Separate Good Assets From Bad?

After nationalisation, often it is proposed to separate those of the banks assets (which are the loans that it has written) into those which are from creditworthy institutions (good assets) and those which are from borrowers who are financially distressed and therefore may be unable to pay back their loans (bad assets). The bank in other words is separated into a 'good bank' and a 'bad bank'. Both the good bank and the bad bank would then be owned by the government, but the good bank could be re-privatised and the bad assets in the bad bank could be sold off once the economy recovers. This is the often quoted 'Swedish Model'. The important principle of good-bank/bad-bank is that of separation between the old bad assets and the new lending. Bad banks are equity investments. They contain assets but no lending capability. They contain the assets of the loans which are not capable of being paid back. The advantage of the government buying the 'good bank' first, is that systemically important assets (UK depositors, interbank lending) can be transferred into the public sector first.

Recapitalizing the Banking System by Creating Good Banks

There are broadly three objectives to recapitalizing the banking system:

1) Increase finance to companies and individuals, and increase the amount of 'good' money in the economy
2) Make concrete implicit guarantees of private domestic & other bank deposits
3) Limit the potential liability of the sovereign / taxpayer; and avoid the socialization of private losses & risks

These objectives can be achieved by a transaction that involves:
a) Buying the branch networks of the major UK banks (needed to 'get lending going')
b) At the same time, taking on the liabilities of the domestic depositors
c) Taking on the 'good' assets in the corporate lending and mortgage book

The old banks would be left with more cash (from being able to sell some of their tangible assets). This would leave a de leveraged, cash-rich rump (including in effect an overseas lending unit) which might die slowly.

HBOS would be a good example. The government should take on the branch network, and the brand and the domestic depositors (liabilities), and the good parts of the domestic mortgage book (assets); but none of the 'toxic debt'. This would then be a 'good bank'. The government could then progressively sell stakes in the 'good bank' to private investors. The main risk for this plan, would be that if only some of the branch networks were bought, there might be a run on the other, privately owned banks.

There would still remain the question of what to do with the remaining 'bad bank'. Few might lend to it; but in any case few are lending to the big banks now anyway. Bankruptcy is one option, but it usually involves plenty of money for lawyers.

New lending must be separated from existing lending. Current government thinking suggests that we need a government-backed good bank much more than we need a government-owned bad bank. And taking on the bad assets is socialising private risks - not a good idea. Better to create the good bank first, including both high-street and capital-markets elements. Use the good bank to get lending going and to 'look to the future'. The remaining bad bank would be cash rich with a more volatile and non-domestic balance sheet and fewer tangible assets. It would have in effect a skeleton team remaining. If insolvent it would wind itself up naturally.

Appendix A: Definitions of Financial and Economic Terms

Cash: Notes and coins of currency in general circulation.

Money: Item used as a unit of exchange. Typically includes cash and other assets.

Law: Rules governing conduct enforced by governments.

Legal person: Individuals (natural persons) and companies (who can act as persons under law)

Contract: Obligation between two legal persons under law.

Debt: A contract providing money (from a lender to a borrower) that must be repaid in full, usually with interest.

Principal: The original amount of money lent in a debt contract.

Interest: The additional money repaid in addition to the principle in a debt contract.

Asset: An item of property or right (e.g. to future payments) owned by a person or company

Liability: The debts or other money obligations of a person or company.

Profit: The surplus of a company's operations. Excess of revenues and asset appreciation over costs and asset depreciation

Loss: A negative profit.

Shares/Equity: Ownership rights of a company typically entitling the owner to share in dividends and vote on the direction of the company

Dividends: Profits distributed to shareholders

Retained earnings: Profits not distributed to shareholders.

Shareholder equity: Net asset value (Assets minus Liabilities) of a company (e.g. a bank). *Valuation* of a company's equity can take two main forms:

- *Market valuations*: the amount of the whole company as imputed from the traded price of shares of that company.
- *Accounting (book) value*: *the total sum of the contributions of the shareholders plus* net retained earnings

Retained Earnings: Profits not paid out as dividends

Goods: Discrete physical objects *valued* by someone.[16]

Bads: Physical states that are *disvalued* by someone.

Capital: Accumulated wealth of an individual, company, or community, used as a fund for carrying on fresh production; wealth in any form used to help in producing more wealth.

16 Goods can be consumable or non-consumable; perishable or non-perishable. Producing goods requires certain things commonly known as factors of production:

Production[17] Transformation of resources, labour, and other goods into useful goods.[18]

Resource: Anything that is useful

Factor of Production: Resource needed in order to produce goods

Labour: Human time and physical effort used in the production of goods and bads.

Land: Area of the surface of Earth (esp. when used in production).

Economic land: Factor which is completely fixed in supply. Radio spectrum is another example of economic land, as is the amount of space in geosynchronous orbit. Land can be occupied for a particular amount of time, but can only in special cases (e.g. inundation) be consumed entirely.

Natural Resource: Other gift from nature. Typical examples are oil, coal, natural gas, and ancient rainforest.[19] These can be entirely used up by transformation. Other gifts from nature include the air, water, forest and soils. The quality of these factors can be changed, by human or other degradation.

Pollution: Reduction in quality of air, water, forests and soils and other natural resources through human activity

Capital[20] *goods:* Those that are used to production other goods, e.g. factories, machines and tools (also known as 'physical capital')[21]

Investment: Production used to create capital goods [22]

Depreciation: Reduction in quality of capital goods over time.

Consumption: Production and use of consumption goods

Consumption goods. Goods that can be used up for human purposes (e.g. food).
Some consumption goods are produced but not immediately used up. This is known as 'stock building'.

17 Similarly *income*

18 Production requires land and labour. The quantity and quality of production can be enhanced by the use of capital. Production is a flow. In general production can be consumed (ie used up to maintain health or for enjoyment) or invested.

19 The supply of resources is not totally inelastic, if the price rises, more can be found in more difficult or low-quality areas.

20 The word 'capital' (alone) is often used incorrectly to mean “money and other financial assets which can be used to make more money and financial assets” and so is here avoided.

21 Some (e.g. see Ekins) have expanded the idea of capital to include human capital (e.g. the education of the population) and natural capital (natural resources) and social capital (networks and organisation).

22 For an interesting perspective, please see Costanza's article (1980, *Science*). Constanza adds government and individual consumers to the standard input/output tables (Leontif & Stone). Then the output of society is capital goods.

Appendix B: Further Information on Valuation

Up to now, we have not been able to put different classes of goods together into a single measure. Wealth could include the diverse set of one's car, house, etc; production could include cars, food and televisions, but we never put these things together into one measure. We can attempt to put these things into unified measures by *valuation*.

Valuation typically involves *counting* goods and *pricing* them (pricing means to value things *relative to other things)*. Valuation typically requires a basis; one example of a basis[23] that can be used is *monetary value* (another could be *hours of time* or *pints of beer*).

Valuation can be made by *an individual,* by *the market* (see below), by *accounting rules,* or by *society* (in some non-market or market-adjusted way). Each of these three valuations will produce different values for items. *Private values* are those which are given on goods by an individual person and which presumably drive that person's behaviour. *Market values*[24] are the prices seen in the market; presumably, the price that is simultaneously that willing to be paid for an additional item and that at which an additional item could be produced. *Accounting* (or *book*) *values* are those at which an asset is measured according to certain rules. For example, in business the accounting value could equal the amount paid for an asset, depreciated according to certain rules; or the amount for which this asset could be sold. It may be good practice for *society* to put a value on the various assets, so as to understand whether a *net profit* is being made in any activity.[25]

It is important to distinguish between a change in the quantity or quality of a set of goods and services from a change in the prices used to value something. A change in nominal market value of a bunch of goods could be caused by:

1. Change in the value of money relative to goods (overall[26] price-inflation/disinflation)
2. Change in relative prices of a fixed bunch relative to other goods (change in relative prices)
3. Change in the real quantity/quality of this bunch of goods (change in quantity or quality)

Up to now, we have spoken only about the valuation of goods and services. Goods and services are valued according to some basis, usually money. Present and future rights and obligations can also be valued. The valuation of future financial flows is usually achieved using 'discounted cash flow' analysis, which assumes that money can be lent or borrowed at certain rates of interest.

The overall value[27] of the assets of an individual, company, country or planet can then be assessed by one of the methods above (typically market or accounting prices), giving an 'value of assets'. The value of liabilities can also be assessed in financial terms giving 'value of liabilities'. The two values put side by side is called a 'balance sheet', and the value of assets minus the value of liabilities is called the 'net asset value' or 'net worth'.[28]

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23 The technical word is 'n*umériaire*'

24 Also known as 'exchange value'

25 One implicit assumption is that valuations are separable: ie the value of my cat plus that of my mouse are equal to the value of the two put together. This may not always be the case; we may have to value interactions. The most important example of this is so called 'social capital'.

26 Typical measures of price inflation e.g. 'retail price inflation' 'GDP deflater' may be inappropriate here. The traditional meaning of the word inflation is 'quantity of money' but this is also not appropriate to this context, since all prices can change due to shifts in *expectations* rather than in a change in the *quantity of money.* This would not increase total wealth, but it would increase the value of all goods relative to the stock of money.

27 Either according to accounting rules, or according to market prices.

28 For a financial institution, the net worth of an institution is that which allows it to make further loans and therefore profits. Since the financial institution deals in money and claims over money (rather than goods); capital is sometimes defined as that which allows it to make more money. For the perplexed: Financial Capital (for a bank or other financial institution) = Net Asset Value

Appendix C: The Balance Sheet of The UK Government and The Major UK-based Banks

The UK Government

Gross government debt is a stock of how much the government owes the private sector.

- The value of gross public debt is about three quarters of a trillion pounds (£774bn); the net debt about £600bn) http://www.hm-treasury.gov.uk/psf_statistics.htm
- Pensions liabilities could be added to this (maybe about £530bn). http://www.telegraph.co.uk/finance/2944530/National-debt-may-soar-above-andpound1,000bn.html
- PFI liabilities are around £60bn (capital value)-£180bn (total repayment)
- So it seems that roughly speaking, the UK public debt is around £600+£530+£100 or £1.2trillion. This is a stock. (UK GDP (a flow) is about £1.5 trillion. http://www.statistics.gov.uk/STATBASE/tsdataset.asp?vlnk=574&More=N&All=Y .

Therefore the total UK public liabilities are about 80% of the flow of income into the British economy. To make the stock and flow comparable if we paid a 5% interest rate, interest payments would be around 4% of GDP.)

The Major UK-based Banks

Now let's compare with the balance sheets of the banks

Lloyds TSB - http://finance.yahoo.com/q/bs?s=LYG&annual Assets of £706bn, Liabilities of £681bn. (net assets of £25bn).
HBOS- http://www.hbosplc.com/investors/results/sfs/2004/balancesheet.htm Assets £442bn, Liabilities of £370bn
Barclays - http://www.investor.barclays.co.uk/results/2005/annualreport/annualreview2005/summaryconsolidatedbalancesheet.htm Assets £924bn; Liabilities £900bn.
RBS - http://finance.yahoo.com/q/bs?s=RBS&annual Assets of $3.8tr Liabilities $3.7tr
(this has jumped from assets of $1.7tr liabilities of $1.6tr at the end of 2006).

Summary

As can be shown by the table below, the liabilities of the banks are large in comparison to the UK existing public debt (£700bn). It is risky for the government to write the banks an unlimited cheque. In the next section I will outline a proposed solution that does not involve unlimited liability for the government.

Public Liabilities	**Gross Bank Liabilities (in brackets, the loss incurred for a 10% fall in asset values due to bad debt)**
UK Gross Public Debt £770bn	Lloyds TSB £680bn (£71bn)
Public Pensions £530bn	HBOS £370bn (£44bn)
PFI £100bn	Barclays £900bn (£92bn)
	RBS $3.7tr ($380bn)
Total Gross Public Debt £1400bn	