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The banking crisis: A rational interpretation

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**Cardiff Economics
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The Banking Crisis — A Rational Interpretation

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THE BANKING CRISIS — A RATIONAL INTERPRETATION

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Abstract

Modern macroeconomic models have been widely criticised as relying too much on rationality and market efficiency. However, basically their predictions about this crisis are being borne out by events. ‘Crashes’ are an integral part of an ‘efficient market’ capitalism and are brought on by swings in the news about productivity growth; this time nearly two decades of strong computer-based productivity growth were brought to a crashing halt by raw material shortages. This presages a slow recovery until innovation in material use frees growth up again as it did in the 1990s after the shortages of the 1970s.

The banking crisis of 2007–9 can probably be dated to August 2007, when the first bank casualties of the sub-prime collapse appeared and the interbank market closed up, claiming as its first victim the UK’s Northern Rock bank. However, many central banks took little offsetting action on their official lending rates, confining themselves to the provision of liquidity to the interbank market; the exception was the US central bank, the ‘Fed’, which was coping with the direct fall-out of the sub-prime collapse. For the others a dominant feature of 2008 was continued worldwide growth at rapid rates accompanied by a sharp boom in commodity prices which in turn fed into domestic prices. It was not until the Lehman bankruptcy of mid-September, followed by the collapse and bail-out of AIG the next day, that the rest of the world’s central banks went into panic monetary easing. They were soon joined by the world’s governments in taxpayer bailouts of major banks. The fourth quarter saw record risk-premia on loans to firms and households, and also a spectacular collapse in output and world trade. In the first quarter of 2009 there was a further though smaller fall. It now seems as if the second quarter has seen some slight recovery in output in several major economies; a number of indicators are suggesting that this may be the cyclical bottom of the recession induced by the crisis.

This is a short staccato description of the banking crisis. Many would disagree with it, especially with the assessment of its end; they would say we have yet to see further fallout and a ‘double-dip’ cyclical pattern. Of course it is possible they are right; hence the words ‘may be’ in that paragraph’s last sentence. Nevertheless, at this moment (mid-June 2009) it is a fair statement of the facts we currently have.

My aim in the rest of this paper is to assess the causes, and say something about cures, but mainly to use available macroeconomic models to assess the prospects. Much has been written recently in blogs and op-eds about the deficiencies of macro-modelling and modellers. However, I will argue that both come out of this episode with some credit; the macro-modelling community’s forecasts have

been for a bad but short recession, followed by a moderate recovery. They have based this on models that plainly could not predict the banking collapse nor analyse banking behaviour, but nevertheless were equipped to assess the fall-out of the ‘credit crunch shock’ and the massive monetary and fiscal response that followed.

In this respect, they have responded to the crisis much as they might have responded to other shocks, such as commodity price shocks or the Asian crisis shock, again without having good models of the shocks themselves. Critics have been eager to seize on the failure of modellers to have models of the shocks; yet a macro-model cannot for obvious reasons model all the sources of the shocks that hit the economy. There is not, nor can be at least with our present abilities, such a thing as a ‘complete model’ of all sources of disturbance in the world economy.

Hence in my first section I look at the candidates for ‘cause’ and ‘cure’ of this crisis. Then in the second I set out just why I think that recent macro-models are capable of analyzing the effects of the crisis shock and of the responses to it. In the third I set out the sort of analysis that results. Finally I draw some conclusions.

Causes and cures of the crisis:

In a recent lecture in Cardiff Dale Henderson (Henderson, 2009), who worked at the Fed until the end of 2008, called the episode ‘a financial perfect storm’ in which ‘all the wrong incentives’ for a variety of agents coincided disastrously. This seems to be exactly right. He documents the incentives for executives of banks to take bonuses on short term gains, for rating agencies to rate well products for which they were paid by the issuers, and for the originators of primary lending to create products that they could easily pass on to bundlers. He could have added that politicians too had incentives, in the form of happy voters and bulging revenue streams, to encourage lending to ‘sub-prime’ borrowers and to go easy on regulatory barriers to these activities (see Schwartz, 2009).

All these aspects of the crisis have been well documented — Adrian and Shin (2008), Foster and Young (2008) and Beenstock (2009) all consider the causes. Undoubtedly all played a role. However, human affairs are full of poor incentives; yet somehow we assume that market disciplines will price their effects fairly. It remains a puzzle that the main villains of the piece, sub-prime mortgage packages (the famed ‘Collateralised Debt Obligations’), seem to have been so badly mispriced. This apparent mispricing lay not so much in the slicing of the mortgages but in the failure to price into the packages as a whole the apparent systematic risk due to the general response of house prices to the business cycle.

The question is whether someone could rationally have been expected to win a bet against these products, given the

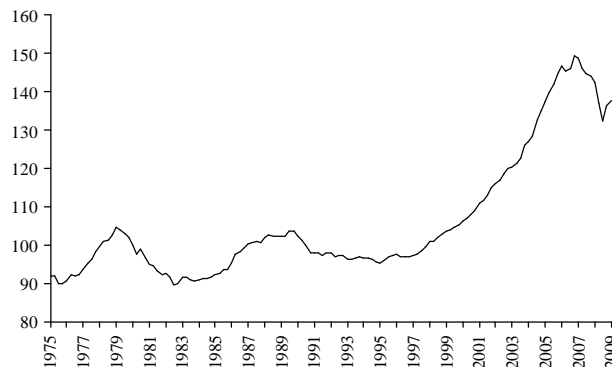
information available before 2007. We know with hindsight of course that they would have won this bet. But could that have been expected statistically? Or to put the question another way: was the behaviour of the US housing market a ‘bubble’?

The prosecution case saying ‘yes, it was’ might seem well founded, since plainly house prices have collapsed and ‘fundamentals’ have turned out to be much worse than the market price seemed to be discounting.

A defence case however would have to point out that the fundamental in the housing market is ultimately productivity, since this drives incomes and demand against a scarce supply of land. Productivity in turn most likely follows a random walk, since the innovation causing productivity growth is largely unpredictable. In the run-up to the crisis US real house prices appeared to become a non-stationary process — taking off from the late 1990s, having previously been stationary and cyclical.

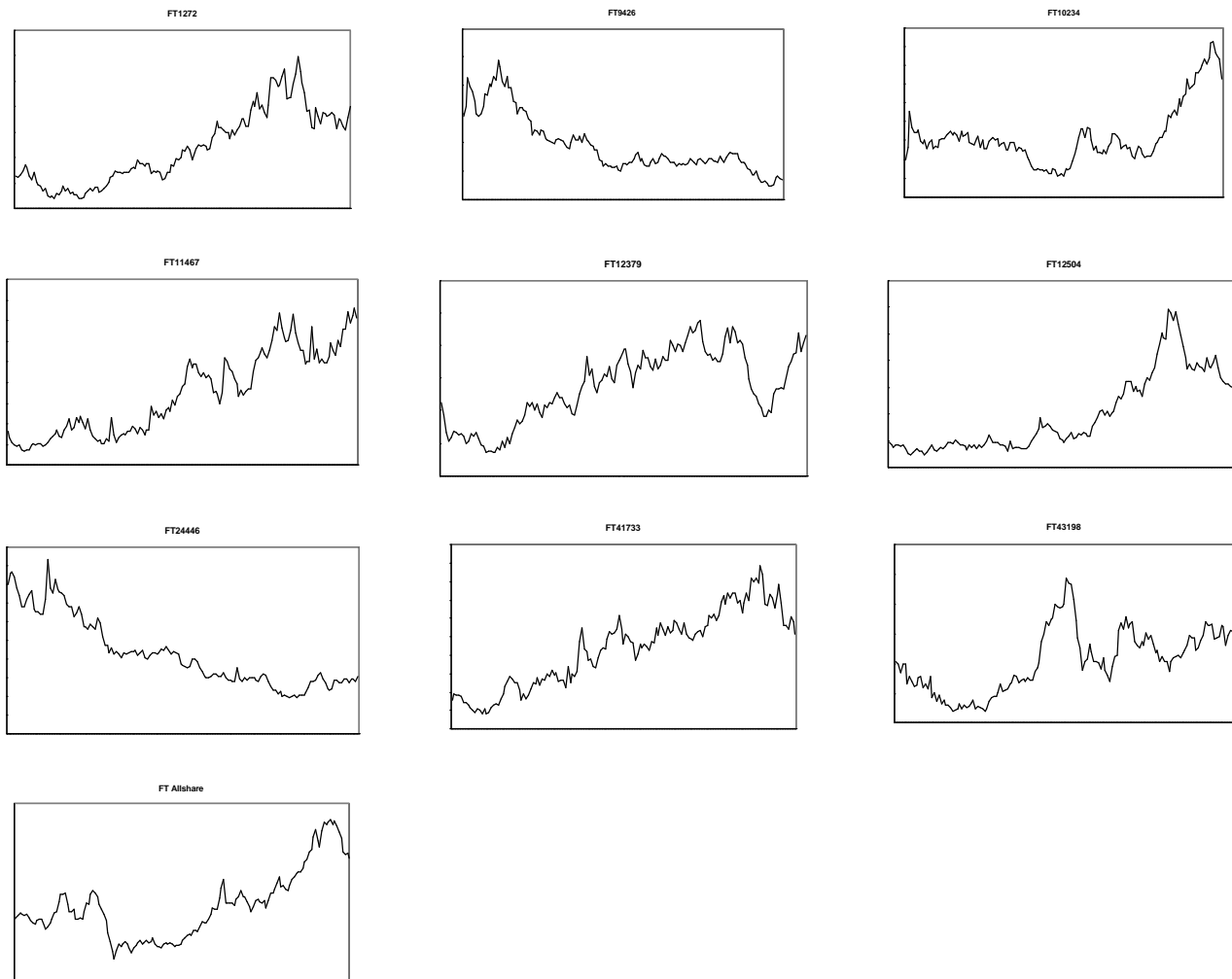
If real house prices were non-stationary — a variable ‘integrated of order 1’ or I(1) for short — then their

Figure 1: Real US House Prices, 1980Q1 = 100 All-Transactions Indexes (Estimated using Sales Prices and Appraisal Data)



Source: Federal Housing Finance Agency
 conditional forecast is close to the current value and their conditional variance say ten quarters ahead equals ten times the one-period variance, which was not very great. This calculation of systematic risk could be quite modest, as compared with one based on the possible fall in a cyclical

Figure 2: A variety of ‘histories’ for the Stock Market (measured by FTSE deflated by CPI)



house price close to a cyclical peak, when a recession has a large probability.

We can illustrate this point from the behaviour of another asset price, for which ‘bubbles’ are often posited, the stock market. Figure 2 shows a variety of ‘histories’ for the UK FTSE over the period from the 1970s to the 2000s. Nine of them are based on simulations from a model of an efficient FTSE market facing a profits fundamental with four possible regimes for growth, each with fixed probability. (Meenagh et al., 2007). One can find a calibration of this model such that it generates behaviour that with 95% confidence is like both that of the observed FTSE and of observed profits. The tenth chart illustrates this by showing the actual FTSE in this period of history.

What this shows is that asset prices are $I(1)$ variables in general, related to other $I(1)$ variables (basically productivity), and that their prices can be efficiently set but nevertheless have the properties of ex post ‘bubbles’— that is, they crash from time to time.

The policy conclusion from this analysis is a gloomy one: ‘capitalism’, in which large bets are taken on available information, will generate ‘crises’ periodically for particular sectors where the bets go wrong after the event. Occasionally the sector in question will be or will include the banking sector and we will have a banking crisis. Since it is generally agreed that we cannot let a banking system, or nowadays more broadly a financial system, fail, then because the required bail-out is costly to the taxpayer the taxpayer will insist on regulation to control the cost when the inevitable happens.

This leads us directly into a discussion of ‘cures’. What can be meant by ‘cure’ when the crisis is inevitable (even though unpredictable)? We mean measures that can either reduce the chances of a banking crisis or reduce the fall-out from it. The main cure suggested is, following the logic above, regulation of bank risk; we had Basel I and then Basel II (which was not fully operative at the time of the crisis) and some have suggested modifications to Basel II such as pro-cyclical risk capital provision.

Taxpayers clearly have the right to demand such safeguards to limit the potential calls on their resources. However, the problem does not stop there. We had regulations before this crisis but in many countries the politicians saw that they were disregarded; thus in the UK the new tripartite system of regulation from 1997 gave the Financial Services Authority power to control the banks, and the FSA has reported in its own defence that it was instructed by the government to do ‘light-touch regulation’— i.e. effectively it let the UK banks load up risk off-balance sheet with impunity. Thus we note that the reappearance in this context of the well-known problem of time-inconsistency, whereby politicians can be persuaded for short-term reasons to override sound previous instructions. Thus ‘quis custodiet ipsos custodes?’— which translated asks: ‘how will we keep control of the regulating government itself?’

In the area of other policies where this time-inconsistency crops up the remedy has been that public opinion should discourage politicians from such interfering overrides. For example we frown on politicians interfering with sentencing in law courts, or nowadays with the setting of interest rates. For public opinion to impose this discipline on politicians it needs to be both well educated in the issues at stake and well informed about the facts. In the case of the banking and financial system neither is the case. The system is poorly understood (even upmarket newspapers can describe financial market participants as ‘greedy’ and short-selling as ‘evil’) and as for information it is by law restricted to the regulators themselves. As Michael Beenstock (ibid) has argued, it is important that regulators release this information to the public so that restraint on participants from public opinion can be operative. This restraint will work directly on the share prices of those taking excessive risks and indirectly through the political process.

So while there can be no ‘cure’ in the sense of preventing bank crises, there can be some reduction of the taxpayer cost when crises occur through regulation of risk-taking and through the release of information about the risk-takers.

How good are our macro models?

The crisis has been an occasion for a number of economists to rail against the ‘modern generation’ of macro models. By this is meant models that assume rational expectations and efficient markets, in which people and firms respond to the cost of capital, and in which the monetary system is modelled in terms of an interest rate-setting rule, whereby the central bank sets the short-term cost of capital in response to inflation and an output measure of the business cycle. A main protagonist has been Charles Goodhart who would like models to embody realistic assumptions about behaviour, much as in the ‘behavioural finance’ literature, and fully specified models of banking and financial balance sheets, which then impinge on people’s behaviour. Recently he has been joined by Willem Buiter who has apologized pro vita sua as a supporter of modern macro (most of which is ‘useless’ he now avers). There has been much in the same vein from Keynesians such as Lord Skidelsky, Professor Vicky Chick and the ubiquitous Paul Krugman.

This headlong desire to scrap modern models must be resisted. Of course research improving them must continue and it may well that these improvements include a better modelling of the channels of monetary policy. But it is unlikely, in my view, that they will be improved by jettisoning their current properties; rather the extra channels may help by being added to this structure.

Let us start by repeating the point above that our crises reflect efficient markets and the underlying nature of capitalism in which we expect and encourage firms and people to take big bets in a decentralized way— the reason

being that this way we get social gains from the good innovations which last for ever and so more than compensate for the bets that fail. Thus our models are capturing an important fact about capitalism. Furthermore, it is theoretically absurd in my view to assume agents are irrational when we make conditional forecasts of the effects of events and policies: they will either catch on sooner or later or we should ensure that they do. 'Learning' can also be modelled; but the policy implication of learning models is that the authorities should communicate well what they are doing.

This is not to say that 'behavioural' models are always wrong, just that to rely on them systematically would be unwise since people have strong incentives to be rational. Macro-modellers gave up on 'ad hoc' behavioural assumptions precisely because they realized they would shift as policies developed and were well understood.

So theoretically there are strong reasons to maintain the basic assumptions of modern models. But the empirical case turns out to be strong too. These models, when suitably set up, have a fairly impressive ability to mimic the behaviour of the economy. They are still under development and there are things that still need fixing for them to do a fully comprehensive job. But this needs to be put into the context of their youth in scientific terms. Serious efforts to use these models to match the data have only been going on for a decade or so.

But what about the detailed attack on their representation of monetary policy? Surely it cannot be right to look merely at interest rates when this crisis has shown that great gaps have opened up between the official interest rates central banks set and the rates prevailing in the market-place? Do we not need a model of 'monetary transmission' which can predict what will occur in the market from given monetary actions?

It would certainly be nice to have such a model. However, we should note that it has only been for the period of this crisis that such 'great gaps' (risk-premia) have appeared. For most of the post-war period these gaps between market and official rates have been fairly constant, or more precisely have fluctuated within a pretty narrow range of little importance for the economy.

What our current modellers have done pragmatically is to add these risk premia directly into their equations for consumer and investor spending where they have their impacts. Thus these premia act like other sources of 'error' or 'shock' in the model. One can then ask what will happen to the economy as a result of these shocks, including the reaction of the central bank to developments via its base rate.

The critics go on: what about the effects of 'quantitative easing'? How can these be assessed in a model without monetary quantities? However this misses the point of the difficulty of assessing QE: that it is occurring at a time

when official interest rates, the normal channel for money supply changes, are at their lower bound of zero. This difficulty is shared with models where money supply and demand are explicitly modelled. In effect QE is attempting to flood the banking and intermediary markets with cash in order to bring down the (risk premia) gaps between market rates for credit and base rates- either by stimulating normal bank credit and so bank money creation or by directly providing credit bypassing the banks and so stimulating activity in retail and other markets normally served by the banks. Both these aims share the objective of bringing down the risk premia in the market.

Now we notice how QE is helping the government's other policy instruments, fiscal support to banks, fiscal action via the automatic stabilisers to support firms and households (effectively with credit, since in due course the budget deficit will need to be paid back with tax rises of spending cuts), and finally 'discretionary' fiscal packages with essentially the same purpose. All these actions are supplementing the normal role of monetary policy in reducing interest rates, with the aim of extending credit to the private sector in a credit crisis.

We notice that in this credit crisis the role of government is to provide credit where the banks are failing to provide it. Fiscal policy in this crisis should therefore not be analysed in the usual way, for its 'multiplier effect'. The whole point of this crisis is that there is a serious shortage of liquidity. Hence fiscal actions are remedying that shortage directly.

Hence because the credit crisis is sui generis a model built to analyse normal credit and intermediary operations would be little use. As it happens a standard macro model is able to examine what is going on by examining the errors in its equations related to the risk premia. We can 'inject' into the model 'improving risk premia' by altering the errors affecting the model. These improvements will be due to the joint efforts of the fiscal and QE actions; their effects on risk premia are easily monitored even if we cannot analyse just how and why they are working.

So I would argue that in practical terms our macro models have served us well, if we treat the crisis and monetary/fiscal responses to it as a series of shocks, provided we are willing to accept that we cannot use them to understand and analyse these very shocks. I would not dispute that it would be good to have a model of the crisis itself; but that is a different thing from a macro model.

The prospects: examining the model simulations of crisis and response

To examine the prospects we divide our analysis into policy (monetary policy predominantly) for the period before the Lehman bankruptcy in mid-September 2008 (Before Lehman); and policy After Lehman when the crisis deepened dramatically into a full-scale collapse of the world economy. We begin with an account of the model we are using; then consider the two periods in turn.

Research and a well-performing model of the EU

In our research under our ESRC grant within the WEF programme, Mike Wickens and I have been examining, together with David Meenagh (Meenagh et al., 2008), whether one can find a modern theoretically well-founded model that can match the data over the past few decades. The model is for the EU as a whole (including the UK) so we can use it to understand average EU behaviour — our work on the UK on its own is not yet complete. A great deal of work across the world has gone into finding a theoretical basis that is able to fit the facts. Our work builds on this effort. We have taken a model of a type used widely by central banks around the world and made some adjustments to it in the light of a very thorough testing procedure we have developed, based on the model's behaviour in response to shocks. The model we used is by Frank Smets at the European Central Bank (ECB) and Rafael Wouters at the Belgian National Bank; it is a 'New Keynesian' (NK) model, that is it embodies a high degree of price and wage stickiness. Its other features are habit persistence in consumption, variable capacity utilisation, and investment adjustment costs, all of which have been found to be helpful in matching the data. In our tests we found that in some respects superior performance could be obtained without significant price/wage stickiness — a 'New Classical' (NC), flexible price, version of the same model. However, neither version was able to match the data — in brief this was because the NK model generated too much output (real) variability and not enough inflation and interest rate (nominal) variability, while the NC model did the opposite, producing too little real and too much nominal variability. So it turned out that a 'mixed' version worked best, in which firms sold their output in both a sticky price sector and a flexible price sector, and similarly workers their labour to both a sticky wage sector and a flexible wage sector. The mixture that fitted best was one with most (around 95%) of the economy flexible price/wage, and only a small part with price/wage rigidity; the latter part is sufficient to get the NC model's nominal variability down and real variability up to match the data. So in what follows we use this mixed or 'weighted' model, to assess the shocks and policy responses.

Before Lehman

What are the shocks?

Our estimates of the shocks are intended to be illustrative of the order of magnitude rather than in any way precise. We assume that commodity price inflation would have added about 3% to headline inflation after a year — we model this as an equivalent shock to productivity since commodity prices do not enter the model as such.

For the credit crunch shock we assume 20% of borrowers were marginal and unable to obtain normal credit facilities after the crisis hit; we assume they could obtain credit on credit card terms (say around 30% p.a.) only. Other borrowers faced a rise in interest rates due to the inter-bank

risk premium which has varied between 50 and 200 basis points during this crisis so far, as compared with a negligible value beforehand; there was also some switching of borrowers away from fixed-rate mortgages to higher variable rate ones. Overall, we assume these other borrowers faced a rise of 2% in rate costs. Averaging across the two categories, we get an estimated 6% per annum rise in average credit costs. We assume it carries on at this level for six quarters before gradually dying out.

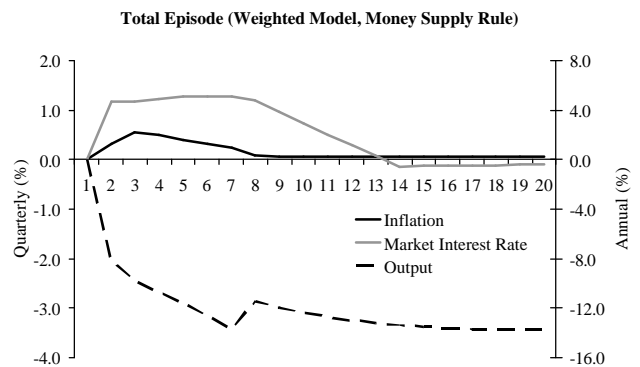
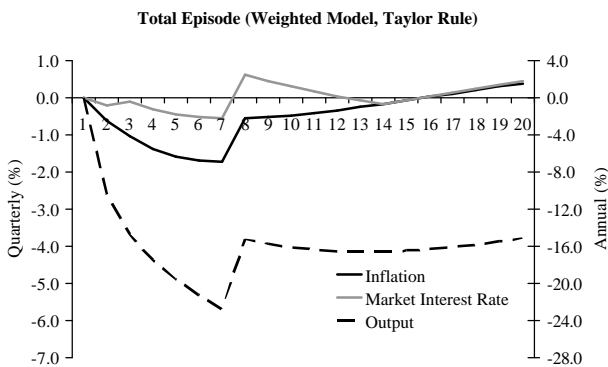
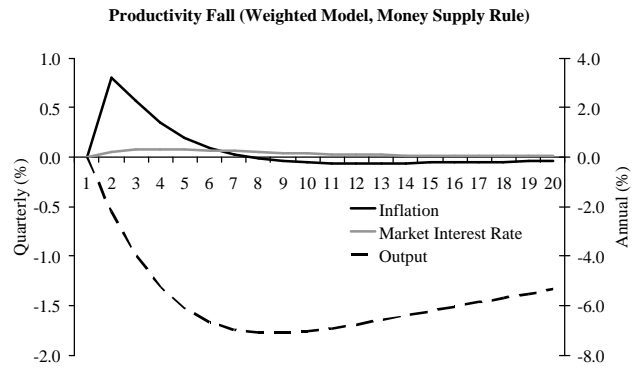
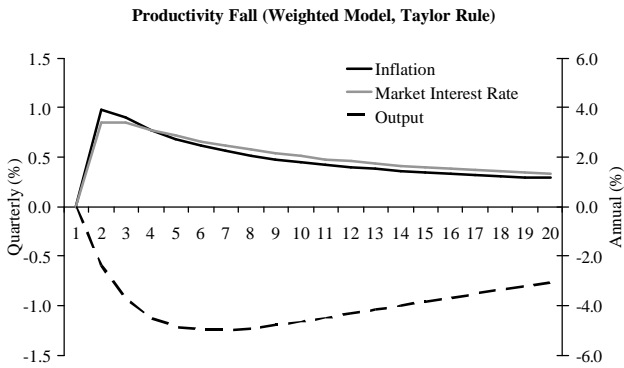
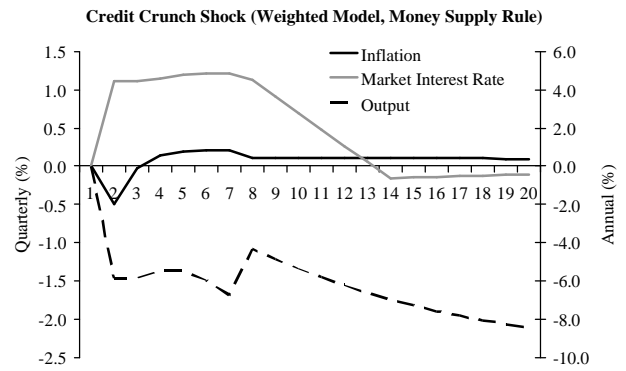
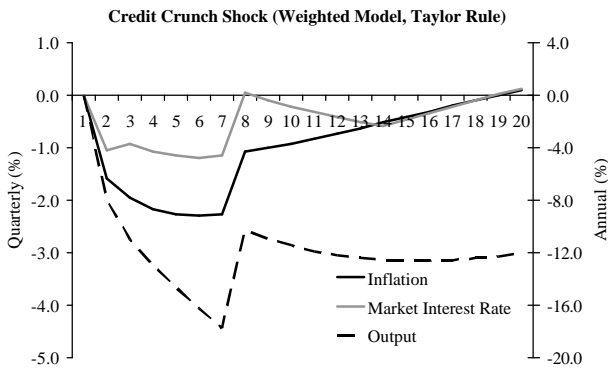
What are the possible monetary policy responses?

To estimate the effects on the economy we have to make an assumption about how monetary policy reacts (i.e. the response of interest rates). We compare two alternative approaches. Under the main one, that is currently followed by central banks committed to inflation targets, they react according to a 'Taylor Rule' in which interest rates respond mainly to inflation though also somewhat to output. Under another one, which occasionally the ECB suggests it has in mind, the central bank moves interest rates to meet a fixed money supply growth target.

When we run the model for these two shocks under these two policy assumptions we get the results shown in the six charts that follow: the last chart in each part show the sum total of effects when the two shocks are combined. In all our charts we show effects quarter by quarter (the horizontal axis measures time in quarters). On the vertical axis the left hand scale applies to output and shows the percent effect on output, the right hand scale applies to interest rates and inflation and shows the effect in percent per annum. Interest rates shown are those that consumers pay (i.e. under the credit crunch they include the estimated direct effect of the credit crunch).

Taylor Rule results:

Under the main Taylor Rule policy we find that interest rates rise substantially in response to the commodity price shock; this is because although there is a recessionary effect it is weak compared with the short-run effect on inflation. However, in response to the credit crunch shock interest rates inclusive of the credit crunch effect fall markedly; this is in reaction to the deflationary effect of the shock, creating both a sharp recession and a sharp fall in inflation. Since the direct effect of the credit crunch is initially 6% on interest rates, to get market rates to fall would require an even bigger fall in base rates — in effect to below zero. While that is technically possible, it is in practice unlikely. Nevertheless it is interesting to see how sharply monetary policy would need to move under the Taylor Rule; and then of course we did not see the credit crunch shock in isolation. When one adds the two shocks together, the interest rate inclusive of the credit effect (the market rate, shown in the charts below) remains about constant — which means that official rates are cut to match the credit crunch effect while it is occurring; plainly this means large cuts in official rates (effectively to around



zero) in the attempt to offset the rise in interest rates charged for risk reasons.

If we look at the interest rates actually set by the ECB and the Bank of England, it is clear that they have deviated substantially from this Taylor Rule prescription. They have barely cut base rates since August 2007. This is to be compared with the US Fed which has tried roughly to offset the tightening credit conditions with repeated cuts in its Fed Funds target (now set at 1%); it looks as if the Fed has roughly followed a Taylor Rule.

Money Supply Rule results:

When we apply the alternative policy of money supply targeting, we find rather different results. First of all, interest rates do not react to the commodity price shock because the demand for money is largely unaffected — the inflation rise more or less offset the drop in output. But secondly, interest rates inclusive of the credit crunch rise in

response to the credit crunch; official interest rates only partially offset the tightening from the rising risk premium. This is because demand for money growth falls but to increase it back up to the money supply growth target only a small cut in interest rates is required — reflecting quite a substantial interest rate demand response in line with the sort of interest elasticity usually found (we assume here 0.075).

Adding the two together we find that interest rates do rise over the whole episode but by quite a lot less than they have done in actual fact in the EU, and rather more than they have in the US.

Conclusions about monetary policy before Lehman

What we can say from these estimates is that on two rules that have been widely suggested for monetary policy, the verdict on US policy is that it has been about right on one approach (Taylor Rule) and a bit too loose on the other

(Money Supply target). Whereas in the EU policy has been too tight on both: very much too tight on the Taylor Rule, rather too tight on the Money Supply target.

The Taylor Rule is what most central banks say they are following and is also widely thought to be a good policy for containing inflation without unduly harsh effects on output. If we take this as our main guide it suggests that the US Fed got its approach to the Before Lehman episode about right while the ECB and the Bank of England, together with most other European central banks, has set policy quite a lot too tight.

The ECB could reply that it pays more attention to money supply. Even if that is the case, on this measure here it was still rather too tight. The same applied to the Bank of England and most other European central banks.

Where might this excessive tightness come from? It appears from statements by board members of these bodies that on the European side of the Atlantic there was concern about losing credibility in the face of rising ‘headline’ inflation whereas on the US side of the Atlantic credibility was felt to be safe because ‘core inflation’ was not affected by the commodity price shock.

Clearly assessing credibility requires another sort of model entirely — one that allows for political backlash against the regime of inflation targeting among other elements. But certainly in the context of such a severe credit shock, the US judgement seems to have been valid judging by events. Credibility has not been threatened because credit conditions have in effect been greatly tightened by the credit shock just as the commodity shock was hitting. In the US even the efforts of the Fed to offset the rise in credit costs failed to do so completely.

Our assessment here has assumed that these two monetary rules represent the best practices available, based on the views of central bankers and their advisers. It would be interesting to experiment with other monetary policy rules, both evaluating their properties in general and in the context of these shocks. That is something for further work.

After Lehman

What distinguishes the aftermath of the Lehman bankruptcy from this earlier drawn-out and ambiguous episode that went before is that the shock and the response were both huge and nearly simultaneous. So it seems as if the economy was beset by an irresistible force and an immovable object at more or less the same time.

However, it is plain on brief reflection that the two shocks are not on a par in terms of force. The Lehman bankruptcy was itself a decision of government (arguably a bad mistake but that does not concern us here), designed ironically to save the US taxpayer money from bailouts. Of course the crisis it caused led to far bigger bailout demands on that taxpayer.

What government caused it was doomed to remedy. What Lehman did was suck all taxpayers everywhere into that remedying process, as I have argued above providing credit in supplementation of the normal credit channels. Just as government had the power to cause the crisis, so it had the power to more than offset it.

Analysing the shock and counter-shock is therefore in my view to be seen as one negative shock followed by a larger positive shock with a short lag, say of about a quarter. The easiest way to understand the effects are to look at the effect of one such shock and examine the speed and shape of its effect.

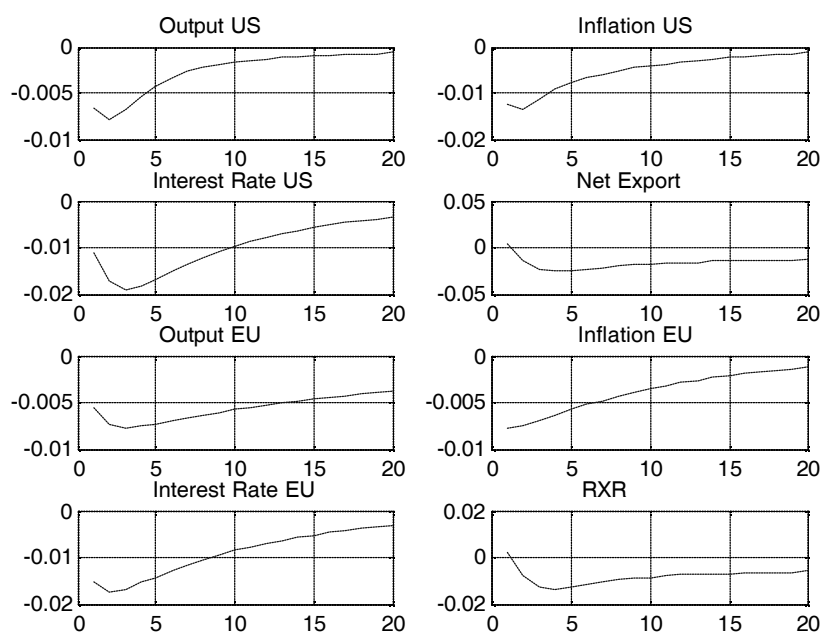
Before we do so we should consider the main alternative canvassed to the model we are using here. In our model there are no balance sheet effects; everything turns on incentives at the margin to take additional actions on consumption, investment, production and labour supply. These incentives come from prices and asset yields. Balance sheets only enter implicitly in the sense that there is a physical capital stock and it has a value which in turn affects investment; but its valuation is entirely forward-looking, based on prospects of future returns from future consumption, investment etc. and hence on incentives.

In the alternative model we have heard much about everything hangs on the state of balance sheets. It is said that with net assets of consumers and firms having been savaged by low asset prices, consumers and investors must necessarily retrench to ‘rebuild’ their net assets. This is said to be likely to take a long time, some people say decades. According to this model the world after Lehman could be headed for a long depression as balance sheets are rebuilt.

Yet in our model this is not the case at all; bygones are bygones. What determines spending is the prospect of return. To put it crudely if I was a billionaire, now down to my last few millions, I do not react by doing nothing and hoarding what I have got, in the hope of things getting better without my active intervention. Rather I look at new opportunities to restore my fortunes.

As we have seen earlier the model we are using is also one with a high degree of wage and price flexibility — recent wage figures have illustrated that idea, with private sector wages in the UK falling recently, as have recent price figures everywhere. So what with firms and households being forward-looking, responding to incentives, and operating in a marketplace with largely flexible wages and prices, it should not surprise us that it shows quite short lags in response to shocks. Below, in Figure 3, we show the effect of a worldwide banking crisis shock in a model that links the EU model above and a similar US model in a ‘world economy’ model (Le et al, 2009). It is calibrated to produce a fall in official interest rates similar to what we saw.

Figure 3: Deterministic Credit Crunch Shock to Both EU and US



Note: Horizontal Axis measures time since shock, marked in quarters of a year. Vertical axis measures change caused by shock relative to base value (per quarter in case of official interest rate and inflation)

What we see is that the peak effect comes quickly, by the second quarter. Also the monetary response comes rapidly, reinforcing the upswing.

Now in this particular crisis we can think of the full response as being more delayed than assumed here- if one includes all the fiscal support and the QE measures. This delay will have worsened the output effect shown here for illustration. However, it is hard to disentangle such details; it must be freely admitted that in such a crisis macro models can only grope for orders of magnitude, shapes of movement and possible speeds of convergence. The basic point, which may be all we can make here, is that the crisis according to this model would be likely to be over fairly quickly, as it induces offsetting action on a large scale, all in the context of rather short lags.

Making some sense of the whole episode — an attempt at an overall conclusion

I have argued that this crisis, for all the failures of regulation and incentives, has to be seen as one of a line of capitalist crises (that look like ‘bubbles’), in which bad news comes hard on the heels of a long period of good news. The resulting crash is worse when it involves the banking and financial system — as often is the case since these are sucked by long periods of expansion into large credit and asset positions.

I have also argued that as crisis it is likely soon to be over, because due to government action worsening it, governments everywhere were forced into a massive response.

However, this still leaves unclear what bad news it was that precipitated the end of the world expansion fed by the good news since 1992. As I argued above the main factor significant for the economy is productivity; this drives production, consumption and housing demand in particular, all symptoms of the underlying productivity success. It is not hard to see the huge exploitation of the computer as the engine of this long productivity miracle.

What brought this process to a shuddering halt during 2008? We saw during 2007 and 2008 a dramatic upsurge in commodity prices, especially oil. It began to become clear that with emerging market economies like China growing at up to 10 percent a year the demands for commodities would quickly outrun supplies. A similar thing had happened in the 1970s; but this triggered large-scale substitution away from the use of oil and other scarce raw materials so that by the 1990s commodity prices languished at nugatory levels and substitution slowed with them. But by the late 2000s this slowing substitution had been overtaken again by the massive growth in the decade and half from 1992. Productivity growth fuelled by the computer hit a wall of raw material shortage again. For it to

restart will require productivity growth in raw material technology — i.e. more substitution.

So in final conclusion it is not possible to see a return to the rapid growth rate of the world in the mid 2000s until productivity growth has spread to eliminate the new

scarcity of raw materials. While the crisis should be over soon, and indeed is probably already over, the immediate macro prospect is for a return to moderate growth in line with the restraint placed on productivity growth by current raw material shortage.

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