Lessons from the North Atlantic financial crisis*

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Revised

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Abstract

The paper studies the causes of the current financial crisis and the policy responses by central banks and regulators. It also considers proposals for the prevention or mitigation of future crises.

The crisis is the product of a 'perfect storm' bringing together a number of microeconomic/incentive pathologies, global macroeconomic developments and monetary policy errors. Among the microeconomic systemic failures were: wanton securitisation, fundamental flaws in the rating agencies' business model, the procyclical behaviour of leverage in much of the financial system, of mark-to-market valuation and accounting and of the Basel capital adequacy requirements, privately rational but socially inefficient disintermediation, and competitive international de-regulation. Reduced incentives for collecting and disseminating information about counterparty risk were a pervasive feature of the new financial world of securitisation and off-balance sheet vehicles. So was lack of transparency about who owned what and about who owed what and to whom. In many ways, the crisis can be seen as a failure of the transactions-oriented model of financial capitalism favoured in the US and the UK. Proximate local drivers of the specific way in which these problems first manifested themselves were regulatory and supervisory failure in the US home loan market.

The monetary policy errors that contributed to the crisis were excessive global liquidity creation by key central banks. Among the key global macroeconomic developments were an *ex-ante* global saving glut, brought about by the entry of a number of high-saving countries (notably China) into the global economy and the global redistribution of wealth and income towards commodity exporters that also had, at least in the short run, high propensities to save. Very low risk-free long-term real interest rates and unprecedently low credit risk spreads of all kinds together with the 'Great Moderation' – low and stable inflation and stable global GDP growth – prompted an increasingly frantic 'search for yield'.

In the UK, failures of the Tripartite financial stability arrangement between the Treasury, the Bank of England and the FSA, weaknesses in the Bank of England's liquidity management, regulatory failure of the FSA, an inadequate deposit insurance arrangement and deficient insolvency laws for the banking sector contributed to the financial disarray and the failure of a medium-sized home-loan bank, Northern Rock. In the US, the balkanised and incoherent structure of regulation of financial institutions and financial markets, even at the Federal level, meant that too many regulators are involved, none of which is actually in charge or responsible.

Despite this, because the excesses were confined mainly to the financial sector and (in the US and some European countries, the household sector), it should have been possible to limit the spillovers over from the crisis beyond the financial sector and the housing sector without macroeconomic heroics. Measures directly targeted at the liquidity crunch should have been sufficient. The macroeconomic response of the Fed to the crisis - 325 basis point worth of cuts between September 2007 and May 2008 and a 75 basis point cut in the discount window penalty – therefore seem excessive and create doubt about the Fed's commitment to price stability.

The liquidity-enhancing policies of the Fed and its bailout of the investment bank Bear Stearns were effective in dealing with the immediate crisis. They also were, quite

unnecessarily, structured so as to maximise future moral hazard by distorting private incentives in favour of excessively risky future borrowing and lending. The cuts in the discount rate penalty, the extraordinary arrangements for pricing the collateral offered to the Fed by the primary dealers through the TSLF and the PDCF, the proposals for bringing forward the payment of interest on bank reserves, the terms of the Bear Stearns bail out and the 'Greenspan-Bernanke put' rate cut on January 21/22, 2008 - 75 bps at an unscheduled meeting and out of normal hours - are most easily rationalised as excess sensitivity of the Fed to Wall Street concerns, reflecting (cognitive) regulatory capture of the Fed by Wall Street.

The macroeconomic stability records of the Bank of England and of the ECB have been superior to those of the Fed. After climbing a quite steep liquidity learning curve in the early months of the crisis, the Bank of England is now performing its lender of last resort and market maker of last resort roles more effectively. It would be desirable to have the information in the public domain that is required to determine whether the ECB (through the Eurosystem) and the Bank of England are pricing illiquid collateral appropriately. There is reason for concern that the ECB may be accepting collateral in repos and at its discount window at inflated valuations, thus joining the Fed in boosting future moral hazard through the present encouragement of adverse selection.

The Fed, unlike the ECB and the Bank of England, is also a banking sector regulator and supervisor. This gives it an informational advantage. The downside to the Fed's position is the risk of regulatory capture. I believe that what I call 'cognitive regulatory capture' of the Fed by Wall Street has occurred during the past two decades. The net result is that both as regards macroeconomic stability and as regards future financial stability, the Fed has performed worse during this crisis than the ECB and the Bank of England.

Future regulation will have to be base on size and leverage of institutions. It will have to be universal (applying to all leveraged institutions above a certain size), uniform, countercyclical and global.

Financial crises will always be with us.

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Introduction

The financial crisis that erupted on August 9, 2007 and spread throughout the advanced market economies (but not, as yet, to the emerging markets), was created by a 'perfect storm' bringing together a number of financial sector microeconomic or incentive pathologies, unprecedented global macroeconomic developments and macroeconomic (mainly monetary) policy errors. This systemic crisis has shaken confidence in the key rules and institutions expected to sustain financial stability; it has shattered the faith of many in the applicability to the financial sector of free market logic and self-regulation. The triumphant progress of the transactions-oriented/arm's-length-principle-based/market-mediated model of financial capitalism has been rudely interrupted. This is all the more remarkable because the crisis, like the financial excesses that preceded it, originated in the most sophisticated financial centres of the world, Wall Street and the City of London, rather than in emerging markets or developing countries with underdeveloped financial markets, regulation and supervision.

Among the microeconomic systemic failures that caused the crisis were: (1) wanton securitisation – a dramatic illustration of the consequences of excessive reliance on the transactions-oriented model of financial capitalism; (2) fundamental flaws in the rating agencies' business model; (3) the procyclical behaviour of leverage in a mark-to-market world (see Adrian and Shin (2007a,b) and of the Basel capital adequacy requirements; (4) financial sector reward structures that encourage excessive risk taking; (5) privately rational but socially inefficient disintermediation, driven mainly by regulatory arbitrage and avoidance, and (6) competitive international de-regulation. Proximate local drivers of the specific way in which these problems first manifested themselves were regulatory and supervisory failure in the US home loan market, especially in its sub-prime segment.

In the UK, the financial stability problems were aggravated by a flawed Tripartite Arrangement between the Treasury, the Bank of England and the Financial Services Authority (FSA, the regulator of financial markets and much of the financial sector) for dealing with financial crises and by supervisory failure by the FSA. The regulator focused almost exclusively on capital adequacy and solvency, left funding liquidity to the Bank of England (which did not have any individual institution-specific information), and never thought about market liquidity.

In the US, the financial stability problems were aggravated by the chaotic and balkanised structure of regulation of banks, near-banks and financial markets. At the Federal level commercial banks are subject to supervision by the Federal Deposit Insurance Corporation, the Federal Reserve Board and the Office of the Comptroller of the Currency; other depositary institutions are supervised at the Federal level by the Office of Thrift Supervision and the National Credit Union Administration. Investment banks fall under the Securities and Exchange Commission (SEC), although this agency may be edged out soon in that role by the Fed. Financial markets are supervised by the SEC or by the Commodity Futures Trading Commission. Insurance, which played a key role in the crisis through the credit risk insurance industry, is not supervised at the Federal level at all. Things are so bad, it is surprising they are not worse.

In the Euro Area as in the UK, the absence of any supervisory and regulatory role for the central bank vis-à-vis the banking system resulted in a paucity of information in the central banks about the financial circumstances of individual banks and other systemically important financial institutions. In the US, the Fed, as one of the regulators of the banking system, did

have better access to institution-specific information, but had fallen victim to regulatory capture by Wall Street.

Among the macroeconomic developments and policy errors that contributed to the crisis were the following:

1. An *ex-ante* global saving glut, brought about by the entry of a number of high-saving countries (notably China) into the global economy and by a global redistribution of wealth and income towards commodity exporters (notably the Gulf States) that had, at least in the short run, higher marginal propensities to save than the losers from the global increase in relative commodity prices. This major terms of trade shock was itself the result of the unleashing of the BRICs on the global economy.[1] This contributed to low long-term risk-free real interest rates, despite the high expected rate of return to physical capital formation in much of the world.
2. A strong preference, until very recently, among the nouveaux riches (including emerging market central banks and sovereign wealth funds) for safe financial assets and a limited supply of high quality financial assets ((Caballero (2006)). This further contributed to low long-term risk-free real interest rates.
3. Excessive liquidity creation by the Fed, the Bank of Japan and (to a lesser extent) the ECB, reinforced by the desire of many new industrialising and oil and gas exporting countries to limit the appreciation of their currencies vis-à-vis the US dollar. The behaviour of these central banks may be in part rationalised as a response to or pre-emptive strike against the Keynesian effective demand weaknesses that many feared would resulted from the *ex-ante* saving glut. It contributed to a global compression of credit risk premia to unprecedentedly low levels.

Excessively lax monetary policy contributed to the financial incontinence that culminated in the current crisis. Very rapid growth of the broad monetary and credit aggregates could (and should) have been a warning sign that a financial bubble might be brewing. It was not considered worrying, probably because on the other side of these transactions were not primarily non-financial corporations and households but rather other, non-deposit-taking financial institutions. Leverage increased steadily in the financial sector (especially outside the commercial banks) and in the household sector. This was interpreted as financial deepening and further productivity and efficiency-enhancing financial sector development, rather than as a financial sector/household sector Ponzi game in which the expectations of future capital gains drove current capital values and made true earnings a side show.

There is a useful economic rule of thumb which says that a society cannot get rich if its people just shine each others' shoes (take in each others' laundry). Increasingly, however, the vast paper profits of the financial sector were made through transactions within the financial sector, rather than from transactions with ultimate savers and investors – households and non-financial corporates. These (often unrealised) capital gains in the financial sector and on residential housing induced rather little spending on currently produced goods and services and therefore caused little or no overheating and inflation outside the asset markets. The private financial sector grew massively, not just in terms of balance sheet size, but also as regards employment, earnings, profits and contributions to the tax revenues. Residential construction boomed in a number of countries, including the US, Spain, Ireland, the Netherlands and the UK, but not at all in others (Germany).

1 BRICs is an acronym for Brazil, Russia, India and China, coined by Jim O'Neill of Goldman Sachs.

The same monetary policy error which fed the bubble that led to the crisis - excessively lax monetary policy - has been repeated by the Fed throughout the crisis. It is likely that this persistent policy error by the Fed is at least in part caused by two fundamental flaws in its model of the transmission mechanism of monetary policy: (1) the Fed's inappropriate focus on core inflation rather than on medium-term and long-term headline inflation and (2) its overestimation of the effect of housing wealth on consumer demand.

Neither of the two other central banks I shall consider in some detail, the ECB and the Bank of England, had comparable deficiencies in their understanding of the monetary transmission mechanism. As regards maintaining financial stability, the Bank of England made a poor start by effectively denying the existence of a serious liquidity crisis and insisting that this was past reckless borrowing and lending chickens coming home to roost in the form of higher default risk premia. It was a rather quick learner, however. By December 2007, the Bank of England was addressing liquidity needs quite effectively, and by April 2008 it had become a quite aggressive market maker of last resort.

The positive side of the Bank of England's reluctance to come to the rescue of the banking system was its keen awareness of the dangers of moral hazard and adverse selection. As a result, even the very large-scale Special Lending Facility created by the Bank of England in April 2008 appears to have avoided the egregious future-moral-hazard-through-present-adverse-selection-features of the new facilities created for the primary dealers by the Fed. However, even in the UK and in the Euro Area there remains one crucial feature of the enhanced credit facilities that have been put in place – the actual pricing of specific illiquid collateral – where the information is still not in the public domain..

The ECB, like the Bank of England, has pursued macroeconomic policies consistent with its mandate since the crisis began. It has provided liquidity in large quantities at the maturities the market wanted and needed it.

At the time this paper is being written – late May 2008 – the worst of the liquidity crisis appears behind us. Credit default swap spreads have come down everywhere. Interbank rates have come down a little but remain high relative to expected official policy rates over the relevant horizons. The significance of the unsecured interbank markets in the financial system of the future is likely to be seriously diminished, however. There are tentative signs of life in some of the asset-backed securities markets. Corporate bond issuance by non-financial corporates never froze like the issuance of structured securities and is seeing quite an upturn.

As the extraordinary North Atlantic liquidity crunch is diminishing gradually, however, much of the advanced industrial world is entering a conventional cyclical downturn. In the US and to some extent in the UK, this downturn is in part the result of the liquidity squeeze, but this does not appear to be the case to anything like the same degree in the Euro Area. The BRICs and other emerging markets continue to grow quite strongly, although they are undoubtedly feeling the effects of the slowdown in US import growth and of the tighter credit conditions in the North Atlantic area. In addition, most emerging markets have got themselves into quite serious inflationary trouble and will have to engage in monetary and fiscal tightening to regain macroeconomic control. This will hurt economic growth in the short run. Even a conventional cyclical downturn will cause further financial distress, so the revival of the financial sector in the US and Western Europe is likely to be still some time away.

1. The Microeconomic Pathologies of Modern Finance

1A. Securitisation

Origins

Historically, financial intermediation and financial regulation can be best understood through the ideal type of the relationships-oriented model of financial capitalism (ROM). In the ROM, banks borrowed short and lent long – they engaged in maturity transformation. Although a longer maturity does not automatically imply a lower degree of liquidity – there are highly liquid markets for certain long-maturity/duration financial assets – in practice the longer-maturity assets of the banks were also illiquid and non-marketable or non-tradable.

The funding side of the ROM bank also typically did not involve tradable instruments. On the liability side of the banks' balance sheets, deposits withdrawable on demand and subject to a sequential service (first come, first served) constraint figured prominently. The banks therefore faced the problem of *funding liquidity*. Funding liquidity is a property of economic agents and institutions. It measures the ease with which an economic entity can attract external of funds – as measured by the speed, reliability and terms (price, collateral etc.) on which such funds are available. On the asset side, loans, secured or unsecured, to businesses and households were the major entry. These loans were typically held to maturity by the banks (the 'originate to hold' model). Banks therefore transformed and extended maturity and created liquidity. Such a combination of assets and liabilities is inherently vulnerable to bank runs by deposit holders.

Banks were deemed to be systemically important, because their deposits were a key part of the payment mechanism for households and non-financial corporations and because they played a central role in the clearing and settlement of large-scale transactions and of securities. To avoid systemically costly failures by banks that were solvent but had encountered funding liquidity problems, the authorities implemented a number of measures to protect and assist banks. Deposit insurance was commonly introduced, paid for either by the banking industry collectively or by the state. Standstill's (the temporary freezing of creditors', including depositors' claims) were not uncommon. In addition, central banks provided lender-of-last resort (LLR) facilities to individual deposit-taking institutions that had trouble financing themselves.

In return for this assistance and protection, banks accepted regulation and supervision. This took the form of minimum capital requirements, minimum liquidity requirements, other prudential restrictions on what banks could hold on either side of their balance sheet, as well as reporting, transparency and accounting obligations (including mark-to-market accounting).

The ROM encourages long-term relationships between lenders and borrowers. This makes long-term commitments easier. It also reduces flexibility, because there are few attractive outside options to the established relationship. Competition is muted. It tends to discourage innovation and entry by outsiders. At worst, it degenerates into cronyism.

In the 1970s, Fannie Mae (Federal National Mortgage Association), Ginnie Mae (Government National Mortgage Association) and Freddie Mac (Federal Home Loan Mortgage Corporation) began the process of securitisation of residential mortgages. Asset

securitisation involves the sale of income generating financial assets (such as mortgages, car loans, trade receivables (including credit card receivables) and leases) by a company (the originator of the financial assets) to a special purpose vehicle (SPV). The SPV, which might be a trust or a company, finances the purchase of these assets by the issue of bonds, which are secured by those assets. The SPV is supposed to be bankruptcy-remote from the originator, that is, it has to be an off-balance sheet entity vis-à-vis the originator. Cash-flow securitisation works in a similar way, as when the UK government agreed to create the International Finance Facility which is supposed to securitise future development aid commitments.

Private institutions, especially banks, immediately took advantage of these securitisation techniques to liquefy their illiquid loan assets. The resulting 'originate to distribute' model had major attractions for the banks and also permitted a potential improvement in the efficiency of the economy-wide mechanisms for intermediation and risk sharing. It made marketable the non-marketable; it made liquid the illiquid. There was greater scope for trading risk, for diversification and for hedging risk.

Securitisation generally involves the 'tranching' of the securities issued against a given pool of underlying assets or cash flows. The higher tranche has priority (seniority) over the lower tranches. This permits the highest tranche secured against a pool of high-risk mortgages, say, to achieve a much better credit rating than the average of the assets backing all the tranches together (the lower tranches, of course, have a correspondingly lower credit rating). In addition, various 'enhancements' are frequently packaged with the securities. A common example is insurance against default risk, which was obtained from specialised financial institutions, called 'monolines ' that had sprung into being to enhance the creditworthiness (and credit ratings) of securities issued by US municipalities.

Securitisation is but one expression of the alternative ideal type of financial intermediation: the transactions-oriented model of financial capitalism (TOM). Under TOM, arms-length relationships, effected through impersonal market exchange, replace the longer-term, bilateral (sometimes multilateral) relationships between banks and borrowers. Capital markets price tradable financial instruments. The TOM provides flexibility and encourages risk sharing through risk trading. Because of its reliance on anonymous, arms-length transactions, it does not support commitment well without external or third-party enforcement.

With the TOM, market liquidity problems take the place of funding liquidity problems under the ROM. Financial markets function because of trust and confidence in the ability and willingness of the counterparties to live up to their contractual obligations. Financial instruments are promises to pay. What they are worth now, or even whether anyone will buy them now at any positive price, depends on (a) the confidence potential buyers have in the willingness and ability of the issuer of the instrument to honour his promises and (b) the anticipated future availability of other potential buyers, should the current (potential) buyers want to sell the security at a future date, (c) the current and likely future transactions costs involved and (d) the current and likely future deviations between the price that is realised and the fundamental value of the asset.

The consequences of market illiquidity can be as fatal for solvent institutions as those of funding illiquidity. Since liquidity has public goods properties (although it can be provided,

albeit inefficiently by the private sector), a provider of market liquidity of last resort or market maker of last resort (MMLR) is required to make the TOM efficient *and* safe.2

As the only source of unquestioned domestic currency liquidity, the central bank is the natural market maker of last resort to deal with market liquidity crisis as well as the natural lender of last resort to deal with funding liquidity crises.

Real-world financial systems are all convex combinations of the ROM and the TOM. A major contributor to the current crisis has been the excessive dominance achieved by the TOM relative to the ROM. The degree to which the TOM model became dominant was greatest in the US, followed by the UK, the Euro Area, Japan and most emerging markets. The degree of damage caused by the crisis (relative to the size of the economy involved) will in all likelihood follow the same rank order.

Problems

There are three problems associated with securitisation (and the generally associated creation of off-balance sheet vehicles).

1. The greater opportunities for risk trading created by securitisation not only make it possible to hedge risk better (that is, to cover open positions); they also permit investors to seek out and take on additional risk, to further 'unhedge' risk and to create open positions not achievable before. When risk-trading opportunities are enhanced through the creation of new instruments or new institutions, and when new populations of potential investors enter the risk-trading markets, we can only be sure that the risk will end up with those most *willing* to bear it. There can be no guarantee that risk will end up being borne by those most *able* to bear it.
2. The 'originate to distribute' model destroys information compared to the 'originate to hold' model. The information destruction occurs at the level of the originator of the assets that are to be securitized. Under the 'originate to hold' model the loan officer collecting the information on the creditworthiness of the would-be borrower is working for the Principal in the investing relationship (the originating bank or non-bank lending institution). Under the 'originate to distribute' model, the loan officer of the originating banks works for an institution (the originating bank) that is an Agent for the new Principal in the investing relationship (the SPV that purchases the loans from the bank and issues securities against them). With asymmetric information and costly monitoring, the agency relationship dilutes the incentive for information gathering at the origination stage. Reputation considerations will mitigate this problem, but will not eliminate it.
3. Securitisation also puts information in the wrong place. Whatever information is collected by the loan originator about the collateral value of the underlying assets and the credit worthiness of the ultimate borrower, remains with the originator and is not effectively transmitted to the SPV, let alone to the subsequent buyers of the securities issued by the SPV that are backed by these assets. By the time a hedge fund owned by a French commercial bank sells ABSs (asset backed securities) backed by US sub-prime residential mortgages to a conduit owned by a small German Bank specialising in lending to small

2 Market liquidity is subject to an intertemporal network externality': my willingness to buy a security from you today (when I am not illiquid) depends on my assessment of the likelihood that (a) I will be illiquid next period and (b) I will be able to find a willing buyer for the security I am contemplating buying from you today. So fear of future liquidity can create current illiquidity. My willingness to buy today depends on my perception of your willingness to buy tomorrow.

and medium-sized German firms, neither the buyer nor the seller of the ABS has any idea as to what is really backing the securities that are being traded.

4. Finally, there appears to be genuine irrationality afoot in the markets during periods of euphoria. Even non-diversifiable risk that is traded away is treated as though it no longer exists. The fact that someone else now holds and owns the risk is forgotten. This 'black hole' theory of risk trading may have grown out of the correct observation, that new instruments (credit default swaps, for instance) and new institutions (hedge funds) made possible the entry of whole new populations of investors into the markets for risk trading. This could indeed cause the market price of risk to fall. To conclude from that, during a period of global macroeconomic moderation and stability, that the fundamental price of risk has gone to zero is but a small step for a man.

Partial solutions

The problems created by securitisation can be mitigated in a number of ways. Securitisation is commoditisation. The key point is to give practical expression to the fact that only relative simple, standardised things can be commoditised well. Securitisation makes sense only for underlying assets or cash flows that are reasonably homogeneous, not too complex and not too affected by asymmetric information problems.

Simpler structures. The financial engineering that went into some of the complex securitised structures issued in the last few years before the ABS markets blew up on August 9, 2007, at times became ludicrously complex. Simple securitisation involves the pooling of reasonably homogeneous assets, say, residential mortgages issued during a given period with a given risk profile (e.g. sub-prime, alt-A or prime). These were pooled and securities issued against them were tranched. However, second-tier and higher-tier-securitisation then took place, with tranches of securitised mortgages being pooled with securitised credit-card receivables, car loan receivables etc. and tranched securities being issued against this new, heterogeneous pool of securitised assets. Myriad credit enhancements were added. In the end, it is doubtful that even the designers and sellers of these compounded, multi-tiered securitised assets knew what they were selling, knew its risk properties or knew how to price it. Certainly the buyers did not.

There is an obvious solution: simpler structures. This will in part be market-driven, but regulators too may put bounds on the complexity of instruments that can be issued or held by various regulated entities. Central banks could accept as collateral in repos or at the discount window only reasonably transparent classes of ABS.

Unpicking' securitisation. This 'solution' is the ultimate admission of defeat in the securitisation process. A number of American banks with residential mortgage-backed securities (RMBS) on their balance sheets have been scouring the entrails of the asset pools backing these securities and have sent staff to specific addresses to assess and value the individual residential properties. This inversion of the securitisation matrix is, of course, very costly and means that the benefits from risk pooling will tend to be ignored. It is an ignominious end for the securitisations involved.

Retention of equity tranche by originator. When the originator of the loans is far removed from the ultimate investor in the securities backed by these loans, the incentives for careful origination and for subsequent thorough monitoring of the borrower over the life of the loan, are weakened. One way to mitigate this problem is for the originator to retain the 'equity

tranche' of securitised and tranched issues. The equity tranche or 'first-loss tranche' is the highest-risk tranche – the first port of call when the servicing of the loans in the pool backing the securities is impaired. It could be made a regulatory requirement for the originator of residential mortgages, car loans etc. to retain the equity tranche of the securitised loans. Alternatively, the ownership of the equity tranche could be required to be made public information, permitting the market to draw its own conclusions.

External ratings. The information gap could be closed or at least reduced by using external rating agencies to provide an assessment of the creditworthiness of the securitised assets. This has been used widely in the area of RMBS and of ABS. This 'solution' to the information problem, however, brought with it a whole slew of new problems.

1B. Rating agencies

A small number of internationally recognised rating agencies (really no more than three: Standard & Poor's, Moody's and Fitch) account for most of the rating of complex financial instruments, including ABS. They got into this business after for many years focusing mainly on the rating of sovereign debt instruments and of large private corporates. They were given a formal regulatory role in the Basel process, (which was greatly enhanced under the Basel II Capital Adequacy regime) because their ratings determine the risk weighting of a whole range of assets bank hold on their balance sheets.

Their role raises a number of important issues..

Problems

What do *they* know? This is a basic but important question. One can imagine that, after many years, perhaps decades, of experience, a rating agency would become expert at rating a limited number of sovereign debtors and large private corporates. In the case of complex structured financial instruments, how would the rating agency familiarise itself with information available only to the originators of the underlying loans or other assets and to the ultimate borrowers?

How would the rating agency, even if it knew as much about the underlying assets as the originators/ultimate borrowers, rate the complex structures created by pooling heterogeneous underlying asset classes, slicing and dicing the pool, tranching and enhancing the payment streams and making the ultimate pay-offs complex, non-linear functions of the underlying income streams? These ratings were overwhelmingly model-based. The models used tended to be the models of the designers and sellers of the complex structures, who work for the issuers of the instruments. The potential for conflict of interest in the design and use of these models is obvious. In addition, even honest models tend to be useless during periods of disorderly markets, because we have too few observations on disorderly markets to construct reasonable empirical estimates of the risks involved. Tail risks are impossible to quantify if you haven't had any sightings of the tail.

The suspicion that the rating agencies don't know more than the rest of the market and at times may know less than the markets about the products they are rating, is confirmed by the revelation earlier in May 2008, that a model used by Moody's, starting in September 2006, to rate Constant Proportion Debt Obligations (CPDO) contained a bug (a computer code error) which resulted in excessive ratings for some CPDO issues. Without the bug, some issues

rated Triple-A could have been rated up to four notches lower.[3] Moody's became aware of the error early in 2007, but the CPDO issues affected were not downgraded until 2008. Standard and Poor's also rated some of the early CPDO issues triple A. Fitch never did.

They only rate default risk. Rating agencies provide estimates of default risk (the probability of default and the expected loss conditional on a default occurring). Even if default risk is absent, market risk or price risk can be abundant. Liquidity risk is one source of price risk. As long as the liquidity risk does not mutate into insolvency risk, the liquidity risk is not reflected in the ratings provided by the rating agencies. The fact that many 'consumers' of credit ratings misunderstood the narrow scope of these ratings is not the fault of the rating agencies, but it does point to a problem that needs to be addressed. First, there has to be an education campaign to make investors aware of what the ratings mean and don't mean. Second, the merits of offering (and requiring) a separate rating for, say, liquidity risk should be evaluated.

They are conflicted. Rating agencies are subject to multiple potential conflicts of interest.

a. They are the only example of an industry where the appraiser is paid by the seller rather than the buyer, even though the buyer is likely to have the greatest information deficiency.

b. They are multi-product firms that sell advisory and consulting services to the same clients to whom they sell ratings. This can include selling advice to a client on how to structure a security so as to obtain the best rating and subsequently rating the security designed according to these specifications.

c. The complexity of some of the structured finance products they are asked to evaluate makes it inevitable that the rating agencies will have to work closely with the designers of the structured products. The models used to evaluate default risk will tend to be the models designed by the clients. This is not just the problem that 'marking-to-model' can become 'marking-to-myth' or 'garbage in, garbage out'. There is the further problem that the myth will tend to be slanted towards the interest of the seller of the securities to be rated.

Partial solutions

There is no obvious solution other than 'try harder and don't pretend to know more than you know' for the first problem – 'what do *they* know?'. The second problem requires better education of the investing public. The potential conflict of interest problem can be mitigated in a number of ways.

1. Reputational concerns. Reputation is a key asset of rating agencies. That, plus the fear of law suits will mitigate the conflict of interest problem. The fundamental agency problem cannot be eliminated this way, however. Even if the rating agencies expect to be around for a long time (a necessary condition for reputation to act as a constraint on opportunistic and

3 A CPDO is a debt-issuing special-purpose vehicle. It invests the majority of the funds it attracts from the holders of its debt instruments in a cash reserve account of liquid, high-quality assets. With the rest it makes a leveraged synthetic investment in an index of debt securities, such as the iTraxx and CDX credit default swap indices. I paraphrase this wisdom from Lucas et. al. (2007). The summary of this article states: the authors *:" … conclude the article by showing the resiliency of one particular CPDO structure via scenario analysis. Their analysis demonstrates that, in keeping with its AAA ratings, it takes extreme conditions to cause a loss in this particular CPDO deal."* That must have been a different structure from those rated and re-rated by Moody's then.

inappropriate behaviour), individual employees of rating agencies can be here today, gone tomorrow. A person's reputation follows him/her but imperfectly. Reputational considerations are therefore not a fully effective shield against conflict of interest materialising.

2. Remove the quasi-regulatory role of the rating agencies in Basel II and elsewhere. Just as the public provision of private goods tends to be bad news, so the private provision of public goods leaves much to be desired ('the best judges money can buy etc.'). The official regulatory function of private credit risk ratings in Basel II should be de-emphasized and preferably ended altogether.

I may get my wish here, because Basel II appears fatally holed below the waterline in a number of ways. It was long recognised to have unfavourable macroeconomic stabilisation properties, because the capital adequacy requirements are likely to be pro-cyclical (see Borio, Furfine and Lowe (2001), Gordy and Howells (2004) and Kashyap and Stein (2004)). On top of this, the recent financial turmoil showed that the two key inputs into Pillar 1, the ratings provided by the rating agencies and the internal risk models of the banks, are deeply flawed.

As regards internal risk models, there are two problems. The first is the unavoidable 'garbage in – garbage out' problem referred to earlier, which makes any quantitative model based on parameters estimated or calibrated using past observations useless during times of crisis, when every crisis is quintessentially different in some key respect. We have really only had one instance of a global freeze-up of ABS markets, impairment of wholesale markets and seizure of leading interbank markets simultaneously in the US, the Eurozone and the UK – the present one. Estimates based on a size 1 sample are unlikely to be useful.

Second, the use of internal models is inherently conflicted. The builders, maintainers and users of these models are perceived by the operational departments of the bank as a constraint on doing profitable business. They will be under relentless pressure to massage their models to produce the results desired by the bank's profit centres. They cannot be shielded effectively from such pressures. Chinese walls inside financial corporations are about as effective in preventing the movement of purposeful messages across them, as the original Great Wall of China was in keeping the barbarians out and the Han Chinese in – that is, utterly ineffective.

Make rating agencies one-product firms. The potential for conflict of interest when a rating agency sells consultancy and advisory services is inescapable and unacceptable. Even the sale of other products and services that are not inherently conflicted with the rating process is undesirable, because there is an incentive to bias ratings in exchange for more business in functionally unrelated areas. The obvious solution is to require any firm offering rating services to provide just that. Having single-product rating agencies should also lower the barriers to entry.

End payment by the issuer. Payment by the buyer (the investors) is desirable but subject to a 'collective action' or 'free rider' problem. One solution would be to have the ratings paid for by a representative body for the (corporate) investor side of the market. This could be financed through a levy on the firms in the industry. Paying the levy could be made mandatory for all firms in a regulated industry. Conceivably, the security issuers could also be asked to contribute, but just to the pool out of which rating fees are paid; this would be joint payment of the rating agency by both sides of the security markets, but not for the rating

of specific products or instruments. Conflict of interest is avoided as long as no individual issuer (or indeed purchaser) pays for the rating of the security he issues (purchases). This would leave some free rider problems, but should permit a less perversely incentivised rating process to get off the ground. I don't think it would be necessary (or even make sense) to socialise the rating process, say by creating a state-financed (or even industry-financed) body with official and exclusive powers to provide the ratings.

Increase competition in the rating industry. Competition in the rating process is desirable. The current triopoly is unlikely to be optimal. Entry should be easier when rating agencies become single-product firms, although establishing a reputation will inevitably take time.

1C. The procyclical behaviour of leverage and of the Basel capital adequacy criteria

As documented extensively in a number of contributions by Adrian and Shin (2007a,b), leverage is strongly procyclical for financial intermediaries that operate mainly through the capital markets. This includes securities brokers and dealers, hedge funds and investment banks but not commercial banks. When assets are marked-to-market, as regulators increasingly require them to be, increases in asset prices therefore tend to be associated with rising leverage and falling asset prices with declining leverage. If financial intermediaries were passive and did not adjust their balance sheets in response to changes in net worth caused by changes in the prices of the assets they hold, leverage would be countercyclical as a matter of arithmetic.[4] Instead, more debt is issued (or equity repurchased) which more that offsets the 'passive' leverage-decreasing effect of capital gains. Higher leverage will thus put upward pressure on asset prices, creating a positive feedback loop. The response of the intermediaries to asset price-changes is therefore systemically destabilising.

Adrian and Shin also document the procyclical behaviour of the value at risk (VAR) to equity ratio. A possible explanation of the procyclical nature of leverage, given by Adrian and Shin, is that financial intermediaries target some reasonably stable value at risk to equity ratio, which induces them to increase leverage when value at risk falls because of rising asset prices. This, however, only restates the puzzle; it does not solve it.

This pattern of procyclical leverage is reinforced through the Basel capital adequacy requirements. Banks have to hold a certain minimal fraction of their risk-weighted assets as capital. Credit ratings are procyclical. Consequently, a given amount of capital can support a larger stock of assets when the economy is booming then when it is slumping. This further reinforces the procyclical behaviour of leverage.

Partial solutions

There is no convincing explanation as to why financial intermediaries might target their value at risk to equity ratio (the 1996 Market Risk Amendment of the Basel capital accord only prescribes a lower floor for the regulatory capital of banks relative to value at risk[5]). Nor do we have much insight about the drivers of leverage for banks and non-bank financial

4 Let A be the market value of assets, D debt and E the value of equity or net worth. $A = D + E$. When the value of assets rises as a result of capital gains and debt is kept constant, E rises one-for-one with A and D/E falls.

5 Regulatory capital should not be less than three times the 10-day, 99 percent value at risk.

intermediaries. It is, however, interesting that there is no procyclical (or countercyclical) behaviour of commercial bank leverage. If the procyclical behaviour of leverage is deemed a problem, bringing commercial bank regulatory practices to bear on other banks and non-bank financial institutions may deserve consideration.

The procyclical effect of the Basel capital requirements has been well-documented (see Kashyap and Stein (2003)). This undesirable feature (and the more recent doubts about the quality of the rating process itself) should lead to an immediate re-opening and rethinking of Basel II. It is rather disappointing having to go back to the drawing board of capital adequacy just as Basel II is formally introduced, but in view of its manifest flaws, there is no other choice.

1D. Excessive disintermediation

There are no doubt solid economic efficiency reasons for taking certain financial activities out of commercial banks (and even out of investment banks), and putting them in special purpose vehicles (SPVs), Structured Investment Vehicles (SIVs, that is, SPVs investing in long-term, often illiquid complex securitised financial instruments and funding themselves in the short-term wholesale markets, including the asset-backed commercial paper (ABCP) markets), Conduits (SIVs closely tied to a particular bank) and a host of other off-balance-sheet and off-budget vehicles. Incentives for efficient performance of certain tasks, including appropriate risk management, can, in principle, be aligned better in a suitably designed SPV than in a general-purpose commercial bank. The problem is that it is very difficult to come up with any real-world examples of off-balance sheet vehicles that actually appear to make sense on efficiency grounds.

Most of the off-balance sheet vehicles (OBSVs) I am familiar with are motivated primarily by regulatory arbitrage, that is, by the desire to avoid the regulatory requirements imposed on banks and other deposit-taking institutions. These include minimal capital requirements, liquidity requirements, other prudential constraints on permissible liabilities and assets, reporting requirements and governance requirements. Others are created for tax efficiency (i.e. tax avoidance) reasons or to address the hunger of governments and other public authorities for off-budget and off-balance sheet finance. This is invariably motivated by the , desire of governments to get around public deficit or debt limits.

OBSVs tend to have little or no capital, little or no transparency and opaque governance. When opaque institutions then invest in obscure, complex financial instruments like the ABS discussed earlier, systemic risk is increased. This is reinforced by the fact that much *de-jure* or *de-facto* exposure remains for the banks that have spun off the off-balance-sheet vehicles (the 'sponsoring' banks) to these vehicles. There exists *de jure* exposure when the bank is a shareholder or creditor of the OBSV, when the OBSV has an undrawn credit line with the bank or when the bank guarantees some of the OBSV's liabilities. *De-facto* exposure exists when, for reputational reasons, it is problematic for the bank to let an OBSV that is closely identified with the bank go under.

Banks in many cases appear not to have been fully aware of the nature and extent of their continued exposure to the OBSVs and the ABS they carried on their balance sheets. Indeed the explosion of new instruments and new financial institutions so expanded the populations of issuers, investors and securities, that many market participants believed that risk could not only be traded and shared more widely and in new ways, but that risk had actually been

eliminated from the system altogether - the 'black hole' theory of risk trading referred to earlier. But all non-diversifiable risk sold by someone is bought by someone else. In the risk-trading frenzy that preceded the crisis, it often ended up with those most willing but not most able to bear it.

Partial solutions

Mitigation of the problems created by excessive disintermediation will be partly market-driven and partly regulatory.

Re-intermediation. Either Conduits, SIVS and other OBSVs are taken back on balance sheet by their sponsoring banks, or the ABS and other illiquid securities on their balance sheets are sold to the banks. The OBSVs then either wither away or vegetate at a low level of activity.

Regulation. We can anticipate a regulatory response to the problem of obscure, incomprehensible instruments held by opaque OBSVs. This response will take the form of reporting requirements, and consolidation of accounts requirements that are driven by broad principles ('duck tests'), with constant adaptation of specific rules addressing particular institutions and instruments. For instance, if the Single Master Liquidity Enhancement Conduit (M-LEC) or Superfund proposed by JPMorgan Chase, Bank of America and Citigroup, with the active verbal support of the US Treasury, had over got off the ground (it died a quiet death instead), it is questionable whether the US regulators would have permitted the participating banks to keep it off-balance-sheet for reporting purposes, including earnings reports.

This would not of course, solve the problem that M-LEC, had it gone forward, could have been too successful in preventing sales of distressed illiquid assets held by various OBSVs at rock-bottom prices. There would have been a material risk that the participating banks would have used M-LEC to buy each other's bad assets at sweetheart prices. They would thus have been able to postpone further the marking to market of these assets at realistic values. This would have meant systemically costly further delays in the resolution of the paralyzing uncertainty about who has lost how much through what exposure.

With M-LEC dead in the water, the Fed created the Term Securities Lending Facility and the Primary Dealer Credit Facility, discussed below. The pricing of the collateral offered by the primary dealers to the Fed through these facilities is wide open to abuse. The implicit or quasi-fiscal subsidies to the primary dealers these facilities permit/encourage may well turn out to be even more helpful to the banking community in the US than M-LEC could ever have been.

1E. Excessive and myopic bonuses

Many commentators have commented on the size of bonuses in the financial sector, especially in the banking and 'shadow banking' sector (the heterogeneous collection of highly leveraged institutions including commercial banks, investment banks, hedge funds etc.), and on the perverse incentives towards excessive risk taking created by the myopic/memoryless nature of many of these bonuses – they are often driven by short-term unrealised capital gains, without much if any linkage to the contribution of the beneficiary to the long-term profit performance of the firm.

Some of the asymmetry in the pay-off functions of the financial superstars is inherent in the asymmetry of certain key institutions of a modern market economy. This includes limited liability and 'free labour', that is, the fact that labour contracts are binding only on the employer, not on the worker who always has the possibility to exit from the arrangement. Negative bonuses, which would at times be highly appropriate, are therefore not possible, unless they are compensated for by the confident expectation of even higher future positive bonuses. The employee about to be given a negative bonus would simply leave. Employers cannot impose taxes!

Partial solutions

- **Governance:** the bonus problem is first and foremost a corporate governance problems. If the bonuses are excessive, the shareholders lose out. Further reform of corporate governance may well be desirable, but this tends to be a long, slow process, not a quick fix. The agency problems and other informational problems are so serious, that even the best feasible solution may well still be a poor one.
- **Regulation:** both the UK's FSA and the Dutch banking supervisor, de Nederlandsche Bank, have proposed making the incentive structure created by bonus system a determinant of the capital adequacy requirements (and of any future liquidity adequacy requirements) imposed on banks. In principle this makes sense, as the internal incentive structure of the bank is as much a determinant of its overall risk-return structure as the composition of its assets and liabilities. The informational requirements would be quite formidable, however, and the process could degenerate into a highly intrusive form of micro-management by the regulator.
- **Taxation:** the combination of huge bonuses and the ability to shelter them from taxes is especially vexing. As the huge bonus earners also tend to be highly mobile, international cooperation on taxation, including a crack-down on tax havens, may well have to be part of any solution.

1F. Competitive global deregulation

Regulators of financial markets and institutions are organised on a national basis and are, in part, cheerleaders for and representatives of the interests of their national financial sectors. While regulation is national, finance is global. The location of financial enterprises and markets is endogenous; many are extremely footloose. A thriving financial sector creates jobs and wealth, and is generally environmentally friendly. So regulators try to retain and attract financial businesses to their jurisdictions in part by offering more liberal, less onerous regulations. This competition through regulatory standards has led to less stringent regulation being adopted almost everywhere.

There have been occasional reversals in this process. The Sarbanes-Oxley Act of 2002 was a response to the corporate governance, accounting and reporting scandals associated with Enron, Tyco International, Peregrine Systems and WorldCom. It undoubtedly contributed to a loss of business for New York City as a global financial centre. Because Sarbanes-Oxley compliance is mainly a matter of box-ticking (like most real-world compliance, especially compliance originating in the USA), it has not materially improved the informational value of accounting or the protection offered to investors.

Is this global competitive deregulation process a welcome antidote to a tendency to excessive and heavy-handed regulation that could be expected in a closed economic system, or a race to

the bottom in which everyone loses in the end? I believe the jury is still out on this one, although I am inclined, if pushed, to suggest that the following are likely to be true.

- Principles-based regulation (allegedly what we have in the UK) vs. rules-based regulation is an unhelpful distinction. You need both. You need principles that spell out the fundamental 'duck test': (a) Is the institution above a certain minimal size (as determined by some 'too large, too interconnected or too well-connected to fail' criterion); (b) Does the institution lend long and borrow short? (c) Does it lend in illiquid form and fund itself either by borrowing from creditors who can refuse to roll over their credit at short notice or by issuing short-term securities in markets that are liquid in normal times but may turn illiquid during period of market turbulence? If so, it should be either consolidated for reporting purposes with a bank that has substantial exposure to the institution or be treated the same way as a bank for regulatory purposes.

  The defining criteria for the imposition of uniform regulatory requirements are therefore (a) size, (b) leverage and (c) potential liquidity mismatch. Then you also need rules that are constantly adapted to keep up with developments in instruments and institutions.
- Self-regulation is no regulation unless backed up credibly with the threat that, should effective self-regulation not be implemented, externally (legally) enforced regulation will be imposed.
- Voluntary codes of conduct are without significance unless they can be and are used by the regulator (through 'comply or explain' rules, for instance) to impose and enforce standards. That means that if the explanation is not to the regulator's satisfaction, consequences follow and ultimately compulsion can be used.
- The UK's 'light-touch' regulation has become 'soft-touch' regulation and needs to be tightened up in a large number of areas.

Partial solutions

1. **Greater international cooperation between regulators.** This is a no-brainer, but very hard to achieve.
2. **A single EU-wide regulatory regime for banks, other financial institutions and financial markets, and a single EU-wide regulator for each relevant market segment.** National financial regulators in the EU should go the way of the dodo. An EU-level FSA separate from the ESCB would be one possibility. Multiple (non-overlapping) regulators are also a possibility, but there should be only one for all EU member states, for any given market segment.

   The central banks (the ECB and 16 (from January 1, 2009, 17) national central banks) should collect more information about individual banks than the Bank of England has done since it lost banking supervision and regulation in 1997 when the Bank became operationally independent for monetary policy. Adequate information on the liquidity positions of systemically important banks and other financial institutions should be collected routinely by all central banks.

   Whether central banks should become regulators, or just be restricted to being able to demand liquidity-relevant information from individual banking institutions is a delicate and difficult issue. It involves a trade-off between better information for the central bank (which would be a positive by-product of an explicit regulatory and supervisory role for the central bank) and the risk of regulatory capture of the central bank by the banking

industry. The example of the regulatory capture of the Fed by Wall Street should give food for thought.

3. **A crackdown on "regulators of convenience".** This requires tough measures towards 'regulation havens', some found in the Caribbean, others closer to the UK. One effective approach would be the non-recognition and non-enforceability of contracts, court judgements and other legal and administrative rulings made by non-compliant jurisdictions. It would be efficient to combine this with a regulatory crackdown on tax havens, as the same countries tend to offer both tax havens and regulatory regimes of convenience.

2. The Global Macroeconomic Setting

The macroeconomic background to the crisis is the 'Great Moderation' – the low and stable global inflation and the reasonably robust and stable global real GDP growth of the past decade. Actually, this moderation is more apparent from the inflation figures than from the GDP figures. Figure 1a shows the spectacular decline and recent stability of global inflation (annual data).

Figure 1a here

The same picture of inflation declining, except during the last few years, can be seen for the US, the UK and the Euro Area in Figure 1b. The headline CPI inflation rate (month on same month a year earlier) has been both higher and more volatile in the US than in the UK and the Euro Area during the past five years.

Figure 1b here

Figures 2a,b and c demonstrate two points.

Figure 2a here

Figure 2b here

Figure 2c here

The stability of global GDP growth (shown using annual data in Figure 1a) does not appear to have increased materially since the early 1980s. The common belief held around the time that the crisis started, that global growth over the previous 4 years had averaged over 5 percent is based on the wrong statistics – that is, on data that weigh national GDPs at purchasing power parity (PPP) exchange rates rather than market exchange rates.

PPP exchange rates are the best conversion factors if comparisons between national standards of living are to be made. To get the best estimate of developments in global economic activity, market exchange rates should be used. GDP growth at market exchange rates has averaged around 3.5 percent per annum over the past few years. The difference between the two measures is due to the fact that PPP exchange rates give a much greater weight to developing countries and emerging markets than do market exchange rates. Since emerging markets (China, India, Russia, Vietnam, South Africa) have been the fastest growers by far

over the past decade, global growth measured at market exchange rates has been well below global growth measured at PPP exchange rates.

The view that global growth has been good but not spectacular is confirmed by the observation that by 2006, the global share of gross investment in GDP (which except for measurement errors and differences in coverage, is the same as the global share of gross saving in GDP) was only slightly above its previous peak value achieved in 1994 (see Figure 1a).

For the Euro Area, synthetic GDP data only give us growth rates going back to 1996, quarter 1. Over that period, as shown in Figure 2c, US and Euro Area GDP growth volatility have been similar, and that of the UK slightly lower than the other two. Over the longer period 1960 -2008, shown in Figure 1b, we note a dramatic reduction in GDP growth volatility for the US and the UK sometime after 1991.

Another striking feature of the global macroeconomic environment has been the declining level of real interest rates since 2001, and specifically the marked decline since the bursting of the tech bubble at the end of 2000. This is shown clearly by Figure 3, which is taken from Desroches and Francis (2007).[6]

Figure 3 here
(Source: Desroches and Francis (2007))

The proximate determinant of the trend decline in global real interest rates is an *ex-ante* saving glut, caused by the rapid growth of new emerging markets like China, which have extraordinarily high propensities to save, and, in more recent years, the global redistribution of wealth and income towards a limited number of producers of primary energy sources (especially oil and natural gas) and raw materials. For a number of years, the absorptive capacity of the beneficiaries could not keep up with their new-found wealth, and vast amounts of savings had to be recycled. The extreme financial conservatism of many of the big savers (in China, Japan, India, Russia, most South East Asian and Latin American countries and the Gulf states, these often were the central banks) meant that much of the increased demand for financial assets was directed towards default-risk-free financial instruments, especially US Treasury bonds. With no response of supply, risk-free real rates fell very low indeed (see Caballero (2006)).

In addition, the response of the US monetary authorities to the bursting of the tech bubble, the continued liquidity trap in Japan and, for a while also the rather relaxed monetary policy in the Euro Area resulted in massive and excessive global liquidity growth, especially from 2003 till the end of 2006. Many rapidly growing and high-saving emerging markets and a number of key oil producers (including the 6 members of the Gulf Cooperation Council) pursued policies of undervalued nominal exchange rates and sterilized intervention, which although only partially effective, resulted in an unprecedented accumulation of foreign exchange reserves and, until recently, growing demand for high-grade sovereign debt instruments.

6 Nothing much can be concluded from eyeballing the ex-post saving and investment rates in Figure 4. They are supposed to be identically equal, and any difference represents just measurement error.

As a result of this, not only were long-term risk-free nominal and real interest rates extraordinarily low since 2003, but unprecedentedly low credit risk spreads (that is, default risk spreads) prevailed across the board. There was also an explosion of leverage, although interestingly enough not in the non-financial corporate sector. Households leveraged up and so did the financial sector. *Prima facie*, commercial banks did not increase their leverage very much. The increased leverage in the financial sector took place outside the commercial banks - in investment banks, hedge funds, private equity funds and a whole range of new financial institutions (SIVs, Conduits etc), often using the new securitisation-based financial instruments discussed earlier. It was insufficiently appreciated, by regulators, by the banks and by the new financial institutions themselves, that being off-balance-sheet for certain regulatory, auditing and reporting purposes, does not mean that there is no substantive (and potentially substantial) financial, commercial, economic and reputational exposure.

Partial Solutions

Global risk-free real interest rates have been rising since the end of 2006, as the absorptive capacity of the oil and gas exporters has risen and as central banks at last lost control of the management of the bulk of the gross external assets acquired in the high-saving emerging markets. The transfer of these resources to sovereign wealth funds with a much greater willingness to take risk and a thirst for returns, means that at first the incremental flows, but increasingly also the existing stocks of external assets are being shifted out of high-grade sovereign obligations and into such things as equity, infrastructure and other riskier but higher-yielding investments, including commodities.

As regards excessive liquidity creation, it looks as though both Japan and the US may be repeating (or be about to repeat) the policies of the beginning of the decade. Japan appears to be perilously close to sliding back into recession, with no prospects for an early normalisation of nominal interest rates. The Bernanke Fed has turned out to be more like the Greenspan Fed than I would have expected or hoped, and has, since the crisis started in August 2007, cut the Federal Funds target rate by 325 bps and the primary discount rate penalty 75 bps, despite the presence of serious inflationary pressures. While the exchange rates of many oil and gas producers have appreciated against the dollar, there has been and continues to be considerable intervention to keep down their rates of appreciation. The same has been true in China and India. It looks as though monetary policy makers worldwide are putting in place the foundations for the next global liquidity glut while the world is still struggling with the liquidity crunch that started this summer.

Restraining asset and credit booms

The original Greenspan-Bernanke position that the regular monetary policy instrument, the official policy rate, should not be used to tackle asset booms/bubbles is sound. To the extent that asset booms have implications for the distribution of future outcomes for the macroeconomic stability objectives (price stability or price stability and economic growth), they should, of course, already have been allowed for under the existing approaches in the US, the Euro Area and the UK. But the official policy rate should not be used to 'lean against the wind' of asset booms and bubbles beyond that, that is, to pursue the mitigation or damping of asset booms in their own right. It would overburden the official policy rate and, since going after an asset boom/bubble with the official policy rate is like going after a rogue elephant with a pea shooter, Mundell's principle of effective market classification suggests that the official policy rate not be targeted at asset booms/bubbles in their own right.

That, however, leaves a major asymmetry in the macroeconomic policy and financial stability framework. This asymmetry is not that interest rates respond more sharply to asset market price declines than to asset market price increases. Even if there were no 'Greenspan-Bernanke put', such asymmetry should be expected because asset price booms and busts are not symmetric. Asset price busts are sudden and involve sharp, very rapid asset price falls. Even the most extravagant asset price boom tends to be gradual in comparison. So an asymmetric response to an asymmetric phenomenon is justified. This does not mean that there has been no evidence of a 'Greenspan-Bernanke' put, of course.

Fundamentally, the key asymmetry is that the authorities are unable or unwilling, whether for good or bad reasons does not matter here, to let large leveraged financial institutions (HLIs) collapse. This unwillingness to let HLIs collapse is not restricted to depository institutions. Indeed the desire to protect deposits or depositors, whether for their means of payment systemic role or for 'widows and orphans reasons', is no longer a reason for bailing out depository institutions, if indeed ever it was. Deposit guarantees or deposit insurance will handle the special problems associated with depositors losing their shirts when a deposit-taking bank fails. There is no need to bail out the rest of the bank.

Although the implicit bail-out guarantee for HLIs truncates the lower tails of their payoff functions, there is no matching inclination by the authorities to expropriate, impose extraordinary taxes on or otherwise financially punish or restrain HLIs during periods when they are doing extremely well. This asymmetry has to be corrected. Therefore, any large leveraged financial institution, commercial bank, investment bank, hedge fund, private equity fund, SIV, Conduit or whatever it calls itself, whatever it does and whatever its legal form, ought to be regulated according to the same principles.

Operationally, the asymmetry is that there exists a panoply of liquidity-and credit-enhancing measures that can be activated during an asset market bust and during a credit crunch, to enhance the availability of credit and to lower its cost, but that there exists no corresponding liquidity- and credit-restraining instrumentarium during a boom.

When financial markets are disorderly, illiquid or have seized up completely, the LLR and MMLR can and do spring into action. We even have proposals now, because fair value accounting and reporting rules are procyclical when asset markets are impaired and artificially depressed asset markets undervalue assets, that mark-to-market accounting rules be suspended during periods of market illiquidity. If this proposal were implemented, it would introduce a further asymmetry, because orderly and technically efficient asset markets too can produce valuations that depart from the fundamental valuation because of the presence of a bubble. There have been no calls for mark-to-market accounting and reporting standards to be suspending during asset price booms and bubbles.

These asymmetries have to be corrected through regulatory measures, effectively by across-the board credit controls. Every asset and credit boom in history has been characterised by rising leverage. The one we are now suffering the consequences of is no exception. Leverage is a simple concept which may be very difficult to measure, as those struggling to quantify the concept of *embedded leverage* will know. In the words of the Counterparty Risk Management Group (CRMG) II (2005), *"...leverage exists whenever an entity is exposed to changes in the value of an asset over time without having first disbursed cash equal to the value of that asset at the beginning of the period."* And: *"...the impact of leverage can only be understood by relating the underlying risk in a portfolio to the economic and funding*

structure of the portfolio as a whole." Traditional sources of leverage include borrowing, initial margin (some money up front - used in futures contracts) and no initial margin (no money up front – when exposure is achieved through derivatives).

I propose using simple measures of leverage, say a measure of gross exposure to book equity, as a metric for constraining *capital insolvency* risk (liabilities exceeding assets) of all large, highly leveraged institutions. Common risk-adjusted Basel II-type capital adequacy requirements and common reporting requirements would be imposed on all large institutions whose leverage, according to this simple metric, exceeds a given value. These capital adequacy requirements would be varied by the monetary authority in countercyclical fashion.

To address the second way financial entities can fail, what the CRMG calls *liquidity insolvency*, meaning they run out of cash and are unable to raise new funds, I propose that minimal funding liquidity and market liquidity requirements be imposed on, respectively, the liability side and the asset side of the balance sheets of all large leveraged financial institutions. These liquidity requirements would also be tightened and loosened by the monetary authority in countercyclical fashion.

Finally, I would propose that all large leveraged institutions that are deemed too large, too interconnected, or simply too well-connected to fail, be made subject to a Special Resolution Regime along the lines that exists today for deposit-taking institutions through the FDIC. A concept of *regulatory insolvency*, which could bite before either capital insolvency or liquidity insolvency kicks in, must be developed. A determination by the regulator of regulatory insolvency of an HLD would allow an official administrator to take control of any large, leveraged financial institution and to engage in Prompt Corrective Action. The intervention of the administrator would be expected to impose serious penalties on existing shareholders, incumbent board and management and possibly on the creditors as well. The intervention should aim to save the institution, not its owners, managers or creditors.

3. The Onset of the Financial Crisis

Facts can be ignored for a long time, but not forever. The realisation that risk may have been underpriced dawned first in the USA to holders of securities backed by sub-prime mortgages. During the second half of 2005, the delinquency rate on these mortgages began to creep up from a low of 10 percent at an annual rate (see Figure 4).

Figure 4 here

During 2006, the delinquency rate rose further and by early 2007 it had reached 15 percent. It became clear that, because many of the mortgages granted in 2005 and 2006 had up-front 'teaser rates', which during 2007 and 2008 would reset at much higher levels, there was only one direction delinquencies were going to go: up.

The prices of sub-prime mortgage credit default swaps began to fall late in 2006 (see Figure 5) and dropped like a stone by the middle of the year, indicating higher perceived default risk for the underlying assets.

Figure 5 here

The widening of credit risk spreads that followed was not confined to sub-prime related instruments and institutions. As is clear from Figure 6, which shows the behaviour of Sterling corporate bond spreads by rating, the global underpricing of risk had affected virtually every private financial instrument, and the sovereign instruments issued by all but a small number of highly creditworthy sovereigns.

Figure 6 here

The US sub-prime mortgage crisis was just the trigger of the global crisis. To illustrate, early in 2007, a large amount of unsecured household debt (consumer credit) had to be written down/off by UK banks.

In August 2007, we saw something we had never seen before. The simultaneous global freezing up of virtually all wholesale capital markets, including the interbank markets, CDO markets, markets for asset-backed-commercial paper (ABCP) (where the crisis hit Canada first) and markets for all but the very best asset-backed securities. Global new CDO issuance dropped precipitously (see Figure 7) and it became impossible to roll over outstanding stocks of commercial paper, especially asset-backed commercial paper, which as a result declined sharply (see Figure 8).

Figure 7 here

Figure 8 here

The financial turmoil did not just touch securities and institutions associated with sub-prime lending in the US. The underpricing of credit risk had been a global phenomenon, and the re-pricing of credit risk, which is by no means over at the time of writing (May 28, 2008), has affected other financial markets.

The 'monolines' or credit risk insurers, from the largest ones like MBIA and Ambac to smaller ones like ACA, FGIC, Security Capital Assurance found themselves in the spotlight and under pressure. The value of the credit risk enhancement they can provide depends entirely on their own credit rating. A 'monoline' without a triple A rating no longer has a viable business model. It is therefore key that they are well-capitalised or are backed by well-capitalised parents or sponsors who can replenish their capital should the need arise. That this is a real issue became clear when at the end of November 2007, two French banks pledged $1.5 bn to recapitalise a small French monoline, CIFG. This was not the last rescue of a monoline in this credit cycle.

Some further measures of the distress felt in the financial markets since the summer of 2007 is shown in Figures 9a,b,c, 10 and 11.

Figure 9 a shows the behaviour of the spread between 3-month Libor, the unsecured interbank offered rate, and the 3-month overnight index swap rate (OIS). This is the 3-month fixed rate leg of a swap whose variable rate leg is the overnight rate in the interbank market. It used to be a key rate because many private sector loans for both households and non-financial corporates are priced off this rate. Since Libor is an unsecured rate, the spread should reflect, in orderly market conditions, mainly the probability of default of the borrowing bank over a three month horizon and the recovery rate conditional on a default

occurring. When markets become disorderly and illiquid, a liquidity risk premium inserts itself between Libor and the OIS rate.

As Figure 9a shows, in the US, the UK and the Euro Area this spread shot up from an average level of around 10 bps in the US and the Euro Area and around 20 bps for sterling, to levels that reached 120 bps for sterling in September 2007, levels above 100 bps for the US dollar and over 90 bps for the euro.

Figure 9a here

Even today, 3-month Libor-OIS spreads are between 70bps and 90 bps for the three currencies. And according to the banking community (no hard data on interbank volumes are, unfortunately, available), very little is transacted at these spreads. This massive increase in spreads is not confined to 3-month maturities. Figure 9b shows the Libor-OIS spreads for the 1-month maturity and Figure 9c for the 12-month maturity. On May 26, 2008, the 1-year Libor-OIS spreads were still around 100bps for all three currencies.

Figure 9 b here

Figure 9c here

Another striking feature of Figures 9a, b and c is how similar the spreads are for the three currencies, except for some early very high spikes in the sterling spreads which were not shared by the US dollar and the euro. I don't think this necessarily indicates an equally good performance of the three central banks involved in the provision of liquidity. Certainly the Bank of England did a poor job as regards the provision of liquidity at the right maturities and in the right amounts early in the crisis. Its performance wasn't up to snuff until about December 2007. And the task of the Fed was probably the most difficult, as the damage done to US banks through earlier financial excesses was greater than the damage UK and Euro Area banks had inflicted on themselves.

Certainly the amount of liquidity actually extended (as measured, say, by reserve flows or average reserve holdings, by the size of repo operations or by the amount of repos or reverse repos carried on the books of the central bank) says little or nothing about the quality and quantity of the actual liquidity support offered by the central bank. If it were perfectly clear and credible that a wide range of eligible securities, even illiquid, could be offered as collateral in repos at the central bank at any time and at any maturity, there might well be very little demand for actual liquidity from the central bank.

An important reason, I believe, for the similarity of the increases in the liquidity spreads in the interbank markets of the US, the UK and the Euro Area is that liquidity was fungible between the jurisdictions of the three central banks, even without active central bank interventions through swaps and similar arrangements. As long as the foreign exchange markets remained liquid (and they did for these three currencies), euro liquidity and dollar liquidity could be turned into sterling liquidity. This apparently happened on a significant scale, as reported amongst others by Fitch.[7]

7 "The agency believes a number of non-euro zone banks, most notably UK banks, have made use of ECB liquidity facilities via their European operations, or through intermediaries in return for a fee or margin," Fitch said, according to the London Times on May 16, 2008.

UK banks with subsidiaries in the Euro Area that were subject to the minimum reserve requirements of the Eurosystem, and therefore eligible to use the discount window or to be a counterparty in open market operations, used the euro repo facilities of the Eurosystem to acquire liquidity for themselves through these subsidiaries. The same was done by UK and Euro Area banks with subsidiaries in the US, where some of these subsidiaries also used the Fed discount window. In the middle of May, 2008, it became known that the Icelandic bank Glitnir was in the process of clearing the use of a €890m collateralised loan obligation (CLO) for funding at the ECB, presumably through its subsidiary in Luxembourg. Thus liquidity arbitrage between the major currency jurisdictions affected by the crisis meant that liquidity in any of the three currencies and held in any of the three jurisdictions, could be turned, through the use of subsidiaries, into liquidity in any of the other currencies and held in any of the other jurisdictions.

Figure 10 shows the drastic reassessment of default risk from the perspective of the CDS markets.

Figure 10 here

Credit default swap spreads for US securities houses rose from just over 30 bps in January 2006 to over 320 bps around the term of the Bear Stearns crisis. Of course the CDS spreads are not pure measures of credit risk. They too are contaminated by illiquidity, especially as they are over-the-counter rather than exchange-traded instruments. Some encouraging signs of normalisation are visible following the end of the Bear Stearns panic.

If 320 bps spreads sound bad, two of the three main internationally active Icelandic banks experienced CDS spreads of over 1000 bps in March 2008, while the third saw its CDS spreads exceed 800bps. This is shown in Figure 11.

Figure 11 here

The Itraxx Financial Europe index, an exchange traded instruments, showed spreads of around 180 bps at the same time. All these spreads have come down significantly since the Fed bailed out Bair Stearns.

4. How Did Some Leading Central Banks Respond to the Crisis?

I shall focus on the Fed, the ECB and the Bank of England in what follows. None of the world's leading central banks exactly covered themselves with glory. In an earlier study (Buiter (2007)), completed in November 2007 and published in December 2007, I concluded that the Bank of England, which mismanaged the provision of market liquidity early in the crisis, had done the worst job. Today, I believe that the Fed has done by far the worst job, both as regards macroeconomic stability and as regards one of the two key dimensions of financial stability: minimizing the likelihood and severity of *future* financial crises. The Fed was, however, quite effective at preventing the current crisis from doing unnecessary immediate damage (for an alternative account and appreciation of the Fed's performance, see Cecchetti (2008)).

Monetary policy and financial stability

At the time the financial crisis erupted, in August 2007, all three central banks faced increasing inflationary pressures and at least the prospect of weakening domestic activity. The evidence for weakening activity was clearest in the US. In the UK, real GDP growth in the third quarter was still robust, although some of the survey data had begun to indicate future weakness. In the Euro Area also, GDP growth was healthy. As late as August, the ECB was signalling an increase in the policy rate for September or soon after.

By the middle of 2007, the US economy was in need of serious adjustment to address its external and internal imbalances. The US trade deficit was around six percentage points of GDP. Since the US is a net external debtor (and assuming the long-run real rate of return on the (negative) net external investment position of the US exceeds the underlying real growth rate of the US economy), the US has to run a permanent trade surplus to maintain international solvency. This means that a permanent reduction in domestic absorption relative to GDP of at least six percentage points of GDP is required for the US to maintain external solvency.

This (at least) six percent of GDP permanent reduction in domestic absorption relative to GDP could, starting from a position where potential and actual GDP are equal, be achieved by a six per cent of potential GDP reduction in absorption.[8] This reduction in absorption could come through cuts in consumption or in investment, private and public. I am ruling out a spontaneous supply-side miracle that raises the sustainable path of output without raising absorption. For illustrative purposes, I will assume that the necessary adjustment takes the form of a cut in residential construction spending of two percentage points of GDP and in private consumption spending of four percent of GDP.[9] The internal imbalance was, of course, the unacceptably high rate of headline inflation. The UK was qualitatively in a similar position, although the permanent change in the trade balance that was required was just half that of the US, as a share of GDP.

It is in principle possible to achieve a reduction in private consumption and investment of the required magnitude at full employment. In an open economy, the trade balance deficit would shrink seamlessly as domestic demand declined. A depreciating real exchange rate would accompany and facilitate a shift of resources out of the non-traded sectors into the exporting and import-competing sectors. In practice, this is unlikely. In the case of the US, domestic construction demand was falling because of the exogenous shock of the end of the US house price boom/bubble. Consumption demand was weakening because of reduced scope for mortgage equity withdrawal as a result of declining house prices and (*if and only if* the house price decline reflected the bursting of a bubble – see the Appendix) possibly through the negative wealth effect of declining house prices. The US economy does not have enough short-term price and wage flexibility and intersectoral resource mobility to achieve the transition to a sustainable external position without going through a period of declining economic activity and rising unemployment.

The Fed refused to see either the inevitability of a period of economic slowdown, quite possibly a recession, or the desirability, from a longer-term perspective, of getting the

8 For the younger generation, absorption is domestic final demand, the sum of consumption and investment spending, private and public.

9 Give or take net foreign factor income, which is small in the case of the US, the adjustment can therefore also be stated as a four percentage point of GDP increase in private saving and a two percent of GDP reduction in private investment. The public sector saving-investment balance is assumed to be unchanged.

slowdown over with as soon as possible. Instead it did all it could through large and aggressive cuts in the Federal Funds target rate, to prevent or at least mitigate the necessary and inevitable slowdown, effectively interpreting the 'maximum employment' leg of its mandate not as the maximum sustainable level of employment or the maximum sustainable rate of growth, but as the maintenance of high levels of current employment and current real GDP growth regardless of their sustainability.

From lender of last resort providing funding liquidity to market maker of last resort providing market liquidity

The three monetary authorities also found themselves with similar financial stability problems. All three had to cope with the evolution of the central bank's financial stability role in a financial system where intermediation was increasingly market-mediated rather than bank-mediated. The familiar lender-of-last-resort-role of providing funding liquidity to banks evolved towards that of a mixed lender of last resort and market maker of last resort. Following Bagehot, the lender of last resort provides funding liquidity to illiquid but solvent banks, at a penalty rate, against collateral that would have been good in normal times but may have become impaired because of the liquidity crisis. The penalty rate is key to the minimisation of moral hazard – incentives for future excessive risk taking – which is inevitably created or enhanced when LLR facilities exist.

The market maker of last resort provides liquidity to markets either by accepting illiquid collateral in repos or other kinds of open market operations, or by purchasing illiquid assets outright. As the assets are illiquid, the MMLR must establish a mechanism for establishing the valuation/price of the assets offered as collateral or for outright sale. Elsewhere, I have suggested the use of reverse auctions as a possible mechanism, with the central bank acting as the sole borrower/buyer of the illiquid assets. A reverse Dutch auction would be likely to be particularly harsh on the original owners of the illiquid assets.

Funding liquidity and market liquidity interact and mutually amplify each other during a financial crisis (see Spaventa (2008)). When a bank finds itself short of liquidity because it cannot roll over its maturing liabilities, it may have to sell assets in illiquid asset markets. This will drive down the prices of these assets. Declining asset prices may lead to margin calls for holders of similar assets. Mark-to-market valuation requirements will reduce the equity and capital of holders of similar assets, which may trigger the need to boost capital ratios, either for regulatory or for internal prudential reasons. To the extent that financial institutions try to achieve higher capital ratios by selling assets in illiquid markets, or by curtailing lending, the problem is aggravated. Behaviour that is individually rational may become systemically destabilising through these positive feedback effects. The central bank can address the funding liquidity shortage as LLR and the market liquidity shortage as MMLR. Moral hazard attaches to both kinds of interventions.

Just as the LLR has to lend at a penalty rate to minimise adverse incentives for excessive future risk taking, so the MMLR has to impose penalty terms when it accepts illiquid assets as collateral or purchases illiquid assets outright. As outright purchases by the central bank (or some other agent of the state) have not yet occurred, I shall focus on collateralised loans and repos.

There are at least three parameters that determine the 'degree of punitiveness' of a repo involving illiquid collateral. These are the rate charged on the transaction, the valuation of

the collateral and the 'haircut' or liquidity discount applied to the valuation. We know, unfortunately, rather little about the second of these: the valuation of the collateral. The interest rate and the haircuts are generally in the public domain, but the actual valuation or pricing of specific collateral tends to be a closely held secret. At best we know non-operational general descriptions of the mechanism or process. It is key that the information on the actual valuations put on specific collateral be put in the public domain, so the public can determine whether or not, or to what extent, the central bank is subsidising its counterparties in the collateralised transactions.

Both the LLR and the MMLR have to decide the following seven dimensions of the loans they make or the financial contracts they trade: (1) The interest rate charged; (2) the range of eligible counterparties and the regulatory demands made of these counterparties; (3) the duration/maturity of the loans/repos; (4) the amount of funds made available at various maturities; (5) the range of eligible collateral; (6) the valuation/pricing of the collateral and (7) the haircuts (liquidity discounts) applied to these valuations.

The Federal Reserve

The Federal Funds target rate

On September 18 2007, the Fed cut the Federal Funds Rate by 50 basis points to 4.75 percent, with a further reduction of 25 basis points following on October 31. On December 11 there was a further 25 basis points cut, on 21 January 2008 a 75 basis points cut, on 30 January a 50 basis points cut, on 18 March a 75 basis points cut and on 30 April another 25 basis points cut. This brought the Federal Funds target to 2.00 percent, where it remains at the time of writing (28 May 2008). The merits of these cuts will be discussed below.

The discount rate

The Fed reduced the 'discount window penalty', that is, the excess of the rate charged on overnight borrowing at the primary discount window over the Federal Funds target rate, from 100 bps to 50 bps on August 17, 2007 and to 25 bps on 18 March 2008. I cannot see any argument based either on the pursuit of macroeconomic stability or on the pursuit of financial stability in support of these cuts in the discount rate penalty. On August 17, 2007, there were no US financial institutions for whom the difference between able to borrow at the discount rate at 5.75 percent rather than at 6.25 percent represented the difference between survival and insolvency; neither would it make a material difference to banks considering retrenchment in their lending activity to the real economy or to other financial institutions. It was a reduction in the discount window penalty margin of interest only to institutions already willing and able to borrow there (because they had the kind of collateral normally expected at the discount window). It was a subsidy to such banks – a straight transfer to their shareholders from the US tax payers. It also reinforces moral hazard by lowering the penalty for future illiquidity.

LLR and MMLR actions

The Fed, as soon as the crisis hit, injected liquidity into the markets at maturities from overnight to 3-month. The amounts injected were somewhere between those of the Bank of England (allowing for differences in the size of the US and UK economies) and those of the ECB.

Extending the maturity of discount window loans
On August 17, the Fed extended the maturity of loans at the discount window from overnight to up to one month. On March 16, 2008, it further extended the maximum term for discount window lending to 90 days. These were helpful measures, permitting the provision of liquidity at the maturities it was actually needed

The TAF
On December 12, the Fed announced the creation of a temporary term auction facility (TAF). This allows a depository institution to place a bid for a one-month advance from its local Federal Reserve Bank at an interest rate that is determined as the result of an auction. The TAF allows the Fed to inject term funds through a broader range of counterparties and against a broader range of collateral than open market operations. When the normal open market operations counterparties are hoarding funds, and the unsecured interbank market is not disseminating liquidity provisions efficiently throughout the banking sector, this facility is clearly helpful.

International currency swaps
Also on December 12, the Fed announced swap lines with the European Central Bank and the Swiss National Bank of $20 billion and $4 billion, respectively. On March 11, 2008, these swap lines were increased to $30 billion and $6 billion, respectively. This, I would suggest, represents the confusion of motion with action. Banks in the Euro Area and Switzerland were not liquid in euros/Swiss francs but short of US dollars because the foreign exchange markets had become illiquid. These banks were short of liquidity – full stop – that is, short of liquidity in any currency.

This is unlike the case of Iceland, where the Central Bank on 16th May 2008 arranged swaps for euros with the three Scandinavian central banks. Since the Icelandic banking system is very large relative to the size of the economy and has much of its balance sheet (including a large amount of short-term liabilities) denominated in foreign currencies rather than in Icelandic kroner, the effective performance of the LLR and MMLR functions requires the central bank to have access to foreign currency liquidity. With no-one interested in being long Icelandic kroner, the swap facilities are an essential line of defense for the Icelandic LLR/MMLR

The TSLF
On March 11, 2008 the Fed announced that it would expand its existing overnight securities lending program for primary dealers by creating a Term Securities Lending Facility (TSLF). Under the TSLF, the Fed will lend up to $200 billion of Treasury securities held by the System Open Market Account to primary dealers secured for a term of 28 days by a pledge of other collateral. The first TSLF auction took place on March 27, with $75 billion offered for a term of 28 days. The price is set through a single-price auction.[10] The range of collateral is quite wide: all Schedule 2 collateral plus agency collateralized-mortgage obligations (CMOs) and AAA/Aaa-rated commercial mortgage-backed securities (CMBS), in addition to the AAA/Aaa-rated private-label residential mortgage backed securities (RMBS) and OMO-eligible collateral.[11] Until the creation of the Primary Dealer Credit Facility (PDCF, see

10 The TSLF is a single-price auction, where accepted dealer bids will be awarded at the same fee rate, which equal to the lowest fee rate at which any bid was accepted. Dealers may submit two bids for the basket of eligible general Treasury collateral at each auction.

11 Schedule 1 collateral is all collateral eligible for tri-party repurchase agreements arranged by the Open Market Trading Desk (that is, all collateral acceptable in regular Fed open market operations). Schedule 2

below) the Fed could not lend cash directly to primary dealers. Instead it lends highly liquid Treasury bills which the primary dealers then can convert into cash. This facility extends both the term of the loans from the Fed to available to primary dealers and the range of eligible collateral. In principle this is a useful arrangement for addressing a liquidity crisis. The design, however, has one huge flaw.

An extraordinary feature of the arrangement is that the collateral offered by the primary dealers is valued (and revalued daily to ensure that, should the value of the collateral have declined, the primary dealer puts up the additional collateral required to restore the required level of collateralisation) by the clearing bank acting as agent for the primary dealer. Primary dealers cannot access the Fed directly, but do so through a clearing bank – their dealer. As long as the clearing bank which acts as agent for the primary dealer in the transaction is willing to price the security (say, by using an internal model), the Fed will accept it at that price.

This arrangement is far too cosy for the primary dealer and its clearer. The incentive for collusion between the primary dealer and the clearer, to offer pig's ear collateral but value it as silk purse collateral will be hard to resist. This invites adverse selection: the Fed is likely to find itself with overpriced, substandard collateral. Offering access to this adverse selection mechanism today also creates moral hazard in the future. It does so by creating incentives for future reckless lending and investment by primary dealers aware of these future opportunities for dumping bad investments on the Fed as good collateral through the TSLF.

The PDCF

On March 16, 2008, the Primary Dealer Credit Facility (PDCF) was established, for a minimum period of six months. Primary dealers of the Federal Reserve Bank of New York are eligible to participate in the PDCF via their clearing banks. It is an overnight loan facility that will provide funding to primary dealers in exchange for a specified range of eligible collateral, including all collateral eligible for tri-party repurchase agreements arranged by the Federal Reserve Bank of New York (that is, all collateral eligible for pledge in open market operations), as well as all investment-grade corporate securities, municipal securities, mortgage-backed securities and asset-backed securities for which a price is available from the primary dealer's clearing bank. The rate charged is the one at the primary discount window to depositary institutions for overnight liquidity, currently 25 bps over the Federal Funds target rate.

This facility effectively extends overnight borrowing at the Fed's primary discount window to primary dealers, at the standard primary discount window rate. Note again the extraordinary valuation mechanism put in place for securities offered as collateral: "The pledged collateral will be valued by the clearing banks based on a range of pricing services."[12] This is the same adverse-selection-today-leading-to-moral-hazard-tomorrow-machine created by the Fed for use with the TSLF.

Bear Stearns

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collateral is all Schedule 1 collateral plus AAA/Aaa-rated Private-Label Residential MBS, AAA/Aaa-rated Commercial MBS, Agency CMOs and other AAA/Aaa-rated ABS.

12 http://www.newyorkfed.org/markets/pdcf_terms.html

On 14 March 2008, the Fed agreed to lend US$29 billion to Bear Stearns through JPMorgan Chase (on a non-recourse basis). Bear Stearns is an investment bank and a primary dealer. It is not regulated by the Fed (which only regulates depositary institutions) but by the SEC. Bear Stearns was deemed too systemically important (probably by being too interconnected rather than just too big) to fail. Why a *special resolution regime* analogous to that administered by the FDIC for insured depositary institutions was not set up for Bear Stearns in unclear. This could have ring-fenced the balance sheet of Bear Stearns and permitted the analogue of *Prompt Corrective Action* to be implemented. The entire top management could have been fired without any golden handshakes. If necessary, regulatory insolvency could have been declared for Bear Stearns. The shareholders would have had to take their place in line, behind all other claimants. Outright nationalisation of Bear Stearns could have created the same superior alignment of incentives.

Instead we have, if the deal is accepted by Bear Stearns shareholders, a $10 per share payment for the shareholders, what looks like a sweetheart deal for JPMorgan Chase, and a $29 billion exposure for the US tax payer to an SPV in Delaware, which has $30 bn of Bear Stearns' most toxic assets on its balance sheet. Only $1bn of JPMorgan Chase money stands between losses on the assets and the $29 billion 'loan with equity upside' provided by the Fed. It is difficult to believe that this kind of deal did not create more of an outcry, as it is both deeply distortionary and highly unfair.

Interest on reserves

Reserves held by commercial banks with the Fed are currently non-remunerated. This is a nuisance for the Fed when it attempts to set the short-term risk-free nominal interest rate. As reserves are non-remunerated, commercial banks have little incentive to hold excess reserves with the central bank. If there is excess liquidity in the overnight interbank market, banks will try to lend it out overnight at any positive rate rather than holding it at a zero overnight rate as excess reserves with the Fed. Clearly it makes sense for interest to be paid on excess reserves at an overnight rate equal to the Federal Funds target rate. Under existing legislation, the Fed will have the authority to pay interest on reserves starting in October 2011. The Fed has asked Congress for this date to be brought forward.

The proposal clearly makes sense, but it will be a rather minor technical improvement in short-term liquidity management and rate setting. It is not really aesthetically pleasing to have the Federal Funds target rate at $X > 0$ percent and the actual overnight interbank rate near zero. But it will not contribute substantially to financial stability. Figure 12 shows that for all three central banks, the capacity for keeping the overnight interbank rate close to the official policy rate has been poor.

Figure 12 here

Setting the official policy rate ought to mean that the central bank is willing to lend reserves (against suitable collateral) on demand in any amount and at any time at that rate, and that it is willing to accept deposits in any amount at that rate. This would effectively peg the secured overnight lending and borrowing rate at the official policy rate. The overnight interbank rate could still depart from the official policy rate because of bank default risk on overnight unsecured loans, but that spread should be trivial almost always. The deviations between the official policy rate and the overnight interbank rate that we observe for the Fed, the ECB and the Bank of England are the result of inept management – the vain pursuit of the

pipe dream of setting both price (the official policy rate) and quantity (the reserves of the banking system), and in the case of the Fed, of the restrictions on paying interest on reserves.

If interest at the Federal Funds target rate is paid on both required and excess reserves, the proposed policy change represents another transfer payment from the tax payers to the shareholders of the banks. This could be considered distributionally unfair, and indeed a further reward for past imprudent behaviour. The Fed should insist that interest be paid only on excess reserves held by the commercial banks, with zero interest on required reserves. Once the dust has settled, the question of the appropriate way to tax the commercial banks and fund the Fed can be addressed at leisure.

What accounts for the Fed's poor performance?

The Fed has not acquitted itself well during the current crisis. I will consider three criteria: (1) macroeconomic stability, (2) the resolution of the current financial crisis and (3) the implications of recent actions for the likelihood and severity of future financial crises.

Macroeconomic stability

A summary picture is contained in Figure 13, which shows quarterly data for GDP growth (quarter on same quarter a year earlier), CPI inflation (idem) and the effective Federal Funds rate. Inflation has been too high for comfort (above 2 percent per annum) since 2003, quite volatile, and appears to be on a slowly rising path.

Figure 13 here

As can be seen from Figure 14, short-term inflation expectations (mean expectations for inflation 12 months ahead on the Michigan survey measure) are rising and are now at 5.7 percent. Longer term inflation expectations (mean inflation expectations 5 to 10 years ahead on the Michigan survey measure) don't show as much of an up-tick, but have also risen to 3.5 percent.

Figure 14 here

Despite these worrying inflation developments, and with output not exactly falling off a cliff (and probably not even weakening enough to accommodate the necessary external rebalancing of the US economy) the Fed cut rates aggressively. What accounts for this anomalous, and in my view misguided, monetary policy behaviour?

I believe there are a number of reasons. It is possible that the policy rate cuts were at least in part motivated by a desire to address the liquidity crunch directly, rather than by the effects the liquidity crunch might have on price stability and real economic activity. I find that hard to believe, as there is no obvious connection between the very short nominal risk-free policy rate of interest and the lack of confidence and trust that produced the dysfunctional liquidity 'strike' equilibrium.

A second reason may be a misunderstanding of the concept of 'risk management' and the avoidance of 'tail risks' it implies. Both concepts are regularly and inexpertly wielded by FOMC members. First, one has to agree what the 'tail risks' are. What contingencies would cause extreme damage? Even if it were agreed that the damage done by a sharp and protracted decline in output and employment were much more significant than the cost of

inflation expectations drifting sharply higher, it does not follow that sharp and early cuts in interest rates are desirable whenever the output/employment tail risk is perceived to be more of a threat. Sharp and early cuts are only indicated if later and/or more gradual cuts are not equally effective in dealing with the key risk. There has to be some sharp irreversibility, akin to falling off a cliff, that makes early aggressive action optimal. There is no evidence to support the view that the real economy at the beginning of the 21st century behaves in such a catastrophic, non-linear, irreversible way. Even in the 1930s, more effective later monetary, fiscal and trade policy actions could have limited the damage of the Great Depression. Prevention is not always better than cure, especially if prevention of one disaster makes another one more likely.

Then there are problems deriving from the Fed's legal mandate. Legally, the Fed has a *triple* macroeconomic stability mandate (as well as a responsibility for financial stability). According to the Federal Reserve Act, *"The Board of Governors of the Federal Reserve System and the Federal Open Market Committee shall maintain long run growth of the monetary and credit aggregates commensurate with the economy's long run potential to increase production, so as to promote effectively the goals of maximum employment, stable prices, and moderate long-term interest rates."* Since no-one knows what moderate long-term interest rates are, the Fed has ignored this third leg of its macroeconomic stability mandate. It professes to a dual mandate: maximum employment (most of the time watered down to sustainable economic growth or sustainable high employment) and price stability. In effect, the Fed appears to have downgraded the price stability leg of its mandate to the point that its mandate now looks lexicographic or hierarchical, with the prevention of a decline in real economic activity in pole position.

The result has been persistent high inflation and a determined and protracted attempt to sustain an unsustainable level of activity, and especially an unsustainable level of private consumption demand.

There are also two key flaws in the model of the transmission mechanism of monetary policy that are shared by a number of influential members of the FOMC. These relate to the wealth effect of a change in price of housing and to the role of core inflation as a guide to future underlying inflation.

Housing wealth isn't wealth

This bold statement was put to me about ten years ago by Mervyn King, now Governor of the Bank of England, then Chief Economist of the Bank of England, shortly after I joined the Monetary Policy Committee of the Bank of England as an external member in June 1997. Like most bold statements, the assertion is not quite correct; the correct statement is that a decline in house prices does not make you worse off, that is, does not create a wealth effect on consumer demand.

The argument is elementary and applies to coconuts as well as to houses. When does a fall in the price of coconuts make you worse off? Answer: when you are a net exporter of coconuts, that is, when your endowment of coconuts exceeds your consumption of coconuts. A net importer of coconuts is better off when the price of coconuts falls. Someone who is just self-sufficient in coconuts is neither worse off nor better off.

Houses are no different from coconuts in this regard. The fundamental value of a house is the present discounted value of its current and future rentals, actual or imputed. Anyone who is

'long' housing, that is, anyone for whom the value of their home exceeds the present discounted value of the housing services they plan to consume over their remaining lifetime will be made worse off by a decline in house prices. Anyone 'short' housing will be better off. So the young and all those planning to trade up in the housing market are made better off by a decline in house prices. The old and all those planning to trade down in the housing market will be worse off. Another way to put this is that landlords are worse off as a result of a decline in house prices, while current and future tenants are better off. On average, the inhabitants of a country own the houses they live in; on average, every tenant is his/her own landlord and vice versa. So there is no net housing wealth effect. You have to make a distributional argument to get an aggregate wealth effect from a change in house prices (see the Appendix for a formal statement of this proposition).

Most econometric or calibrated numerical models I am familiar with treat housing wealth just like the value of stocks and shares as a determinant of household consumption. Their designers appear to forget that households consume housing services (for which they pay or impute rent) but not stock services. An example is the FRB/US model. It is used frequently by participants in the debate on the implication of developments in the US housing market for US consumer demand. A recent example is Frederic S. Mishkin's (2007) paper "Housing and the Monetary Transmission Mechanism". The FRB/US model *a-priori* constrains the wealth effects of housing wealth and other financial wealth to be the same. The long-run marginal propensity to consume out of non-human wealth (including housing wealth) is 0.038, that is, 3.8 percent. In several simulations, Mishkin increases the value of the long-run marginal propensity to consume out of housing wealth to 0.076, that is, 7.6 percent, while keeping the long-run marginal propensity to consume out of non-housing financial wealth at 0.038.

The argument for an effect of housing wealth on consumption other than the wealth effect, is that housing wealth is collateralisable. Households-consumers can borrow against the equity in their homes and use this to finance consumption. If they are credit-constrained, a boost to housing wealth would relax the credit constraint and temporarily boost consumption spending. Of course, the increased debt will have to be serviced, and eventually consumption will have to be below the level it would have been at in the absence of the mortgage equity withdrawal (MEW). At market interest rates, the present value of current and future consumption will not be affect by the MEW channel.

Ben Bernanke (2008), Don Kohn (2008), Fredric Mishkin (2007), Randall Kroszner (2007) and Charles Plosser (2007) all have made statements to the effect that the credit effect or MEW effect of a change in house prices is on top of the normal wealth effect. The benchmark should be that it is instead of the normal wealth effect. By overestimating the contractionary effect on consumer demand of the decline in house prices, the Fed may have been convinced to cut rates too fast and too far.

The will-o'-the-wisp of 'core' inflation

I assume that the Fed cares about price stability, now and in the future, defined in terms of a representative basket of consumer goods and services. Price stability of even an ideal cost of living index cannot, of course, be derived as an implication of standard microeconomic efficiency arguments. The Friedman rule gives us a zero risk-free nominal interest rate as the optimal monetary rule. New-Keynesian sticky price models of the Calvo-Woodford variety imply the optimality of a constant *relative* price of the goods and services whose prices can be set freely and optimally and the goods and services that are constrained by some simple heuristic. It does not yield an optimal inflation rate. Menu costs imply the optimality of

greater stability of the prices with the highest menu costs – in practice probably money wages.

I will, however, take it as given that the Fed's definition of price stability does involve a representative cost of living index. This means that the Fed does not care intrinsically about core inflation (inflation of a price index that excludes food and energy). Americans, after all, do eat, drink, drive cars, heat their homes and use air conditioning. The proper operational target implied by the Fed's price stability leg of its mandate is therefore headline inflation over the horizon that this can be targeted effectively by the central bank.

Core inflation is therefore relevant only to the extent that it is a superior predictor of future headline inflation, over the horizons that the Fed can influence headline inflation. To be relevant it must be a better predictor of medium-term future headline inflation not only than headline inflation itself, but than any readily available set of predictors. After all, the monetary authority should not restrict itself to univariate predictor sets.

Non-core prices tend to be set in auction-type markets for commodities. They are flexible. Core goods and services tend to have prices that are subject to short-run Keynesian nominal rigidities. They are sticky. The core price index and its rate of inflation tend to be less volatile than the index of non-core prices and its rate of inflation, and also than the headline price index and its rate of inflation. For extended periods in the past, core inflation also has been more persistent than non-core inflation and headline inflation. Depending on the time-period one uses, bivariate Granger-causality tests of headline and core inflation firmly point in all possible directions.

A good economist is never the slave of mechanical statistical relationships that may have prevailed over some historical sample period. Instead (s)he asks what economic forces might have brought about this statistical pattern and what economic forces might cause it to change might cause the future to be different from the past.

With what we know about this latest phase of globalisation - the rise of the BRICs - it is clear that the assumption that the relative price of core and non-core goods is expected to be constant, which (together with the still empirically valid assumption that the volatility of core inflation is less than the volatility of non-core inflation) underlies the use of core inflation as a predictor of future headline inflation, is bad economics. Indeed, since just after the start of the new millennium, the ratio of core to non-core prices or of the core price index to the headline price index, is has been rising predictably, driving a systematic, predictable negative wedge between the core and headline inflation rates. This is clear from Figures 15 and 16, which show the ratio of the headline to the core price index for the CPI and the PCE deflator, respectively.

Figure 15 here

Figure 16 here

The phenomenon driving the increase in the ratio of headline to core prices in recent years is well-understood. Newly emerging market economies like China, India and Vietnam have entered the global economy as demanders of non-core commodities and as suppliers of core goods and services. This phenomenon is systematic, persistent and ongoing.

When core goods and services are subject to nominal price rigidities but non-core goods prices are flexible, a relative demand or supply shock that causes a permanent increase (decrease) in the relative price of non-core to core goods will, for a given path of nominal policy rates (short-term nominal interest rates), cause a temporary increase in the rate of headline inflation, and possibly a temporary reduction in the rate of core inflation as well.

This pattern is apparent from Figures 17, 18, 19 and 20, which plot the headline inflation rate on the vertical axis against the difference between the rate of headline inflation and the core rate of inflation.

Figure 17 here

Figure 18 here

Figure 19 here

Figure 20 here

This is done, in Figures 17 and 18 for the CPI over, respectively, the 1958-2008 period and the 1987-2008 period. It is repeated in Figures 19 and 20 for the PCE deflator over, respectively, the 1960-2008 and the 1987-2008 periods. The association is if anything stronger for the shorter, more recent periods: when there is a continuing upward movement in the relative price of non-core goods to core goods, core inflation will therefore be poor predictor of future headline inflation for two reasons.

First, even if headline inflation were unchanged, core inflation would, for as long as the upward movement in the relative price of non-core goods continued, be systematically below both non-core inflation and headline inflation. Second, for a given path of nominal interest rates, the increase in the relative price of non-core goods will temporarily raise headline inflation above the level it would have been if there had been no shock leading to an increase in the relative price of non-core goods to core goods. When the increase in the relative price of non-core goods comes to a halt, headline inflation will not decline below the level it would have been at without the increase in the relative price of non-core goods. It would take a reversal of the shock leading to the increase in the relative price of non-core goods for headline inflation to fall below the path it would have been on in the absence of the increase in the relative price of non-core goods. The implication is that for many years now (starting shortly after the turn of the century), the Fed has missed the implications of the global increase in the relative price of non-core goods for the usefulness of core goods inflation as a predictor of future headline inflation. Medium-term inflationary pressures have been and continue to be higher than the Fed thinks they are.

CPI vs. PCE deflator

Communication with the broader public (all those not studying index numbers for a living) is made more complicated when the index in terms of which inflation and price stability are measured bears no obvious relationship to a reasonably intuitive concept like the cost of living. I believe the PCE deflator falls into the 'obscure indices' category. Furthermore, being a price *deflator* (current weighted), the PCE deflator (headline or core) will tend to produce inflation rates lower than the CPI deflator. Since 1987/01, the difference between the headline CPI and PCE deflator inflation rates has been 0.44 percent at an annual rate. The difference between the core CPI and PCE deflator inflation rates has been 0.45 percent. Over the longer period 1960/01-2008/03 the difference between the headline CPI and PCE

inflation rates has been 0.47 percent, that between core CPI and PCE inflation rates 0.55 percent. This further reinforces the inflationary bias of the Fed's procedures.

Disdain for the monetary aggregates

Monetary targeting died as a monetary policy tool because the velocity of circulation of any monetary aggregate turned out to be unpredictable and unstable. Even so, the decision to cease publishing M3 statistics effective 23 March 2006 was extraordinary. The reason given was: *"M3 does not appear to convey any additional information about economic activity that is not already embodied in the M2 aggregate. The role of M3 in the policy process has diminished greatly over time. Consequently, the costs of collecting the data and publishing M3 now appear to outweigh the benefits."*

Information is probably the purest of all pure public goods. The cost-benefit analysis argument against its continued publication, free of charge to the ultimate user, by a public entity like the Fed, is completely unconvincing. Broad monetary aggregates, including M3 and their counterparts on the asset side of the banking sector's balance sheet are in any case informative for those interested in banking sector leverage and other financial stability issues. The decision to discontinue the collection and publication of M3 data supports the view that the Fed took its eye off the credit boom ball just as it was assuming epic proportions.

The decision to discontinue publication of the M3 series also smacks of intellectual hubris; effectively, the Fed is saying: *we* don't find these data useful. Therefore *you* shall not have them free of charge any longer.

Limiting the damage of the current crisis versus worsening the prospects for the next crisis

There can be little doubt that the Fed has done most things right as regards dealing with the immediate liquidity crisis. First it used its existing facilities to accommodate the increased demand for liquidity. It extended the maturity of its discount window loans. It widened the range of collateral it would accept in repos and at the discount window. It created additional term facilities for existing counterparties through the TAF. It increased the range of eligible counterparties by creating the TSLF and the PDCF. And it stopped a run on the investment banks by bailing out Bear Stearns.

However, the way in which some of these putting-out-fires-manoeuvres were executed seems to have been designed to maximise bad incentives for future reckless lending and borrowing by the institutions affected by them. Between the TAF, TSLF, the PDCF and the rescue of Bear Stearns, the Fed and the US tax payer have effectively underwritten directly all of the 'household name' US banking system – commercial banks and investment banks – and probably also, indirectly, most of the other large highly leveraged institutions. This was done without the extraction of any significant quid-pro-quo and without proportional pain for shareholders, creditors and top managers of the institutions that benefited. The valuation of the collateral for the TSLF and the PDCF by the clearer acting for the borrowing primary dealer seems designed to maximise adverse selection. The discount rate cuts were infra-marginal transfer payments from the tax payers to the shareholders of banks already using or planning to use the discount window facilities. Asking for the decision to pay interest on bank reserves to be brought forward without insisting that required reserved remain non-remunerated likewise represents an unnecessary boon for the banking sector.

Cognitive regulatory capture of the Fed by vested interests

In each of the instances where the Fed maximised moral hazard and adverse selection, obviously superior alternatives were available – and not just with the benefit of hindsight. Why did the Fed not choose these alternatives? I believe a key reason is that the Fed listens to Wall Street and believes what it hears, or at any rate, acts as if it believes what Wall Street tells it. Wall Street tells the Fed about its pain, what its pain means for the economy at large and what the Fed ought to do about it. Wall Street's pain was indeed great – deservedly so in most cases. Wall Street engaged in special pleading by exaggerating the impact on the wider economy of the rapid deleveraging (contraction of the size of the balance sheets) that was taking place. Wall Street wanted large rate cuts fast so as to improve its solvency, not its liquidity, and Wall Street wanted the provision of ample liquidity against overvalued collateral. Why did Wall Street get what it wanted?

Throughout the ten months of the crisis, it is difficult to avoid the impression that the Fed is too close to the financial markets and leading financial institutions, and too responsive to their special pleadings, to make the right decisions for the economy as a whole. Historically, the same behaviour has characterised the Greenspan Fed. It came as something of a surprise to me that the Bernanke Fed, if not quite a clone of the Greenspan Fed, displays the same excess sensitivity to Wall Street concerns.

The main evidence to me of Fed excess sensitivity to Wall Street concerns are (1) the two cuts in the primary discount rate; (2) the decision to let the clearing bank acting for the primary dealer price the collateral offered by the primary dealer to the Fed in both the TSLF and the PDCF; (3) the modalities of the Bear Stearns rescue, and especially the roads not taken; (4) the proposal that interest be paid on reserves without making this conditional on interest not being paid on required reserves; and (5) the aggressive interest rate cuts since August 2007, and especially the 75 basis points cut on January 21/22 2008. It seems that the only news that could have prompted this cut was high-frequency movement in stock prices and the palpable fear in the financial sector, that the stock market rout in Europe on Monday 21th January 2008 (a US stock market holiday) and at the end of the previous week, would spill over into the US markets.[13]

As regards the cuts in the Federal Funds target rate, some of them are difficult to rationalise even with a Fed interpretation of its mandate that gives priority to the real economy over the maintenance of price stability. Instead they provide support for what used to be called the 'Greenspan put' hypothesis, but should now be called the 'Greenspan-Bernanke put' or 'Fed put' hypothesis.[14] I find it hard to rationalise in any other way the decision on 21 January, 2008 to implement a Federal Funds target rate cut of 75 bps, at an unscheduled meeting, and the announcement of that cut of normal working hours the next day.[15]

A complete definition of the 'Greenspan-Bernanke put' is as follows: it is the aggressive response of the official monetary policy rate to a sharp decline in asset prices (especially

13 Apparently the French central bank President had not bothered to inform his US counterpart, that a possible reason behind the stock market rout in Europe could be the manifestation of the stock sales prompted by the discovery at the Société Generale bank of the Kerviel exploits. If true it is extraordinary.

14 The term was coined as a characterisation of the interest rate cuts in October and November 1998 following the collapse of Long Term Capital Management (LTCM).

15 US stock markets were closed on Monday, January 21 for Martin Luther King Jr. Day. Seemingly in response to the fall in non-U.S. markets (and information provided by stock index futures markets), the Fed announced a surprise rate cut of 0.75% on Tuesday, 22 January at 8 a.m.

stock prices), even when the asset price falls (a) are unlikely to cause future economic activity to decline by more than required to meet the Fed's mandate and (b) do not convey new information about future economic activity or inflation that would warrant interest rate cuts of the magnitude actually implemented.

Mr Greenspan and many other 'put deniers' are correct in drawing attention to the identification problems associated with establishing the occurrence of a 'Greenspan-Bernanke put' with a reasonable degree of confidence. The mere fact that a cut in the policy rates supports the stock market does not mean that the value of the stock market is of any inherent concern to the policy maker. This is because of the causal and predictive roles of asset price changes already alluded to.

Nevertheless, looking at the available data as a historian, and constructing plausible counterfactuals as a laboratory economist, it seems pretty evident to me, that the Fed under both Greenspan and Bernanke has responded more vigorously with rate cuts to sharp falls in stock prices than can be rationalised with the causal effects of stock prices on household spending and private investment or with the predictive content of unexpected changes in stock prices.

To me, both the LTCM and January 21/22, 2008 episodes suggest that the Fed has been co-opted by Wall Street - that the Fed has effectively internalised the objectives, concerns, world view and fears of the financial community. This socialisation into a partial and often highly distorted perception of reality is unhealthy and dangerous.

It can be called *cognitive regulatory capture (or cognitive state capture)*, because it is not achieved by special interests buying, blackmailing or bribing their way towards control of the legislature, the executive, the legislature or some important regulator, like the Fed, but instead through those in charge of the relevant state entity internalising, as if by osmosis, the objectives, interests and perception of reality of the vested interest they are meant to regulate and supervise in the public interest instead.

The literature on regulatory capture, and its big brother, state capture, is vast (see e.g. Stigler(1971), Levine and Forrence (1990), Laffont and Tirole (1991), Hellman et. al. (2000) and Hanson and Yosifon (2003)). Capture occurs when bureaucrats, regulators, judges or politicians instead of serving the public interest as they are mandated to do, end up acting systematically to favour specific vested interests – often the very interests they were supposed to control or restrain in the public interest. The phenomenon is theoretically plausible and empirically well documented. Its application to the Fed is also not new. There is a long-standing debate as to whether the behaviour of the Fed during the 1930s can be explained as the result of regulatory capture (see e.g. Epstein and Ferguson (1984) and Philip et. al. (1991)).

The conventional choice-theoretic public choice approach to regulatory capture stresses the importance of collective action and free rider considerations in explaining regulatory capture (see Olsen (1965)). Vested interests have a concentrated financial stake in the outcomes of the decisions of the regulator. The general public individually have less at stake and are harder to organise. I prefer a more social-psychological, small group behaviour-based explanation of the phenomenon. Whatever the mechanism, few regulators have succeeded in escaping in a lasting manner their capture by the regulated industry. I consider the hypothesis

that there has been regulatory capture of the Fed by Wall Street during the Greenspan years, and that this is continuing into the present to be consistent with the observed facts.

There is little room for doubt, in my view, that the Fed under Greenspan treated the stability, well-being and profitability of the financial sector as an objective in its own right, regardless of whether this contributed to the Fed's legal triple mandate of maximum employment, stable prices and moderate long-term interest rates. While the Bernanke Fed has but a short track record, its rather panicky reactions and actions since August suggest that it too may have a distorted and exaggerated view of the importance of the financial sector for macroeconomic stability.

The ECB

The interest rate decisions of the ECB during the crisis are easily summarised. There has been no change in the official policy rate (the Main refinancing operations Variable rate tenders Minimum bid rate) since June 2007. It continues to stand at 4.00 percent. There has also been no change in the discount rate penalty: the Marginal lending facility continues to stand at 100 basis points above the official policy rate. There were no meetings on unscheduled dates or announcements at unscheduled hours.

The (excessively long) name of the ECB's official policy rate hints at the reason the ECB, like the Fed and the Bank of England, does not do a very good job at keeping the overnight interbank rate close to the official policy rate (see Figure 12). The official policy rate is implemented through a variable rate tender! Pegging a rate, like fixing any price, means that the pegger has to be willing and able to buy or sell any amount the market wishes to sell or buy at that rate. Clearly, targeting the overnight rate in the interbank market should be pursued through a fixed rate tender, with the central bank willing to lend (against suitable collateral) any amount at that rate and also to accept deposits in any amount at that rate. Once again, central bankers seem unable to resist the central planner's siren call of controlling both the price and quantity of reserve assets.

The European Central Bank immediately injected liquidity both overnight and at longer maturities on an very large scale indeed, but, at least as regards interbank spreads, with limited success (see Figures 9a, b and c). While it did not cut the policy rate or its discount rate, it refrained from raising rates as it had planned to do, and had effectively pre-announced following its last pre-crisis Governing Council rate-setting meeting on August 2. Since then there have been eight more meetings where rates have been kept on hold, but where the rhetoric much of the time hints at a bias towards further rate increases. The longer talk without action persists along these lines, the lower the credibility of the forward-looking statements of President Trichet. *"Speak loudly and carry a little stick"* is not a wise strategy for a central banker.

Unlike the Fed, the ECB has a lexicographic or hierarchical objective function with price stability in pole position. With its operational definition of price stability as inflation (measured by the HICP index) close to but below 2 percent per annum in the medium term, it must be a source of concern to the ECB that inflation has had a tendency to be systematically above target since 1999. While the deviations from target used to be small, this is no longer the case, with year-on-year inflation in April at 3.3 % (down from 3.6 % the previous month) and likely to rise quite smartly towards 4 percent in the next few months. Real economic

activity in the Euro Area is slowing down, but a significant slowdown is required to get inflation back on target.

Good survey-based data on inflation expectations don't exist for the Euro Area. The ECB publishes its quarterly Survey of Professional Forecasters, which includes inflation forecasts at 1, 2 and 5-year horizons (European Central Bank (2008)). They tend to flat-line at around 2.0 percent quarter after quarter. It is clear that the ECB has convinced the professional forecasters that it is serious about its price stability mandate. Whether it has convinced the markets or price and wage setters remains an unresolved issue. Market-based inflation expectations measures, whether derived from a comparison of yields on conventional and index-linked sovereign debt instruments or from inflation swaps, are not, I think, fit for purpose in the Euro Area (as in the UK and the US).

As regards its liquidity-enhancing open market interventions to deal with the immediate financial crunch, the ECB has been both lucky and smart. It was lucky because, as part of the compromise that created the supranational European Central Bank, the set of eligible collateral for open market operations and at the discount window and the set of eligible counterparties, were defined as the union rather than the intersection of the previous national sets of eligible collateral and eligible counterparties for the 11 countries that joined together to form the Eurosystem on January 1, 1999. As a result, the ECB could accept as collateral in its repos and at the discount window almost anything that did not move, including private securities (even equity) and asset-backed securities like residential mortgage-backed securities. The ratings requirements were also very loose compared to those of the Bank of England and even those of the Fed: eligible securities had to be rated at least in the single A category. The only dimension in which the ECB's eligible collateral was more restricted than the Bank of England's was that the ECB only accepts euro-denominated securities.

The ECB used the available liquidity instruments quite aggressively, injecting above-normal amounts of liquidity against a wide range of collateral at longer maturities (and mopping most of it up again in the overnight market). It is important to note that injecting X amount of liquidity at the 3-month maturity and taking X amount of liquidity out at the overnight maturity is not neutral if the intensity of the liquidity crunch is not uniform across maturities. The liquidity crunch that started in August 2007 clearly was not. Maturities of around 1 month were crucial for end-of-year reasons and maturities from 3 months to a year were crucial because that was where the markets had seized up completely.

I already discussed the swap facilities arranged with the Fed. I believe they were of symbolic significance only.

No major Euro Area bank has failed so far. Some small German banks fell victim to unwise investments in the ABS markets, and some fairly small hedge funds failed, but no institution of systemic importance was jolted to the point that a LLR rescue mission had to be organised.

I have one concern about the nature of the ECB's liquidity-oriented open market operations and about its collateral policy at the discount window. This concerns the pricing of illiquid collateral offered by banks. We know the interest rates and fees charged for these operations, and the haircuts applied to the valuations. But we don't know the valuations themselves. The ECB uses market prices when a functioning market exists. For much of the assets it accepts as collateral there is no market benchmark.

The ECB does not make the mistake the Fed makes with the pricing of the collateral offered at the PDCF and TSLF. The ECB itself determines the price/valuation of the collateral when there is no market price. But the ECB does not tell us what these prices are. We are told the interest rate charged, the fees and the haircut (discount) applied to its valuation of the collateral, but not what the prices of specific collateral items are. As with the Bank of England, we are told that market prices are used if liquid markets exist, but that does not really help in the current setting when much of the collateral offered is illiquid. We know that when there is no market price the ECB itself determines the price, but how it does this is not revealed, and neither are the prices that result from the process.

There is therefore the risk that banks use the ECB as lender of first resort rather than last resort, if the banks can dump low-grade collateral on the Fed and have it valued as high-grade collateral. For quite a few months now, market talk has it that Spanish and Dutch banks may be in that game, getting an effective subsidy from the ECB and becoming overly dependent on the ECB as the funding source of first choice.

Late May 2008, Fitch Ratings reported that Spanish banks had, during recent months, created ABS, structured to be eligible for use as collateral with the ECB, that were riskier than the asset-backed securities structures they put together before the crisis. In principle there is nothing wrong with that, as long as the valuation or pricing of these securities for collateral purposes reflects the higher degree of credit risk attached to them. One wonders whether such risk-sensitive pricing is actually taking place, especially when ECB officials publicly worry about the creditworthiness of securities accepted as collateral by the ECB when it provides liquidity to the markets or at the discount window. As long as the risk-adjusted rate of return the ECB gets on its loans is appropriate, there is nothing wrong with the ECB taking credit risk onto its balance sheet. But if it routinely values the mortgage-backed securities offered by the Spanish banks as if the mortgages backing the securities were free of default risk, then the ECB is bound to be overvaluing the collateral it is offered.

It is essential that all the information required to verify whether the pricing of collateral accepted by the ECB is subsidy-free be in the public domain. That information is not available today.

If the collateral offered the ECB were subject to default risk, there could be a case for concern even if *ex-ante*, the default risk is appropriately priced. In the event a default occurs (that is, if both the counterparty borrowing from the ECB defaults and at the same time the issuer of the collateral defaults), the ECB will suffer a capital loss. In practice, it would be one of the national central banks (NCBs) of the Euro Area that would suffer the loss rather than the ECB, as open market operations tend to be mainly done by the NCBs.

Although the ECB's balance sheet is small and its capital tiny, the consolidated Eurosystem has a huge balance sheet and a large amount of capital (see Buiter (2008)). The balance sheet could probably stand a fair-sized capital loss. But a very large capital loss would threaten the ability of the Eurosystem to remain solvent while adhering to its price stability mandate. The ECB/Eurosystem would need to be recapitalised, but by which national fiscal authorities and in which proportions? Unlike the Fed and the Bank of England, where it is clear which fiscal authority stands behind the central bank and is ready to recapitalise it should the need arise, the fiscal vacuum within which the ECB, and to some degree the rest of the Eurosystem also, operate, leaves a question mark behind the question: who would bail out the ECB? Given

that uncertainty, it may be understandable that ECB officials are more concerned than Fed and Bank of England officials about carrying credit risk on their balance sheet.

The ECB appears much less moved by the groans and moans emitted by the Euro Area financial sector lobby than the Fed appears to be by Wall Street. This is not surprising, as the ECB does not have a supervisory or regulatory role over Euro Area financial institutions and markets. Capture is therefore less likely.

The Bank of England

The Bank of England kept its official policy rate at 5.75 percent until December 6, when it made a 25bps cut. Further 25 bps cuts followed on February 7, 2008 and April 10, 2008, so Bank Rate now stands at 5.00 percent. The discount rate (Standing Lending Facility) penalty over Bank Rate stayed constant at 100bps. There were no meetings or policy announcements on unscheduled dates or at unscheduled times.

It is clear from Figure 12, that the reforms in its sterling money market management framework of May 2006 did no more than raise the level of the Bank of England's performance as regards keeping the overnight interbank rate close to the official policy rate, from rather worse than the Fed and the ECB to as bad as the Fed and the ECB. Its 'Reserve-averaging scheme' is, like the Fed's and ECB's arrangements, a doomed attempt to fix both price and quantity (the interest rate paid on overnight reserves and the amount of reserves held, on average, over the reserve maintenance period). It should be scrapped and replaced by a simple, permanent fixed rate tender and payment of the same interest rates on any quantity of deposits banks may wish to hold.

CPI inflation has crept up to three percent, one percentage point above the Bank of England's official target, and is expected to continue to rise until the end of the year (see Figure 1b). Real economic activity is slowing down, from a peak annual growth rate of real GDP of 3.3 percent round 2007 Q3, to a rate expected to be below the growth rate of potential output for 2008 and much of 2009 (See Figure 2b and Figure 2c). Like the ECB, the Bank of England's official mandate is lexicographic in price stability. It is therefore risking its anti-inflationary credibility by cutting rates with inflation not only well above target but rising.

Survey-based inflation expectations are indeed rising. The Bank of England's own survey shows that when asked in April 2008 to give the current rate of inflation, respondents gave a median answer of 3.9%, a series high, compared with 3.2% in the November 2007 survey, the previous series high. Median expectations of the rate of inflation over the coming year were 3.3%, also a series high, compared with 3.0% in November, the previous series high.

When the crisis started, the Bank of England injected liquidity on a modest scale, at first only in the overnight interbank market. Rather late in the day, on September 19, 2007, it reversed this policy and offered to repo at 3-month maturity, and against a wider than usual range of eligible collateral, including prime mortgages, but subject to an interest rate floor 100 basis points above Bank Rate, that is, effectively at a penalty rate. No one came forward to take advantage of this facility; fear of being stigmatised may have been as important a deterrent as the penalty rate charged.

Since then, the Bank has gradually moved towards become a full-fledged MMLR, with a number of special auctions at one-month and three-month maturities against a wider range of collateral, including prime mortgages and securities backed by mortgages.

On April 21, 2008 the Bank announced the creation of the Special Liquidity Facility (SLF), in the first instance for £100bn, which would lend Treasury bills for one year to banks against collateral that included RMBS, covered bonds and asset backed securities based on credit card receivables. Technically, the arrangement was described as a swap, although it can fairly be described as a one-year collateralised loan of Treasury bills to the banks. It is similar to the TSLF created for primary dealers in the US, although the maturity of the loans is longer (one year as against one month in the US).

The Bank of England has made much of the fact that the SLF will only accept as collateral securities backed my 'old' mortgages, that is, mortgages issued before the end of 2007. The facility is meant to solve the 'stock overhang' problem but not to encourage the banks to engage in new mortgage lending using the same kind of RMBS that have become illiquid. It is not obvious that without the government (not necessarily the Bank of England) lending a hand, securitisation of new mortgages will get off the ground any time soon. And I believe that securitisation of mortgages is a useful instrument, even if it was misused, by securitising home loans that should never have been made in the first place. Since the crisis started, there has not been a single new residential mortgage-backed issue in the markets in the UK.

The Bank of England itself determines the valuation of any illiquid assets offered as collateral in the SLF. This should help it avoid the adverse selection problem created by the Fed with its PDCF and TSLF. The haircuts and other terms of the SLF were also quite punitive, judging from the howls of anguish emanating from the banking community, who nevertheless are making ample use of the Facility. As with the Fed and the ECB, the Bank of England does not make public the information about the actual pricing of specific collateral. Without that information, we cannot be sure there is no subsidy to the banks involved in the arrangement. There can also be no proper accountability of the Bank to Parliament or to the public for its management of public funds.

The Northern Rock debacle

Just before the Northern Rock crisis blew up, on 12 September 2007 (in a Paper submitted to the Treasury Committee by Mervyn King, Governor of the Bank of England) the Bank of England asserted the following:

"…the moral hazard inherent in the provision of ex post insurance to institutions that have engaged in risky or reckless lending is no abstract concept".

On September 13, 2007, the announcement came that the Bank of England, as part of a joint action by HM Treasury, the Bank of England and the Financial Services Authority (according to the Memorandum of Understanding between these three parties), had provided lender of last resort assistance to Northern Rock, a specialist mortgage lender, by providing it with a credit line (the purpose-designed Liquidity Support Facility). Without this, Northern Rock, which funds itself mainly in the wholesale markets, would not have been able to meet its financial obligations. At its peak the Bank had lent about £25bn to Northern Rock, secured against Northern Rock's assets (mainly prime mortgages).

Even today we don't know any of the details of how this reported credit line is secured, how any draw-downs of this credit line are collateralised or what the cost to Northern Rock of using the Facility is. The severity of the penalty rate charged Northern Rock will also be important in determining the long-term moral hazard damage caused by this operation.

It is clear that Northern Rock did not have enough assets on its books that met the collateral requirements of the Bank of England at its discount window or in its repos. Should Northern Rock have had sufficient collateral eligible for rediscounting at the Bank of England's Standing (collateralised) Lending Facility, it presumably would have done so, rather than invoking this emergency procedure involving the Bank, the Financial Services Authority (FSA), Northern Rock's Regulator, and the Treasury.

Collateral eligible for rediscounting at the Bank of England's Standing Lending Facility consisted of sterling and euro-denominated instruments issued by UK and other European Economic Area central governments, central banks and major international institutions rated at least Aa3 (and, exceptionally, US Treasury bonds). Compared to the collateral accepted at their discount windows by the Fed and the ECB, this was by far the most restrictive list of eligible collateral. That same restrictive set of collateral is still all that can be rediscounted at the Bank of England's Standing Lending Facility today.

The same restrictive set of eligible collateral also governed the Bank's liquidity-oriented open market operations (mainly through repos). Here there has been a relaxation of the eligibility criteria.

The Bank's September 12 Paper recognises conditions when this kind of support operation mounted for Northern Rock could be justified:

"…, central banks, in their traditional lender of last resort (LOLR) role, can lend "Against good collateral at a penalty rate" to any individual bank facing temporary liquidity problems, but that is otherwise regarded as solvent. The rationale would be that the failure of such a bank would lead to serious economic damage, including to the customers of the bank. The moral hazard of an increase in risk-taking resulting from the provision of LOLR lending is reduced by making liquidity available only at a penalty rate. Such operations in this country are covered by the tripartite arrangements set out in the MOU between the Treasury, Financial Services Authority and the Bank of England. Because they are made to individual institutions, they are flexible with respect to type of collateral and term of the facility".

The MOU states in paragraph 14:

14. In exceptional circumstances, there may be a need for an operation which goes beyond the Bank's published framework for operations in the money market. Such a support operation is expected to happen very rarely and would normally only be undertaken in the case of a genuine threat to the stability of the financial system to avoid a serious disturbance to the UK economy."

It is clear that the conditions for a justifiable LLR operation, as specified in the MOU and reiterated in the Bank's September 12 Paper, were not satisfied.

Was Northern Rock illiquid but solvent?

No hard evidence has been offered to support the frequently-heard assertion (from Northern Rock, the Treasury, the Bank of England and the FSA) that Northern Rock (total assets £113 bn as of 30 June 2007) suffered just from illiquidity rather than from the threat of insolvency. Delinquencies on its mortgages were said, during the Fall of 2007, to be below the average of the UK mortgage lending industry, and that indeed would be good news if true. The assertion is heard rather less frequently these days. If true, it would be surprising. Northern Rock had followed an extremely aggressive and high-risk strategy of expansion and increasing market share, funding itself in the expensive wholesale markets for 75% of its total funding needs, and making mortgage loans at low and ultra-competitive effective rates of interest. When the wholesale markets froze in August 2007, Northern Rock ran soon out of sources of market liquidity and funding liquidity.

In the first half of 2007, Northern Rock accounted for over 40 percent of the gross mortgage lending in the UK, and for 20 percent of the net. It is hard to see how with such a breakneck rate of expansion, it is possible to maintain adequate quality control over the lending process. Creditworthiness vetting must have slipped – there are limits to the speed of organic growth.

In addition, the bank reputedly offered mortgages up to six times annual income, and packages of mortgage and (unsecured) personal loans adding up to 125 percent of the value of the collateral for the mortgage. That seems reckless and a strategy designed to end up with non-performing loans. There is some information surely in the fact that Northern Rock's share price had been in steep decline since February of this year, well before the financial market turmoil hit.

In my view, the solvency of Northern Rock is a matter still to be determined. As usual, there is no hard information to go by.

Was Northern Rock too systemically significant to fail?

Second, it is hard to argue that the survival of Northern Rock was necessary to avoid a genuine threat to the stability of the UK financial system, or to avoid a serious disturbance to the economy. The bank was not 'too large to fail'. As the fifth largest mortgage lender in the UK, it was not systemically significant.

When all else fails, the 'threat of contagion' argument can be invoked to justify bailing out even intrinsically rather small fish, but irrational contagion, that is, contagion not justified by objective balance sheet and off-balance sheet interdependencies, is extremely rare in practice, and could have been addressed directly, through effective deposit insurance arrangements or other deposit guarantees and lender of last resort support.

With a reasonable deposit insurance arrangement (say one insuring personal retail deposits up to £50,000 and capable of making full payment on the insured deposits in no more than a couple of working days), Northern Rock could and should have been left to sink or swim on its own, or with any private sector assistance it might be able to drum up without the support of the UK taxpayer.

The UK's dysfunctional deposit insurance regime

It came as a shock to many who thought they understood the UK financial sector, that the UK did not have even a minimally effective deposit insurance regime. One hundred percent insurance applied only to the first £2000 and of the next £33,000 only ninety percent was insured. Worse, it could take more than six months to get your money back, even if it was

insured. This created an invitation for a run as soon as there was any suspicion attached to the viability of Northern Rock. The invitation was accepted and a run on the deposits of Northern Rock started on September 14. The Chancellor ended up guaranteeing not just the retail deposits of Northern Rock but virtually all its unsecured creditors, except for subordinated debt holders.

It was also made clear by the Chancellor, that both the deposit guarantee extended by the Treasury to Northern Rock and the Liquidity Support Facility managed by the Bank of England would be extended to any UK bank that found itself in similar circumstances to Northern Rock. This effectively socialised the risk of the UK banking sector.

The UK has no Special Resolution Regime for banks in difficulties

In a well-designed regulatory regime, there would have been a Special Resolution Regime (SRR) for banks under which Northern Rock could have been restructured and if necessary wound down and liquidated in an orderly manner. This SRR would have permitted Prompt Corrective Action, the ring-fencing of the assets, with the bank remaining open to manage existing exposures and commitments, the appointment of an administrator with full powers, the firing of the top management and the board and the disenfranchisement of the shareholders and their placement at the back of the queue of claimants. The bank could have been declared regulatorily insolvent even if the conventional balance sheet or ability-to-meet-your-obligations tests for insolvency were not yet satisfied.

Again quite extraordinarily, there was and is no Special Resolution Regime for banks in the UK, although we are likely to get one soon. In the UK, when a bank goes into administration, its deposits are frozen – another reason for getting your deposits out of any suspect bank asp.

After trying unsuccessfully to find a private buyer for Northern Rock, the government announced the nationalisation of the bank on February 18, 2008. It is unlikely that the shareholders will receive anything. Whether the tax payer will earn a competitive risk-adjusted rate of return on his exposure to Northern Rock remains to be seen.

Lessons to be learnt by the UK Authorities

The way the crisis unfolded damaged the prestige and international standing of the City of London - the financial capital of the world – more than the other leading financial centres.[16] The damage is manageable and remediable, but only if effective steps are taken to correct the many manifest weaknesses of the UK financial system that were brought to light by the crisis. I believe there are 6 lessons for the UK authorities.

(1) The Tripartite Arrangement between the Treasury, the Financial Services Authority and the Bank of England for dealing with financial instability is flawed. Responsibility for this design flaw must be laid at the door of the man who created the arrangement - the former Chancellor and current Prime Minister, Gordon Brown. The Treasury, as the dominant

16 The damage done by weaknesses in the design of the framework for financial stability and the implementation of policy by the three key players, the Treasury, the FSA and the Bank of England should not be exaggerated. The position of London as the world's primary financial centre is threatened more by its grossly inadequate transportation infrastructure, its excessive cost of living (especially housing) and sub-standard and/or wildly expensive primary and secondary education facilities than by anything connected with the recent financial crisis.

partner in the arrangement, also bears primary responsibility for the way in which the Tripartite Arrangement performed operationally during this crisis.

A key problem with the arrangement is that it puts the information about individual banks in a different agency (the FSA) from the agency with the liquid financial resources to provide short-term assistance to a troubled bank (the Bank of England). This happened when the Bank lost banking sector supervision and regulatory responsibility on being made operationally independent for monetary policy by Gordon Brown in 1997. It is clear this separation of information and resources creates problems.

There are two solutions. Either the relevant elements of banking supervision and regulation (those having to do with liquidity management) are returned to the Bank of England, or the FSA is given an uncapped and open-ended credit line with the Bank of England, guaranteed by the Treasury. With discretionary access to liquid resources, the FSA can perform the Lender of Last Resort function vis-à-vis individual troubled institutions. The Bank of England would of course retain the Market Maker of Last Resort function of providing liquidity to markets and supporting systemically important financial instruments.

If the Bank were to regain all of banking supervision and regulation - two deeply political activities - its independence could be jeopardised, especially its operational independence for monetary policy. One solution to this problem could be to take the Monetary Policy Committee out of the Bank of England. The Governor of the Bank of England would no longer be the Chairman of the MPC, although I suppose he (or she) could still be an external member. The MPC would just set the target rate for the overnight interbank market. The Bank would act as agent for the MPC in keeping the overnight rate as close to the official target as possible. Anything else (including liquidity-oriented interventions at maturities longer than overnight, discount window borrowing and foreign exchange market intervention), and all other LLR and MMLR responsibilities would be the province of the Bank of England, not of the MPC.

The problem of regulatory capture cannot be avoided. If the FSA remains the main bank regulator and supervisor, it will be most at risk of capture. If it is also given control of LLR financial resources, the returns to capture would be magnified. If the Bank of England is given some regulatory and supervisory functions vis-à-vis the banking system, even if these are restricted to liquidity matters, regulatory capture of the Bank by the City would become more likely. Taking the MPC out of the Bank might be a partial solution to that problem.

(2) Create an effective deposit insurance regime for retail deposits. It isn't hard, but it is urgent.

(3) Create a Special Resolution Regime for banks (possible for all large HLIs) along the lines found in the US for commercial banks. Again, this is urgent.

(4) The FSA did not properly supervise Northern Rock. It failed to recognise the risk attached to Northern Rock's funding model. Stress testing was inadequate. Liquidity has to be central in banking supervision and regulation - on a par with solvency.

(5) The Bank of England should recognise that the spread between, say, three month Libor and the expected policy rate over the three month period can reflect liquidity risk premia as well as default risk premia. In its memo to the Treasury Committee of September 12, the

Bank got close to arguing that this spread reflected just anticipated default risk. That makes no sense.

Liquidity can vanish in the 3-month interbank market today, because market participants with surplus liquidity fear that both they themselves and their potential counterparties today could be illiquid in the future (three months from now), when the loans would have to be repaid. A credible commitment by the central bank to provide (overnight) liquidity in the future (three months from now) would solve the problem, but it is apparent that the required credibility simply does not exist. Therefore, the only time-consistent solution, in the absence of a credible commitment mechanism, is for the central bank to intervene today at a three-month maturity.

The Bank of England should aim, through repos at these longer maturities, to eliminate as much of the 'term structure of liquidity risk premia' as possible. This corrects a market failure. It does not create moral hazard if the collateral in the repos is priced properly (that is, punitively).

Point (5) assigns to the Bank the responsibility to be the market maker of last resort, to provide the public good of market liquidity when disorderly markets disrupt financial intermediation and threaten fundamentally viable institutions.

(6) The Bank should lend at the discount window at longer maturities than overnight. Following the US example, loans of up to one year should be available against a wide range of collateral (punitively priced). The discount window would become, for all banks and on demand, as long as they have suitable collateral, what the purpose-built Liquidity Support Facility for Northern Rock has been since September 2007.

5. Conclusion: Why The Sky Is Not Falling In Both Wall Street and Main Street?

When all the relevant lessons have been learnt and all appropriate recommendations implemented, we still will not have a system in which banks cannot fail or in which systemic instability cannot take hold. Hyman Minsky (1982) has a lot to teach us about financial instability. Robert Merton (1990, 1992) has nothing to say about it – at least not intentionally.

The need for financial regulation to constrain leverage

Capitalism, based on greed, private property rights and decentralised decision making, is both volatile, cyclical and subject to bouts of financial manic-depressive illness. There is no economy-wide auctioneer, no enforcer of systemic 'transversality conditions' to rule out periodic explosive bubble behaviour of asset prices in speculative markets. It's unfortunate, but we have to live with it. The last time humanity tried to do away with these excesses of capitalism, we got central planning, and we all know now how well that worked. Hayek and Keynes were both right.

Regulation should try to curb some of the more egregious excesses of a decentralised capitalist market economy, but without killing the goose that lays the golden eggs. External control and regulation is especially important in the financial sector, because finance is trade in promises. Given trust and confidence (however misplaced), financial balance sheets and

financial activity in general can be scaled up almost instantaneously to any extent. The physical housing stock or the assembly lines at Boeing cannot be scaled up ten-fold in a matter of months. In finance, the size of balance sheets is only limited by willingness to believe.

This means that during periods of euphoria and optimism, financial activity, the size of balance sheets and leverage can increase very rapidly and effectively without bound. When euphoria turns to despondency, despair, fear and panic, optimism to pessimism, and leveraging up to deleveraging – the contraction of financial balance sheets and the collapse of financial activity can occur even more rapidly. There is no spontaneous, self-equilibrating mechanism here, other than letting the full force of the financial crisis do its work. For better or worse, no government and no regulator with LLR and MMLR resources at their disposal have been able to stand by and let this happen, when they have the means at their disposal to intervene in the process. This simple political economy fact explains how the fundamental asymmetry of government intervention in the financial sector comes about. It also suggests the solution: introduce limits on the ability to leverage up and to expand the size of balance sheets for all financial institutions.

In the UK, the tendency towards 'light-touch' regulation, de-regulation and self-regulation has probably swung too far. It will, however, be difficult to tighten up unilaterally, as business would no doubt be lost to other jurisdictions with more relaxed standards. Regulation of financial markets and institutions at the EU level would be a major step forward. After that, intergovernmentalism, that is, cooperation between national (or supranational) regulators and tax authorities, will have to take over, to stop the regulatory race to the bottom from discrediting financial globalisation altogether.

The worst of the current financial crisis is over

The present financial crisis has not yet run its course, but we are likely to have seen the worst. This is clear from Figures 9a, b and c, which show the spread of Libor over the OIS rate in the US, the Euro Area and the UK, but more clearly from the evolution of CDS spreads in Figures 10 and 11. It is also consistent with some more encouraging news on asset market transactions volumes. True, there still has not been an issue of new RMBS in the UK since the summer of 2007, but some covered bonds (backed by mortgages) have been issued and there have been some private placements. In Canada, whose crisis story is quite unique and deserves a full treatment in its own right, the central bank is about to declare victory in its war on the ABCP overhang.

The correction of the global under-pricing of risk from 2003 till the beginning of 2007 has manifested itself beyond the US sub-prime residential mortgage markets, the instruments backed by these mortgages and the institutions exposed to them. Higher-rated residential mortgages in the US and in Europe have suffered similar corrections. So did commercial real estate-backed mortgages and securities backed by them, securities backed by car loans and credit card receivables, and unsecured consumer credit of all kinds. Unsustainable construction, housing market and residential lending booms occurred not only in the US, but also in the UK, Spain, Ireland, the Baltics and other CEE countries like Bulgaria. The banking systems in these countries are all experiencing rising default rates on loans to the construction sector and on home loans, now that these bubbles have burst. But the comprehensive paralysis of financial wholesale markets and the complete vanishing of virtually all forms of securitisation is gradually becoming a thing of the past.

Since December 2007, industrial country and emerging market equity markets have declined significantly, to the point that the conclusion I reached in November 2007 in my earlier study of the financial crisis (Buiter (2007)), that industrial country equity markets had not yet been affected by the re-appraisal and repricing of risk that had shaken the credit markets and the markets for many other financial instruments, no longer is appropriate. While further equity market corrections, in the advanced industrial countries and in some of the formerly most bubbly emerging markets are certainly possible, they can no longer be expected with confidence.

There remains pervasive uncertainty about the value of the credit ratings granted to complex structured products during the period from 2003 to the first half of 2007, and about the value of the various enhancements to these products, including the credit risk insurance provided by the 'monolines' and other financial institutions that diverted from their traditional businesses into the more profitable insurance of complex structured products.

Sovereign risk has been re-priced. Even within the Eurozone, the spread of 10-year Treasury bond yields over Bunds has increased from the 10 bps to 20 bps range to the 40 bps to 50 bps range for highly indebted, fiscally fragile countries like Greece and Italy. Belgium's spread over 10-year Bunds is now in the 20s. These spreads are likely to widen further when the budgetary positions of these countries worsen as the Eurozone goes into a cyclical downturn.

A 'normal' cyclical downturn is on the way, re-inforced by the global need to bring down inflation

It is true that at the same time that the sharp edge is taken off the liquidity squeeze, the US, the Euro Area and the UK have all entered economic downturns – downturns that were in the cards in any case, given the inflationary pressures that had built up because of excessively accommodating central bank monetary policy in the past, and because of the adverse terms of trade shocks suffered by the North Atlantic area. Any downturn creates financial distress. Following closely behind the acme of the liquidity squeeze, life for the financial sector and for borrowers everywhere in the North Atlantic is going to be tough for at least a couple more years.

In the emerging markets, including all the BRICS except Brazil, inflation is not just rising but rising so fast it suggests a major loss of control. Inevitably, during the next couple of years, China, India, Russia, Turkey, Argentina, Vietnam, Ukraine, Kazakhstan and most of Eastern Europe will have to slam on the monetary and fiscal brakes to bring inflation under control. This will further dampen growth prospects also for the North Atlantic area. Emerging market risk is being repriced at more realistic levels at last.

Reasons for optimism

There are, however, also convincing signs that the outline of a systemic stabilisation and recovery sometime in the second half of 2009 is beginning to take shape. Leading commercial banks in the US, the Euro Area and the UK have put their off-balance-sheet offspring back onto their balance sheets. Many commercial banks and some investment banks have engaged in rights issues to restore capital ratios to more conservative levels. The deep pockets of the nouveaux riches in the Gulf Cooperation Council and the Far East, including sovereign wealth funds from the Gulf, China and Singapore are being tapped to restore the balance sheets of the most badly affected banks and other financial institutions. Many more deals like this will follow.

When the dust settles on this crisis, a significant share of the North-American and West-European financial sectors will be owned and controlled by residents of emerging markets, including the emerging sovereigns and their wealth funds. This will be accompanied by a shift in diplomatic and political power to the new creditor nations.

The monetary authorities of the leading industrial countries are likely to have learnt an important lesson about the public good nature of market liquidity. While liquidity can be managed privately, by private financial institutions hoarding liquid assets, this is socially inefficient if it extends beyond the private provision of the liquidity levels required for orderly market conditions. It is more likely today that, even in the UK, the monetary authorities are willing and ready to do what simple applied welfare economics tells them to do: to provide liquidity on a large scale should the need arise, say, because of disorderly conditions in systemically important financial markets.

Most importantly, the credit boom of 2003-2007 did not lead to a massive bout of across-the-board over-investment in physical capital, with the possible exception of investment-driven emerging markets like China. The only sectoral exceptions in the industrial countries are residential construction in the US, Spain, Ireland, the Baltics and a few other emerging markets in CEE, and massive overexpansion of the financial sector almost everywhere in the industrial world. In these countries (the US, Spain, Ireland, the UK, the Baltics) the contractionary effects of lower residential investment are now being felt. But in the most systemically important of these countries, the US, residential construction accounts for barely 4.5 percent of GDP. The damage even a complete collapse of house prices can do through the residential construction channel is therefore limited.

There appears to be no real threat of widespread excess capacity through a sudden massive expansion of the 'supply side' of the economy, except again in a country like China, which had a massive investment boom and continues to do so. The financial position (balance sheets and financial deficits) of the non-financial corporate sectors throughout the industrial world was strong around the middle of 2007. Almost a year later, it is weaker than it was, but still stronger than usual at the beginning of a slowdown or recession. The bulk of the financial excess has stayed inside the financial sector or has involved the household sector.

When the financial sector is but one layer deep – banks intermediating between households and non-financial corporations, a stock market and a bond market in the most extreme example, the collapse of the net worth of the financial sector institutions and the contraction of the gross balance sheet of the financial sector can seriously impair the entire intermediation process. The spillovers into the real economy – household spending and investment spending – are immediate and direct. This was the picture in the Great Depression of the 1930s.

Today, the financial sector is many layers deep. Most financial institutions interact mainly with other financial institutions rather than with households or non-financial enterprises. They lend and borrow from each other and invest in each others' contingent claims. Some of this financial activity is socially productive. Much of it is privately profitable but socially wasteful churning.

The visible sign of this growth of intra-financial sector intermediation/churning is the growth of the gross balance sheets of the financial sector and the growth of leverage, both in the strict sense of, say, assets to equity ratios and in the looser sense of the ratio of gross financial

sector assets or liabilities to GDP. During the 5 years preceding the credit crunch, this financial leverage was rising steadily, without much significant impact on real GDP. If it had to be brought back to its 2002 level over a five-year period, it is likely that no-one would notice much of an impact on real GDP. The orderly, gradual destruction of 'inside' assets and liabilities need not have a material impact on the value of the 'outside' assets and on the rest of the real economy.

But financial sector deleveraging and leveraging is not a symmetric process, in the same way that assets price booms and busts are not symmetric. Compared to the deleveraging phase, the increasing leverage phase is gradual. Rapid deleveraging creates positive, dysfunctional feedback between falling funding liquidity, distress sales of assets, low market liquidity, falling asset prices and further tightening of funding liquidity. The LLR and MMLR roles of the central bank, backed by the Treasury, are designed to prevent excessively speedy, destructive deleveraging. If it does that, there can be massive gradual deleveraging in the financial sector, without proportional impact on households and non-financial corporates.

The key question then becomes whether and to what degree the decline in housing wealth (in the US and a number of other countries) and the general tightening of the cost and availability of credit will adversely affect household spending in the advanced industrial countries. While the *sign* of the effect is clear - consumption will weaken - its *magnitude* is not. The increasing cost and decreasing availability of household credit is likely to affect and constrain mainly those households wishing to engage in new or additional borrowing. The increased burden of servicing outstanding household debt, especially unsecured debt, is as likely to lead to higher defaults as to reduced consumer spending.

In the US, much mortgage lending is non-recourse. In addition, personal bankruptcy has become, especially in the US, a much less painful and harsh option than it used to be. This means that it is the shareholders of the financial institutions that have made the non-recourse and unsecured loans, as much as the households who took out these loans, that will suffer the financial impact of the increased cost and decreased availability of credit. If these shareholders are typically not liquidity-constrained, unlike the defaulting borrowers, the net effect on consumption of widespread mortgage defaults should be mild and could even be positive. There will be further effects on spending through the credit channel because, as a result of the write-offs and write-downs, the financial institutions whose debt has been defaulted on become capital-constrained and curtail further lending. As always, those most affected will be new would-be borrowers, households and corporates.

It is still likely, in my view, that the economic fall-out from the financial crisis will be contained mainly within the financial sector. It is clear that, following the overexpansion of the residential construction sector in the US and in a few European countries, and following the massive overexpansion of the financial sector just about everywhere in the industrial world during the past decade, there is now likely to be an extended retrenchment in both sectors, through lower employment, lower profits and lower equity valuations.

From the point of view of the efficient allocation of resources in the medium and long term, the relative (probably even absolute in the short run) contractions of the residential construction sectors (in a few countries) and of the financial sectors almost everywhere in the industrial world, is a desirable development. For a number of years now, the private returns in the financial sector have exceeded the social returns by an ever-growing margin. Too much scarce analytical and entrepreneurial talent has been attracted into activities that, while

privately profitable and lucrative, were socially zero-sum at best. In the short run, this cutting down to size of 'Wall Street' and 'the City' will inevitably have some negative side effects for Main Street also. In the medium and long term, however, a more balanced sectoral allocation of the best and the brightest will be beneficial.

Final lessons

Central banks have been reminded that they always have a dual mandate, macroeconomic stability and financial stability. Central banks that have been given operational independence for the conduct of monetary policy have discovered that the unavoidable role of the central bank as lender of last resort and market maker of last resort co-exists uncomfortably with the institutional structures that have been created to conduct monetary policy. When monetary policy making is identified with setting the official policy rate (or perhaps setting the exchange rate), under orderly market conditions, the deliberative and decision making structure of a monetary policy committee makes sense. When markets become disorderly and illiquid, different judgements and skills may be required. At the very least, the operational responsibilities of monetary policy committees for liquidity management should be clarified and spelled out explicitly.

In deciding the role of the central bank as supervisor and regulator of banks, other financial sectors and financial markets, the issue of regulatory capture must be faced. It is no accident, in my view, that the only one of the three central banks considered in this study to exhibit manifest excess sensitivity to financial sector concerns is the Fed - the only one of the three with a formal regulatory function vis-à-vis the banking sector. The benefits to the quality of monetary policy, liquidity management and the performance of the LLR and MMLR functions from greater information about and familiarity with individual banks and other financial institutions appear to come bundled with an excessive internalisation by the central bank of the objectives, fears and worldview of the banks and other financial institutions they supervise and regulate.

Openness and accountability are the best antidote against regulatory capture. This is true emphatically in the performance of the central banks' LLR and MMLR functions. To discourage future moral hazard (in the form of excessive risk taking), the central bank should make sure that any securities accepted as collateral or purchased outright at the discount window, through repos or through any special-purpose liquidity facility it may have created, are valued properly, that is, punitively.

It is in this area that concerns exist as regards all three central banks. The Fed's procedures for pricing collateral at the TSLF and PDCF are an invitation to the primary dealers and their clearers to collude at the expense of the central bank and thus of the tax payer. The procedures of the ECB and the Bank of England in this area are not flawed the way the Fed's procedures are. However, in the UK and the Euro Area too, we still do not have the information in the public domain that is required to make an informed judgement about the extent, if any, to which borrowing banks are being subsidised by the ECB or the Bank of England through an overvaluation of the collateral they offer. This must change.

The short-run pain, concentrated in the financial sector, and especially in the banking and investment sector and its off-balance-sheet offspring, is not suffered in silence. There is an army of reporters and newscasters standing by to report each anguished howl from every CEO whose bank has just written down another chunk of careless CDO or CLO exposure. But as long as the monetary authorities take their mandates seriously – including their duty to

act, at a price, as lenders of last resort and market makers of last resort – and as long as the financial market hysteria/gloom and doom does not spread to the real economy, this major financial market kerfuffle and massive financial sector deleveraging should result in no more than a rather mild cyclical downturn around a robust upward trend.

Appendix 1
Housing wealth isn't wealth

The demand for housing services by a representative competitive household

For sake of brevity, I consider an integrated household-construction firm, rather than the household and business entity separately. The structure of preferences is irrelevant to the result, as long utility is increasing in consumption of housing services and consumption of non-housing goods and services. What matters for the result are the representative agent assumption (which implies there is no redistributional effects of house price changes) and the assumption of housing autarky (everyone always consumes their endowment of housing services).

A utility-maximising infinite-lived competitive representative household maximizes the time-additive objective function in (1) subject to the instantaneous budget identity (2), the solvency constraint (3), the relationship between the household's endowment of housing services at time *t* and the stock of housing capital it owns at time *t* (4), and the housing stock accumulation equation (5).

$$W(t) = \int_t^{\infty} e^{-\theta(s-t)} \ln\left(\rho^{\eta}(s)c^{1-\eta}(s)\right) du \qquad \theta > 0; 0 < \eta < 1 \tag{1}$$

$$\dot{A}(t) = r(t)A(t) + w(t) - \tau(t) - c(t) - p(t)\left(\rho(t) - k(t)\right) - I(t) - \frac{\gamma}{2}\frac{\left(I(t) - (\delta + n)K(t)\right)^2}{K(t)} \tag{2}$$

$$\lim_{s\to\infty} e^{-\int_t^s r(u)du} A(s) \geq 0 \tag{3}$$

$$k(s) = \alpha(s)K(s), \ \alpha > 0 \tag{4}$$

$$\dot{K} = I - \delta K \tag{5}$$

Real financial wealth held by the household, excluding the value of the stock of housing it owns, is denoted *A*. The pure rate of time preference is $\theta > 0$. For simplicity, both the intertemporal substitution elasticity and the static substitution elasticity between consumption of housing services, ρ, and other consumption, *c*, are assume to equal *1*. No part of the proposition that there is no wealth effect from a change in house prices depends on this simplification. The real wage is *w*, and real taxes net of transfers τ. For simplicity, labour supply is assumed inelastic and scaled to unity.

The household at time *t* owns a housing stock $K(t)$ which yields a flow of housing services $k(t) = \alpha K(t), \ \alpha > 0$. The household can increase the housing stock it owns by investing or disinvesting in housing, subject to quadratic adjustment costs. Gross investment in housing is denoted I, $\delta > 0$ is the depreciation rate of the housing stock, *n* is the natural growth rate of the economy and $\gamma \geq 0$ measures the adjustment costs. The relative price of a unit of housing services and other consumption is p.

Note that in any period, the household is free to consume housing services in excess of its endowment of housing services ($\rho > k$, that is, the household is short *current* housing

services) or less than its endowment ($\rho < k$,that is, the household is long *current* housing services). In addition, the households can be long lifetime housing services ($\int_t^\infty e^{-\int_t^s r(u)du}\left(\rho(s)-k(s)\right)ds > 0$), that is, the present discounted value of current and future housing services endowments exceeds the present discounted value of current and future consumption of housing services, or it can be short lifetime housing services ($\int_t^\infty e^{-\int_t^s r(u)du}\left(\rho(s)-h(s)\right)ds < 0$).

Let the present discounted value of current and future after-tax labour income or human capital be denoted *H*:

$$H(t)=\int_t^\infty e^{-\int_t^s r(u)du}\left(w(s)-\tau(s)\right)ds \tag{6}$$

and let $R(t)$ be the present discounted value of the current and future real resource cost of investing in houses:

$$R(t)=\int_t^\infty e^{-\int_t^s r(u)du}\left(I(s)+\frac{\gamma}{2}\frac{\left(I(s)-(\delta+n)K(s)\right)^2}{K(s)}\right)ds \tag{7}$$

The solvency constraint (3), the instantaneous budget identity (2) and (6) permit us to write the intertemporal budget constraint of the household as follows:

$$A(t)+H(t)-R(t)=\int_t^\infty e^{-\int_t^s r(u)du}\left[c(s)+p(s)\left(\rho(s)-k(s)\right)\right]ds \tag{8}$$

All we need to establish the absence of any wealth effect of a change in the price of the stock of residential housing on consumption other than the consumption of housing services is to note that in equilibrium, in a representative agent model, every tenant is his own landlord and every landlord is his own tenant:

$$\rho(s)=k(s),\ s\geq t \tag{9}$$

Since at each point in time, *t*, every homeowner consumes just his endowment of housing services that period, there is no income effect from a change in the current rental rate, $p(t)$. It follows that the household is also self-sufficient in lifetime housing services, neither short nor long.

$$\int_t^\infty e^{-\int_t^s r(u)du}p(s)\left(\rho(s)-k(s)\right)=0 \tag{10}$$

Then, given (10) and (14), we can rewrite the intertemporal budget constraint as:

$$\int_t^\infty e^{-\int_t^s r(u)du}c(s)ds=A(t)+H(t)-R(t) \tag{11}$$

Without even any recourse to the optimality conditions for household consumption, but just from a consideration of the intertemporal household budget constraint (equation (8)) and the equilibrium assumption of 'housing autarky' (equation (10)), it follows that the present discounted value of current and future non-housing consumption is independent of the current value of the housing stock.

We can put some icing on this cake by considering the first-order conditions for housing and non-housing consumption: for all $s\geq t$:

$$\frac{\rho(s)}{c(s)} = \left(\frac{\eta}{1-\eta}\right) p(s)^{-1} \tag{12}$$

$$\lambda(s) = \lambda(t) e^{-\int_t^s (r(u)-\theta)du} \tag{13}$$

$$(1-\eta)c(t)^{-1} = \lambda^A(t) \tag{14}$$

$$\lambda^A \left[1 + \gamma\left(\frac{(I-(\delta+n)K}{K}\right)\right] = \lambda^K$$

or (15)

$$I = \left[\delta + n + \frac{1}{\gamma}\left(\frac{\lambda^K}{\lambda^A} - 1\right)\right] K$$

$$\dot{\lambda}^K = \left[\delta - \left(\frac{p\alpha + \gamma(\delta+n)\left(\frac{I}{K} - (\delta+n)\right) + \frac{\gamma}{2}\left(\frac{I}{K} - (\delta+n)\right)^2}{1 + \gamma\left(\frac{I}{K} - (\delta+n)\right)}\right)\right] \lambda^K \tag{16}$$

Define $q(t) \equiv \dfrac{\lambda^K(t)}{\lambda^A(t)}$, then

$$\dot{q} = (r+\delta)q - \left(p\alpha + \gamma(\delta+n)\left(\frac{I}{K} - (\delta+n)\right) + \frac{\gamma}{2}\left(\frac{I}{K} - (\delta+n)\right)^2\right) \tag{17}$$

and

$$I = \left(\delta + n + \frac{1}{\gamma}(q-1)\right) K \tag{18}$$

Here λ^A is the co-state variable of real private non-housing wealth (measured in units of non-housing consumption), whose equation of motion is given in (2), that is, the present value shadow price of private financial non-housing wealth, and λ^K is the co-state variable on the stock of housing, that is, the present value shadow price of housing, whose equation of motion is given in (3). The variable q is the present value shadow price of housing, measures in units of utility. It corresponds to Tobin's marginal *q*. Because the production function for housing services and the adjustment cost function are constant returns to scale in the housing capital stock and rate of investment, it also corresponds to Tobin's average *q* – the value of a unit of installed housing, that is, the price of a house.

We can solve (17) forward to yield

$$q(t) = \int_t^\infty e^{-\int_t^s ((r(u)+\delta))du} \left[p(s)\alpha(s) + \gamma(\delta+n)\left(\frac{I(s)}{K(s)} - (\delta+n)\right) + \frac{\gamma}{2}\left(\frac{I(s)}{K(s)} - (\delta+n)\right)^2\right] ds \tag{19}$$

$$+B(t)$$

The first term on the RHS of (19) is the fundamental value of a unit of installed housing, that is, its shadow price. For future reference, when I interpret *q* not as a shadow price in a dynamic optimisation problem, where the boundary conditions for optimality ensure that the shadow price supports the optimum (that is, $B(t) = 0$), but rather as an asset market price set in a market where there is no invisible transversality-condition-imposing hand, there can also be a bubble term *B(t)* in (19). If the bubble is (myopically) rational, then $\dot{B} = (r+\delta)B$.

From equations (11) to (14), we can obtain the following consumption functions. Aggregate consumption of both housing services and non-housing goods and service is denoted $C = p\rho + c$:

$$c(t) = \theta\left[A(t) + H(t) - R(t)\right] \tag{20}$$

$$\rho(t) = \frac{1}{p(t)}\left(\frac{\eta}{1-\eta}\right)\theta\left[A(t) + H(t) - R(t)\right] = \alpha(t)K(t) \tag{21}$$

$$C(t) = \left(\frac{1}{1-\eta}\right)\theta\left[A(t) + H(t) - R(t)\right] \tag{22}$$

It is clear from equations (19), (20), (21) and (22) , that, provided there is no housing bubble ($B(t) = 0$), current consumption of non-housing goods and services, $c(t)$ is independent of the value of the current housing stock, $q(t)K(t)$.

Likewise, current consumption of housing services, $p(t)\rho(t)$ is independent of the value of the current housing stock, and so is aggregate consumption of all goods and services, $C(t)$.

The present discounted value of the real resource cost of *future* investment in housing $R(t) = \int_t^{\infty} e^{-\int_t^s r(u)du}\left(I(s) + \frac{\gamma}{2}\frac{\left(I(s) - (\delta + n)K(s)\right)^2}{K(s)}\right)ds$ may of course be affected by the same factors that cause a change in the value of the existing housing stock, but that is a quite separate matter from a wealth effect. This effect of house prices is recognized through the investment function, given in equation (18), which makes gross housing investment an increasing function of Tobin's *q*.

I summarise this as a Proposition:

Proposition 1: In a representative agent model, a change in the fundamental value of a unit of installed housing does not change aggregate consumption demand, the demand for housing services or the consumption demand for non-housing goods and services.

Why the common error?

How did so many of students of consumption behaviour and wealth effects miss this obvious point?

The most likely reason is that the standard consumption function is the decision rule of an individual, or an aggregate of individuals. When studying consumption behaviour, equilibrium conditions are not normally imposed on these decision rules. On the whole this is good practice – the fact that prices and economy-wide aggregate quantities taken as parametric by individuals are in fact endogenously determined by the interaction of these price-taking and economy-wide aggregates-taking economic agents, does not mean that it is not helpful to treat individual decision rules and equilibrium conditions conceptually distinct. But when we deal with general equilibrium responses to policies or shocks, the equilibrium conditions do of course have to be imposed. This was obviously not done in such papers as Mishkin (2007).

Without imposing the 'you own the house you rent' or 'housing autarky' assumption (9) or (10), the non-housing consumption and housing consumption can, respectively, be written as given by:

$$c(t) = (1-\eta)\theta\left(A(t) + H(t) + \int_t^\infty e^{-\int_t^s r(u)du} p(s)k(s)ds - R(t) \right)$$

and (23)

$$p(t)\rho(t) = \eta\theta\left(A(t) + H(t) + \int_t^\infty e^{-\int_t^s r(u)du} p(s)k(s)ds - R(t) \right)$$

Aggregate consumption without the housing autarky assumption can therefore be written as:

$$C(t) = \theta\left(A(t) + H(t) + \int_t^\infty e^{-\int_t^s r(u)du} p(s)k(s)ds - R(t) \right) \tag{24}$$

Since

$$\theta\int_t^\infty e^{-\int_t^s r(u)du} p(s)k(s)ds = \theta\left(K(t)\int_t^\infty e^{-\int_t^s r(u)du} p(s)\alpha(s)ds + \int_t^\infty e^{-\int_t^s r(u)du} p(s)\alpha(s)\big(K(s)-K(t)\big)ds \right)$$

and $K(s) = K(t)e^{-\delta(s-t)} + \int_t^s I(u)e^{-\delta(s-u)}du$, aggregate consumption of both housing and non-housing goods and services, $C \equiv c + p\rho$, can be written as:

$$C(t) = \theta\left(\begin{array}{l} A(t) + H(t) - R(t) + K(t)\int_t^\infty e^{-\int_t^s (r(u)+\delta)du} p(s)\alpha(s)ds \\ + \int_t^\infty e^{-\int_t^s r(s)ds} p(s)\alpha(s)\int_t^s e^{-\delta(s-u)} I(u)duds \end{array} \right) \tag{25}$$

The fourth term inside the big brackets in equation (25), $K(t)\int_t^\infty e^{-\int_t^s (r(u)+\delta)du} p(s)\alpha(s)ds$, looks like the value of the current housing stock. In the absence of adjustment costs to housing investment ($\gamma = 0$), it would indeed be the value of the current housing stock, $q(t)K(t)$. In that case the aggregate consumption function can be written as:

$$C(t) = \theta\left(\begin{array}{l} A(t) + K(t)q(t) + H(t) \\ -\int_t^\infty e^{-\int_t^s r(s)ds} I(s)ds \\ + \int_t^\infty e^{-\int_t^s r(s)ds} p(s)\alpha(s)\int_t^s e^{-\delta(s-u)} I(u)duds \end{array} \right) \tag{26}$$

If we identify housing with the exogenously given, unaugmentable and non-depreciating endowment of nature ('land'), then $I = \delta = 0$ and the aggregate consumption function can be written as:

$$C(t) = \theta\big(A(t) + K(t)q(t) + H(t) \big) \tag{27}$$

This is the a simple version of the standard 'permanent income' consumption function where aggregate consumption is proportional to the sum of aggregate non-human and human wealth, and where aggregate non-human wealth includes the value of the housing stock (or rather the value of the land). However, when we impose the housing autarky assumption, equation (27) becomes

$$C(t) = \left(\frac{1}{1-\eta}\right)\theta\left[A(t) + H(t)\right] \tag{28}$$

and the irrelevance of housing wealth for aggregate consumption demand is confirmed.

Qualifications of the housing wealth irrelevance result

Wealth isn't well being

At the risk of belabouring the obvious, Proposition 1 says that a change in house prices does not lead to any change in consumption demand in a representative agent model. However, from (9) and (4) it follows (see also equation (21)) that $\rho(t) = \alpha(t)K(t)$. So clearly, a larger physical stock of housing capital increases equilibrium consumption of housing services and makes you better off. Wealth (the value of your endowments) bears no obvious relation to utility in any case, as wealth values the infra-marginal units at the marginal utility of the last unit: in a world without scarcity, all endowments would be valued at zero and wealth would be zero, but utility would be maximal.

Changes in housing wealth due to a housing bubble

Consider the case where the change in the house price is due to a bubble rather than to a change in fundamental value, that is, $B(t) \neq 0$ in equation (19). For reasons of space, consider the case where housing is land ($I = \delta = 0$). Even if households are autarkic in housing (the present discounted value of current and future consumption of housing services equals the present discounted value of the current and future services yielded by the housing stock they own today), the price of the house exceeds the value of their endowment of current and future housing services by the amount of the bubble. So the aggregate consumption function (28) becomes,

$$C(t) = \left(\frac{1}{1-\eta}\right)\theta\left[A(t) + H(t) + B(t)\right] \tag{29}$$

In this simple model, the marginal propensity to spend out of a change in house prices due to a change in the bubble component of the house price is the same as the marginal propensity to consume out of any other component of wealth.

Distributional effects, including intergenerational distribution

A decline in house prices redistributes wealth from those for whom the value of the housing stock they own is greater than the present discounted value of their future consumption of housing services to those for whom the value of the housing stock they own is less than the present discounted value of their future consumption of housing services. A house price decline redistributes wealth from homeowners to tenants. This means that the young, and all others planning to trade up in the housing market in the future will benefit from a decline in house prices. The old and all others planning to trade down in the housing market in the future will lose when house prices fall. The size or even the sign of the net effect on aggregate consumption demand of such redistributional changes are, as far as I know, not well established. An overlapping generations model is the natural vehicle for analyzing these intergenerational distributional effects. Other distributional effects can occur in open economies where the residents are tenants of non-resident landlords.

Credit or collateral effects

Finally, unlike human capital, housing wealth is collateralisable. This means that households can borrow using the value of the homes they own as security. Unsecured borrowing is more expensive than secured borrowing and may often not be possible on any terms. With free labour (no slavery or indentured labour), future labour earnings cannot legally be collateralised. Housing wealth therefore permits credit constraints to be relaxed. A decline in house prices reduces the amount households can borrow (through 'mortgage equity withdrawal' or MEW).

In his simulation of the effect of a house price decline on consumption and investment demand in the US, Mishkin (2007) captured this credit effect of a change in house prices by assigning to housing wealth twice the long-run marginal propensity to consume (0.076) than that assigned to other financial wealth (0.038). This is wrong for two reasons.

First, without the credit effect, the marginal propensity to consume out of housing wealth would be zero, not 0.038. At most therefore, Mishkin should have assigned the value 0.038 to the marginal propensity to consume out of housing wealth, not 0.076.

However, even 0.038 is likely to be an overestimate of the long-run marginal propensity to consume out of housing wealth. The debt incurred through MEW has to be serviced. Although current consumption will be higher as a result of a household's ability to relax a borrowing constraint by increasing the size of its mortgage, future consumption will be lower. At market interest rates, the present discounted value of current and future consumption does not change as a result of a decline in house prices and the associated. tightening of the credit constraint. Modelling the credit effect of a house price decline properly would introduce it as a tightening of a borrowing constraint, but with the household's intertemporal budget constraint satisfied both in the benchmark (with borrowing collateralised against property) and in the counterfactual simulation (with lower MEW). It may not be easy to determine reliably when the consumption-increasing effect of reduced debt service will kick in and dominate the consumption-reducing effect of reduced borrowing potential for a credit-constrained household, but to assume, as Mishkin does, that it never kicks in surely makes no sense.

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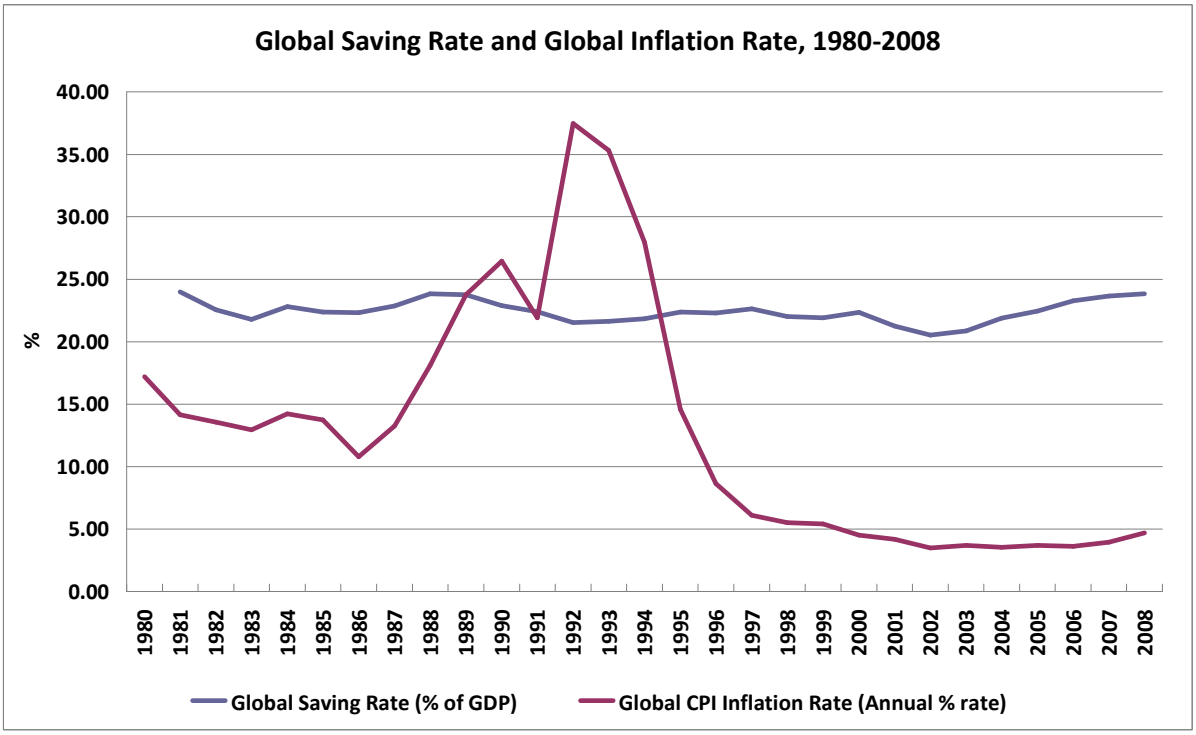
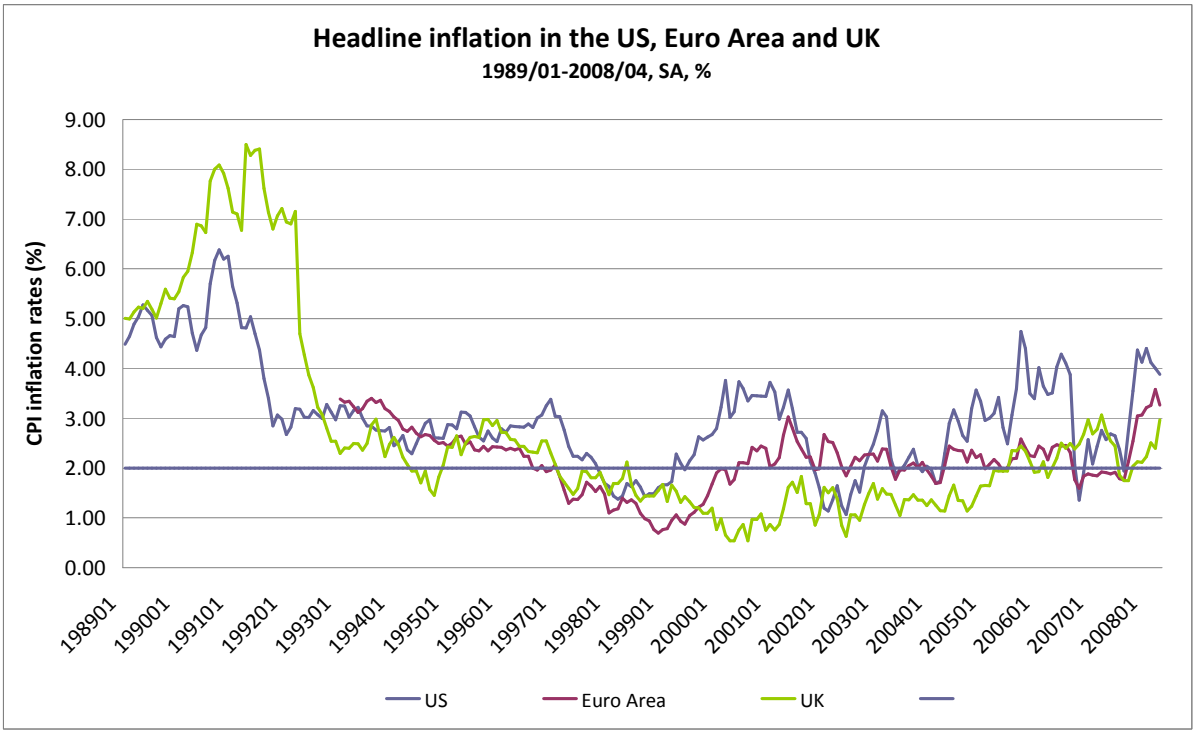
Figure 1a



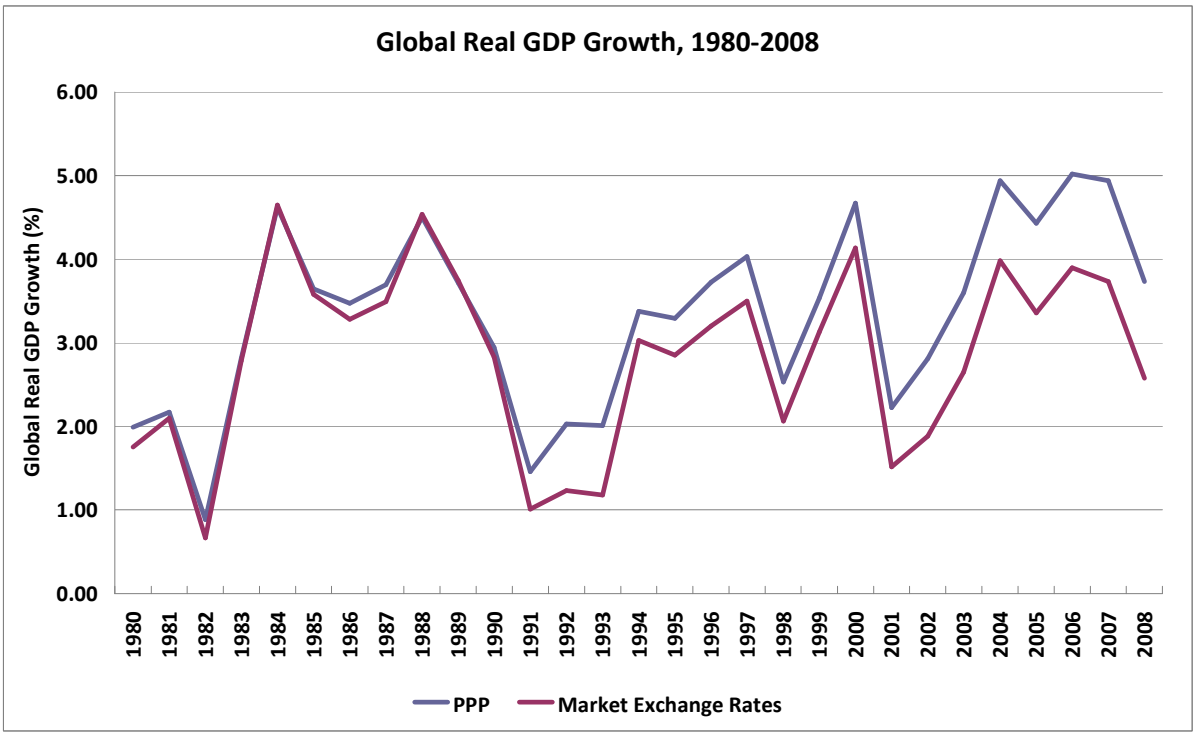
Source: IMF World Economic Outlook, April 2008

Figure 1b



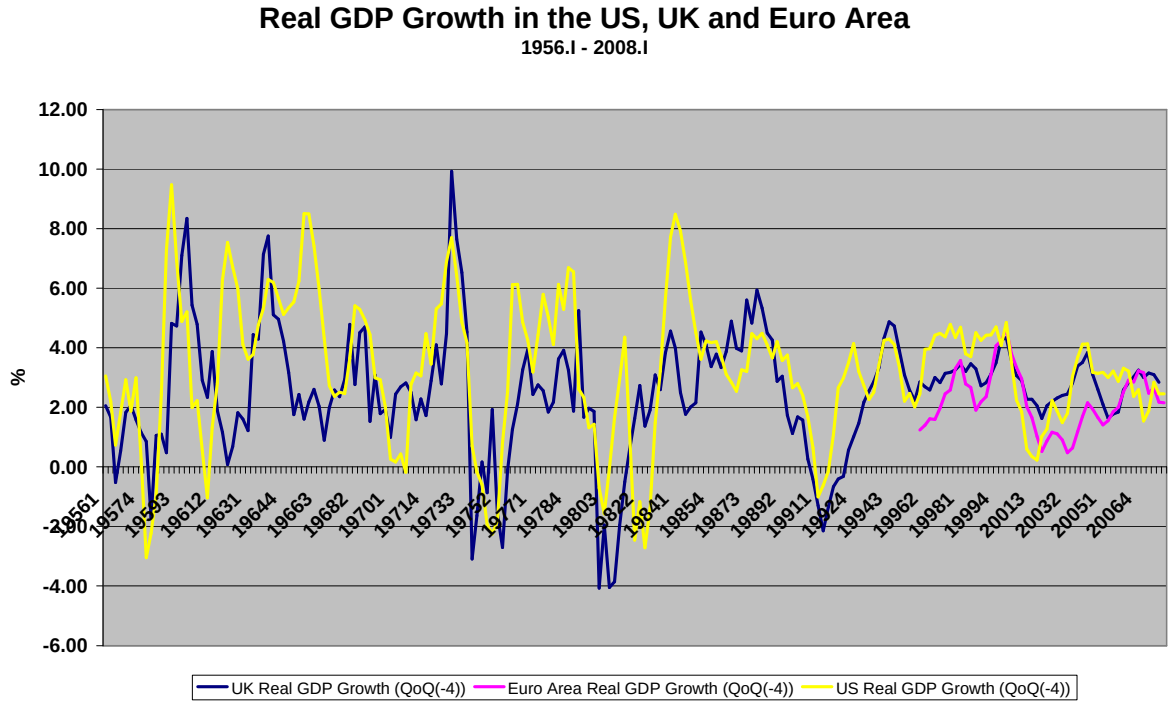
Source: IMF WEO April 2008

Figure 2a



Source: IMF WEO April 2008

Figure 2b



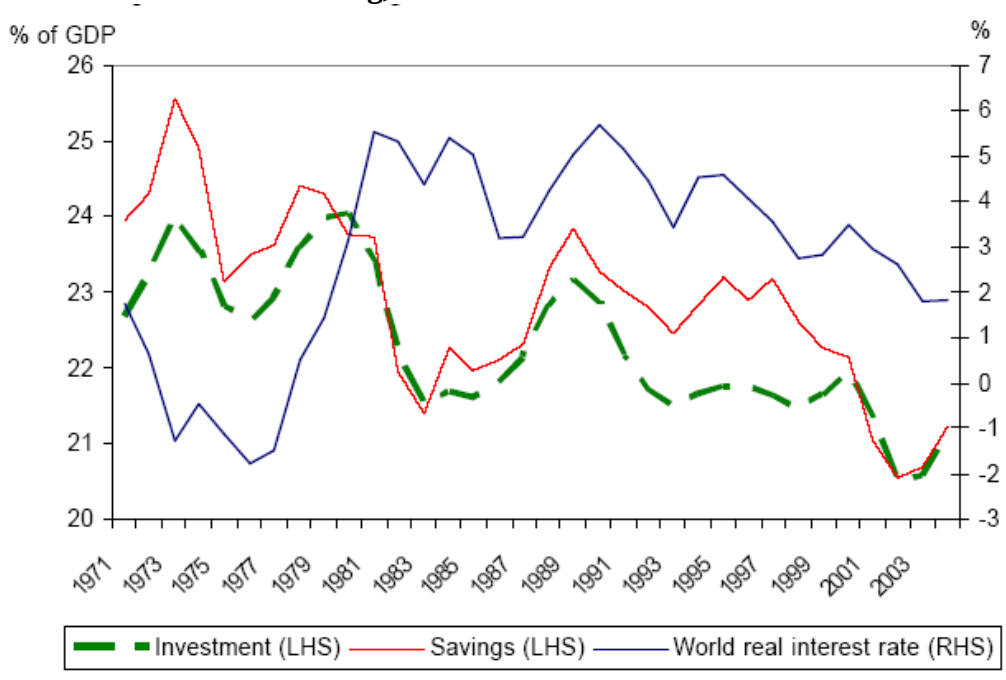
Source: Bureau of Economic Analysis, Eurostat

Figure 2c

Real GDP Growth in the US, the UK and the Euro Area
1996.I - 2008.I

Source: Bureau of Economic Analysis, Eurostat

Figure 3
Global Saving, Investment and Real Interest Rate



Sources: World Bank, BIS, IMF, Bank of Canada calculations.

Figure 3 is taken from Desroches and Francis (2007).

Figure 4
US Sub-prime mortgage delinquency rate

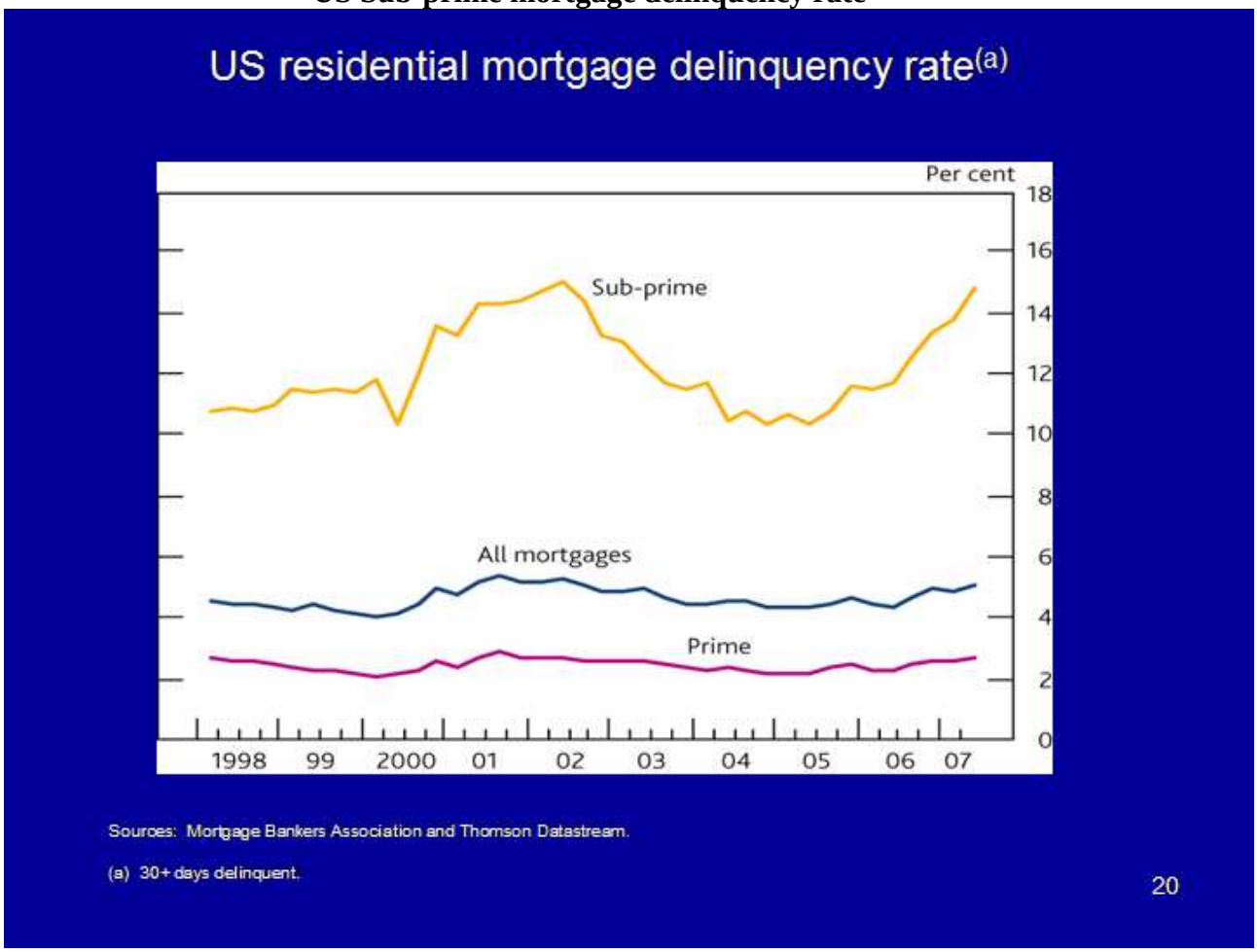


Figure 5
Prices of US Sub-prime Mortgage Credit Default Swaps

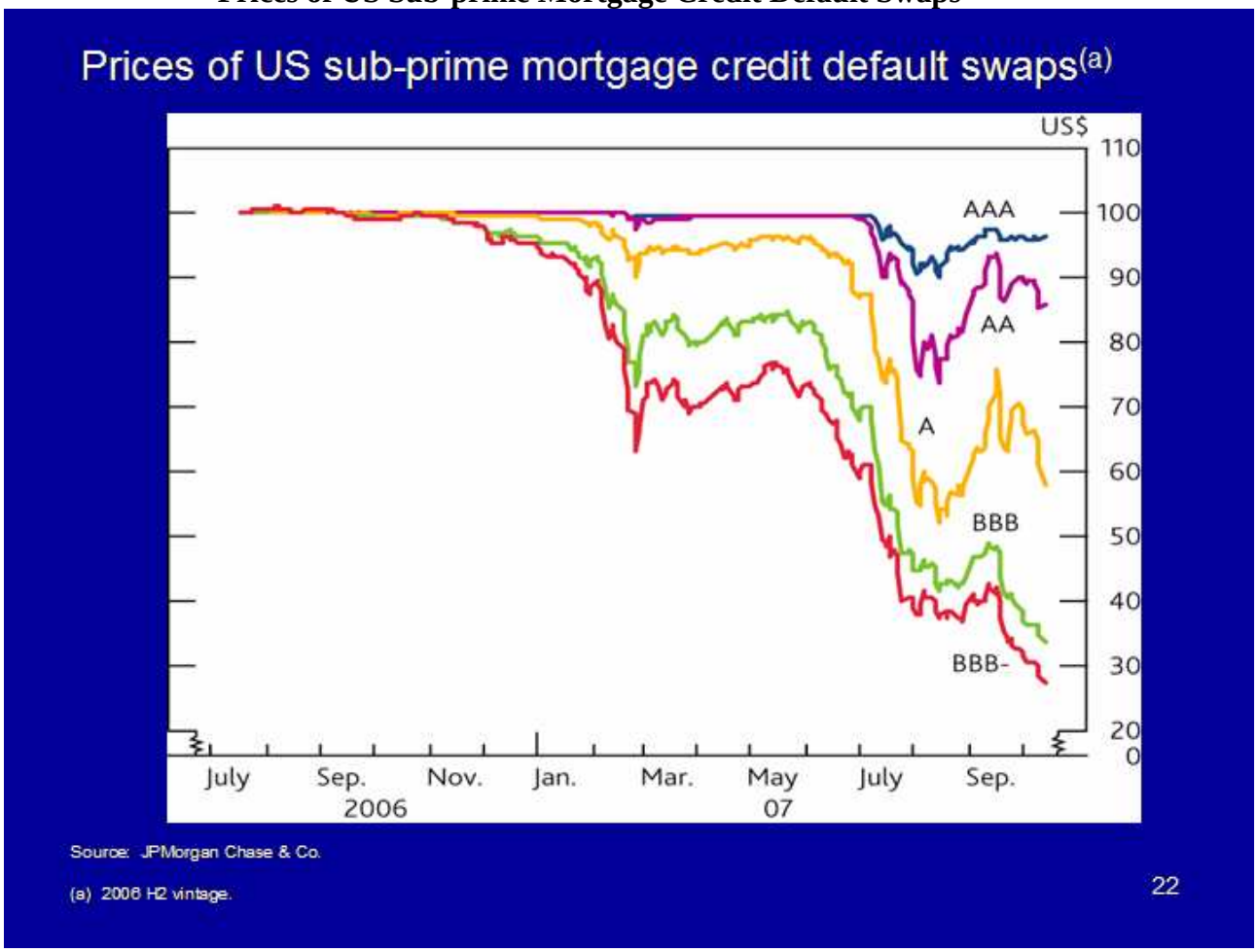


Figure 6
Sterling Corporate Bond Spreads

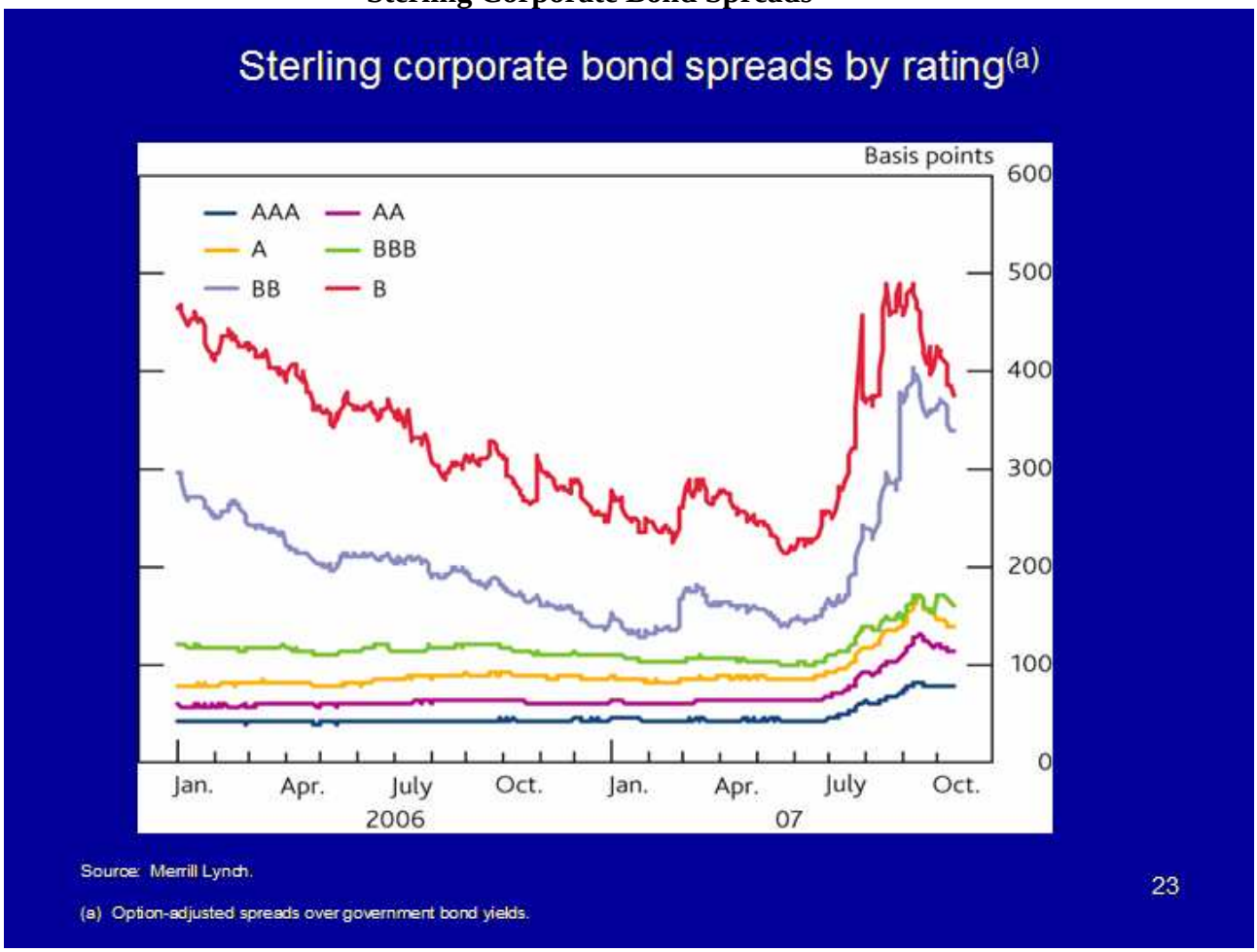


Figure 7
Global CDO Issuance

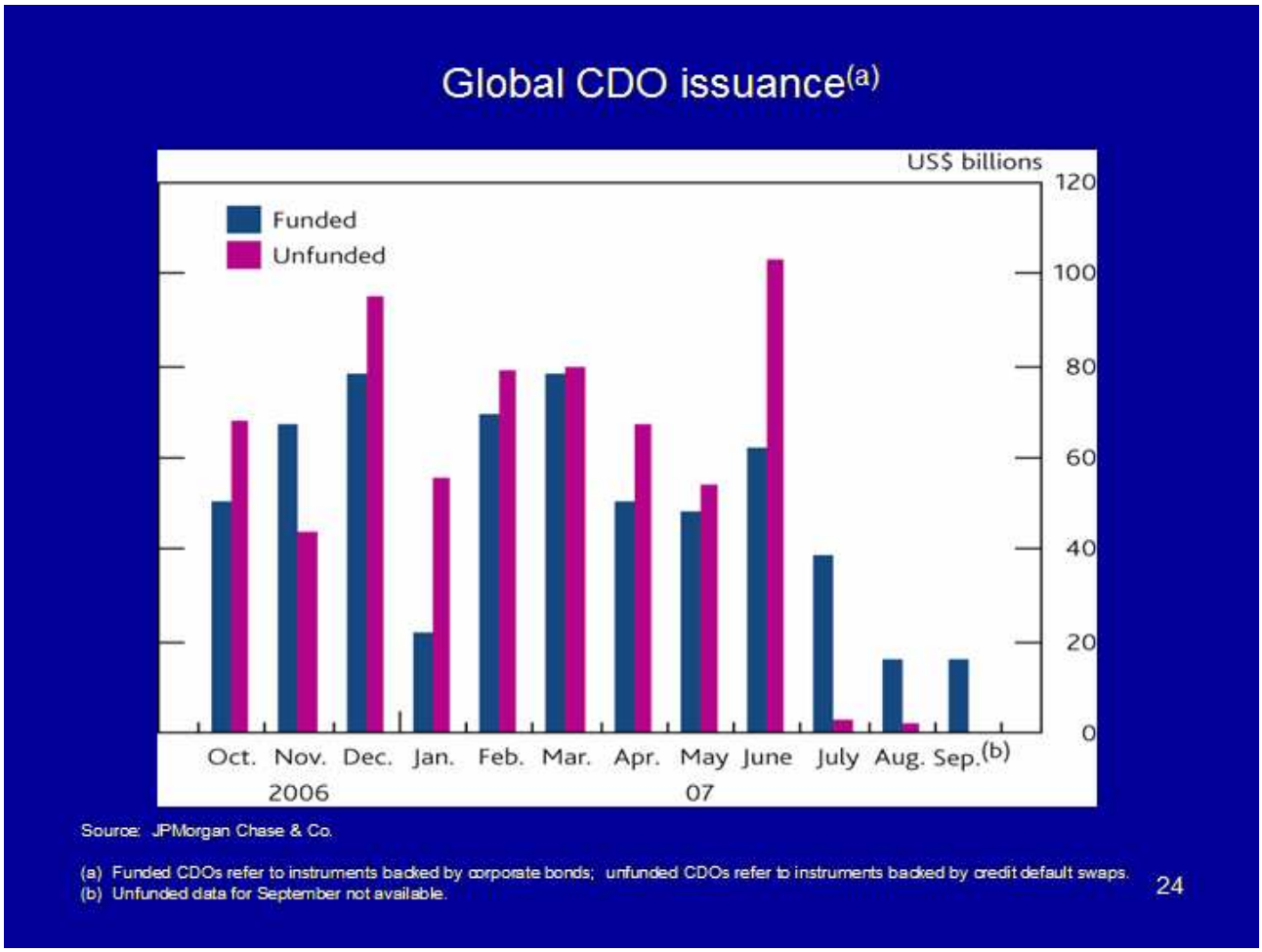


Figure 8
US$-denominated Commercial Paper Outstanding

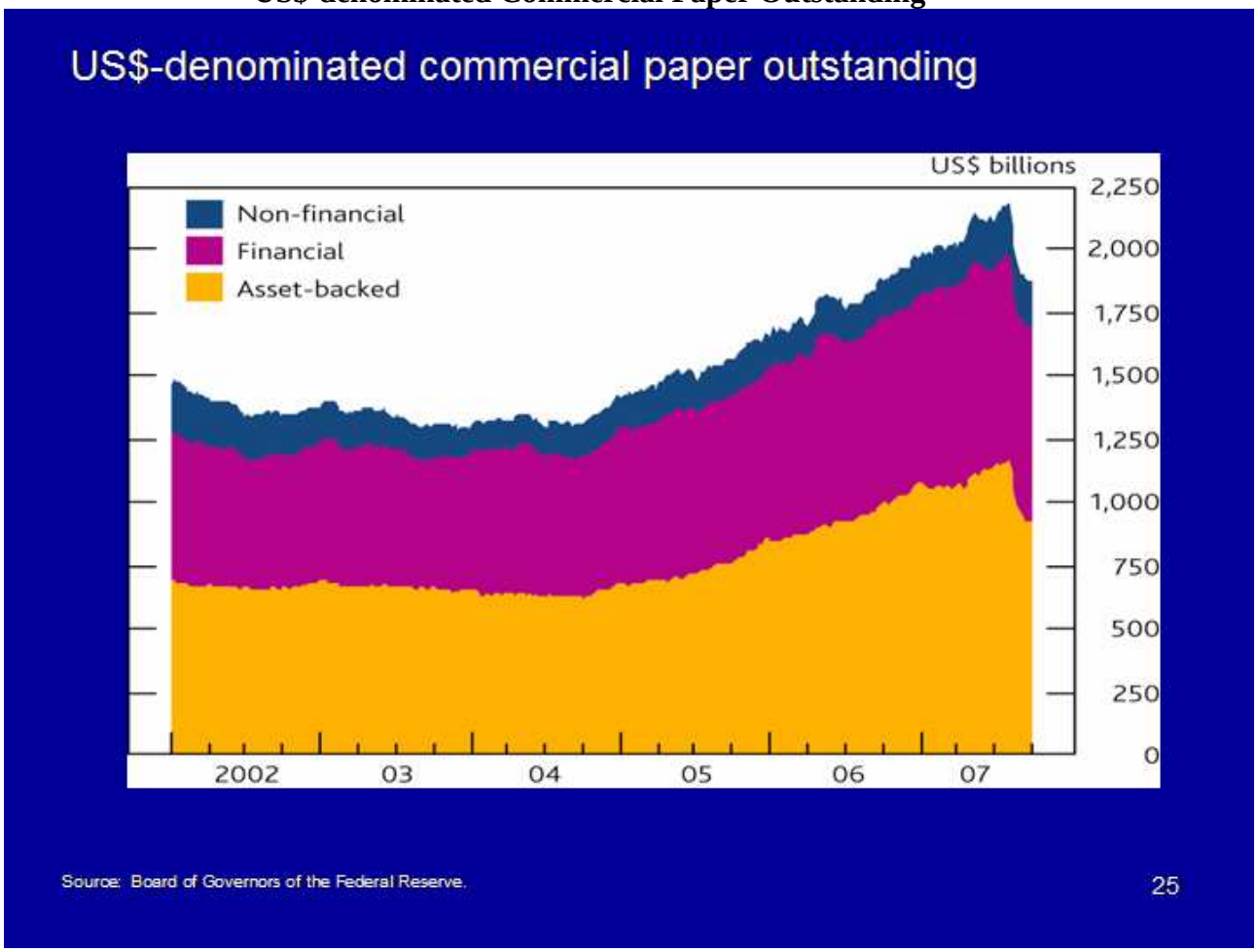
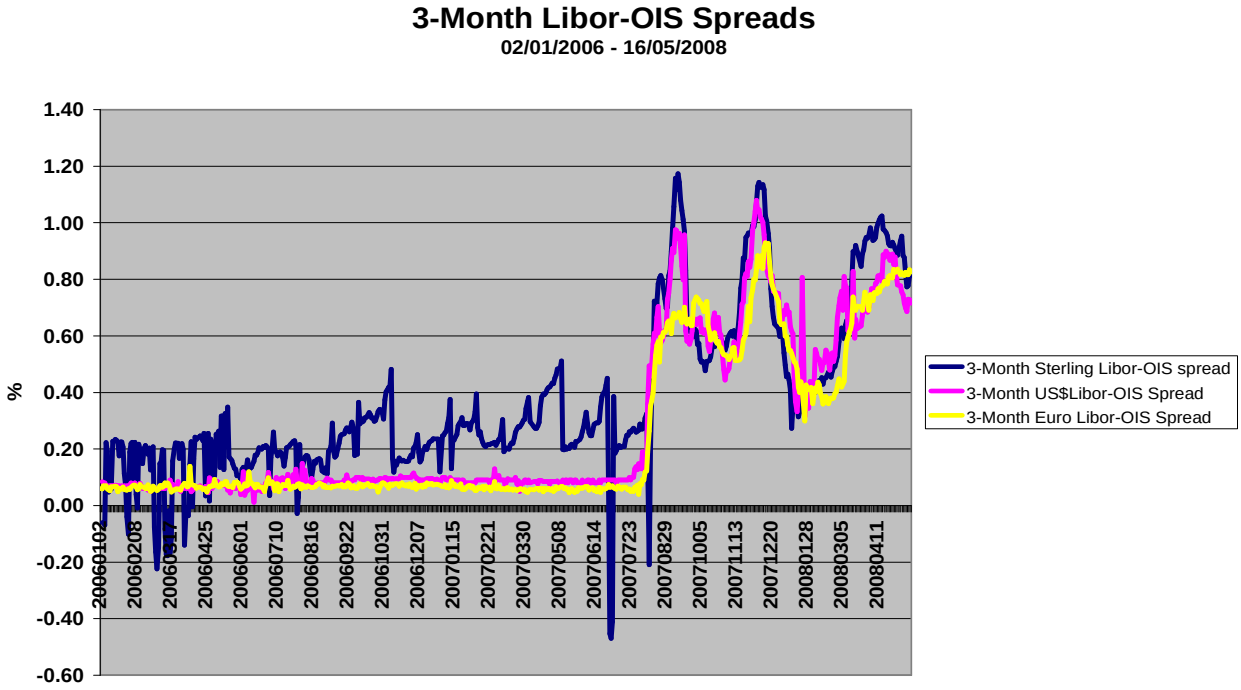
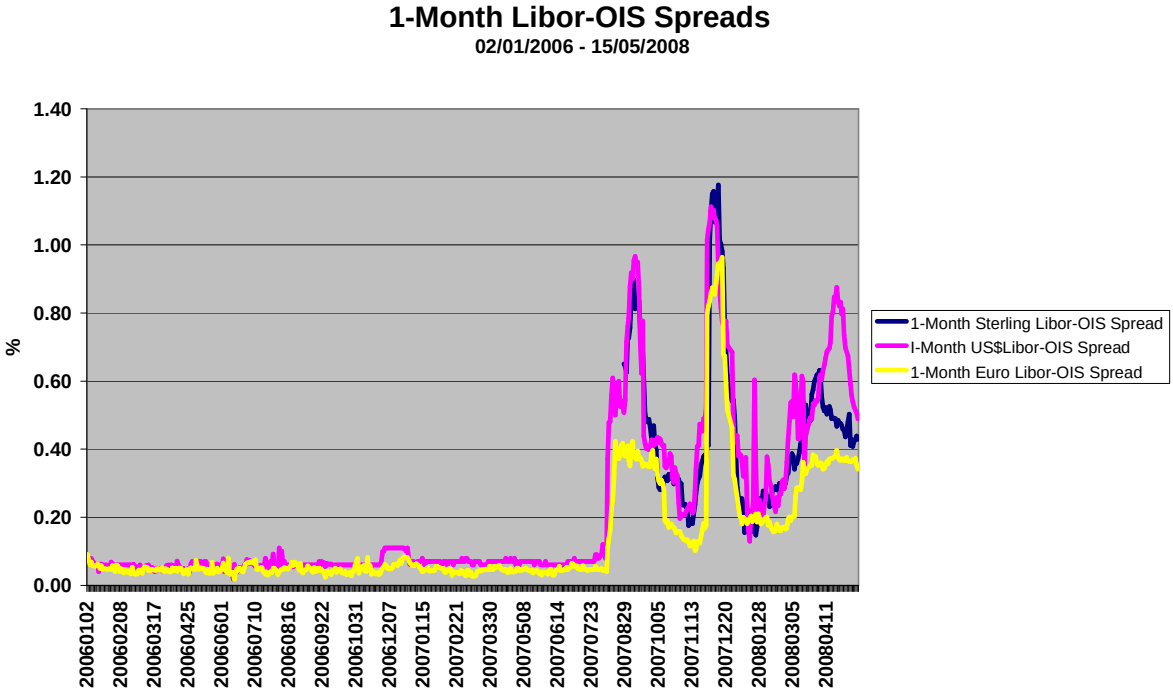


Figure 9a



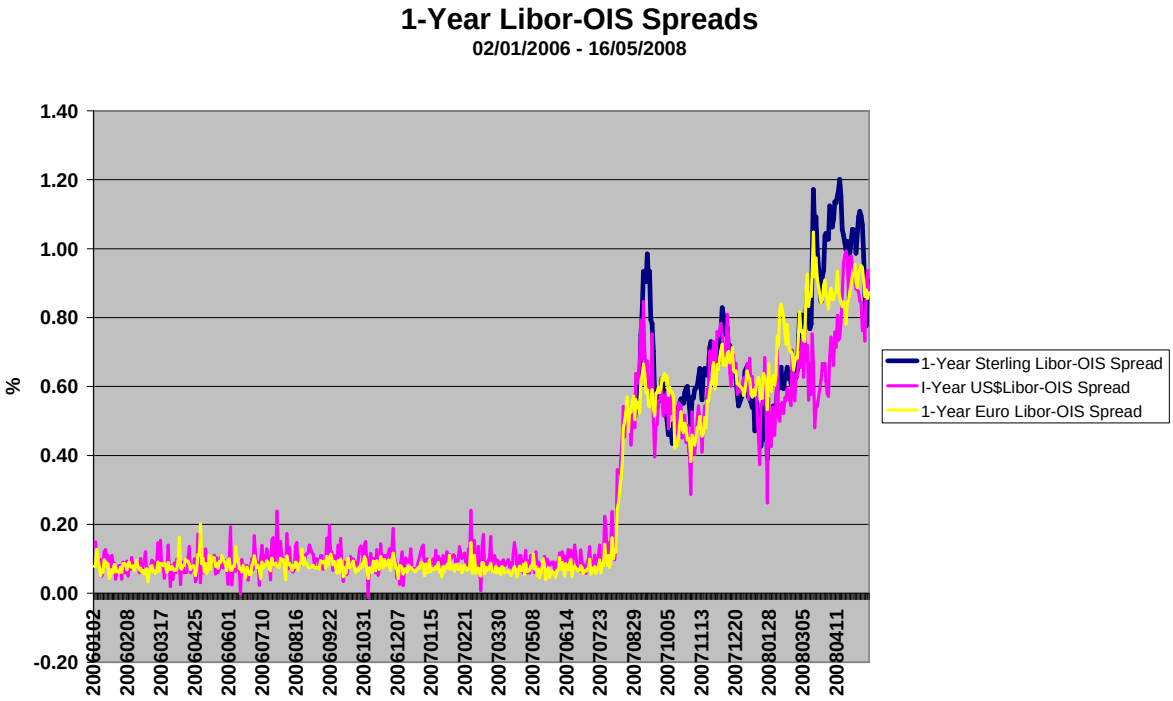
Source: British Bankers' Association and Reuters

Figure 9b



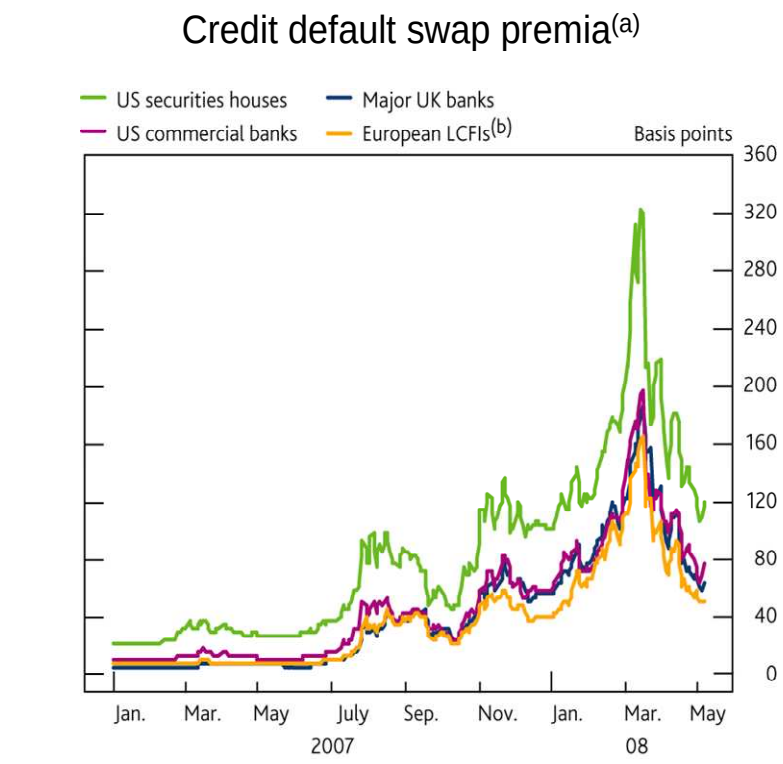
Source: British Bankers' Association and Reuters

Figure 9c



Source: British Bankers' Association and Reuters

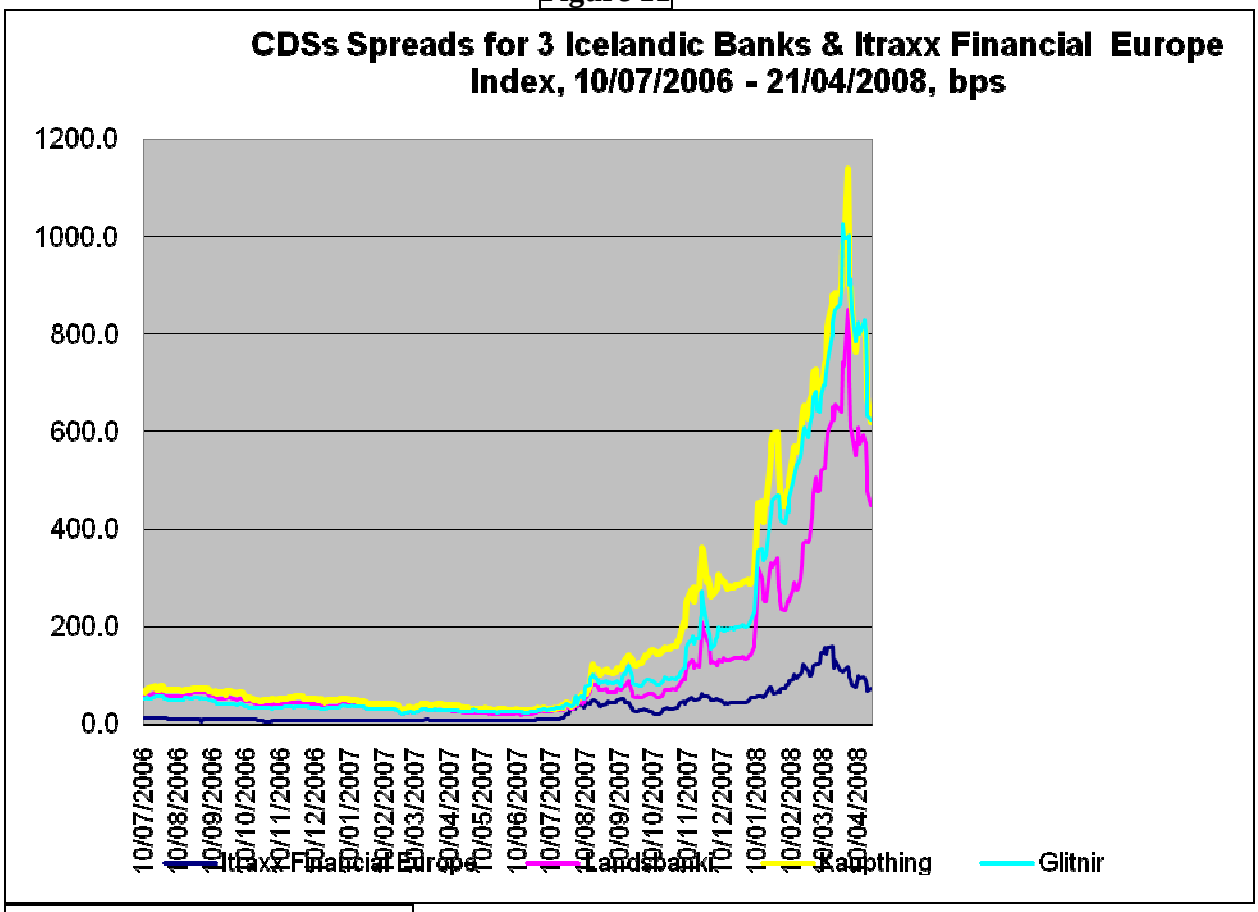
Figure 10



Sources: Markit Group Limited, Thomson Datastream, published accounts and Bank calculations.

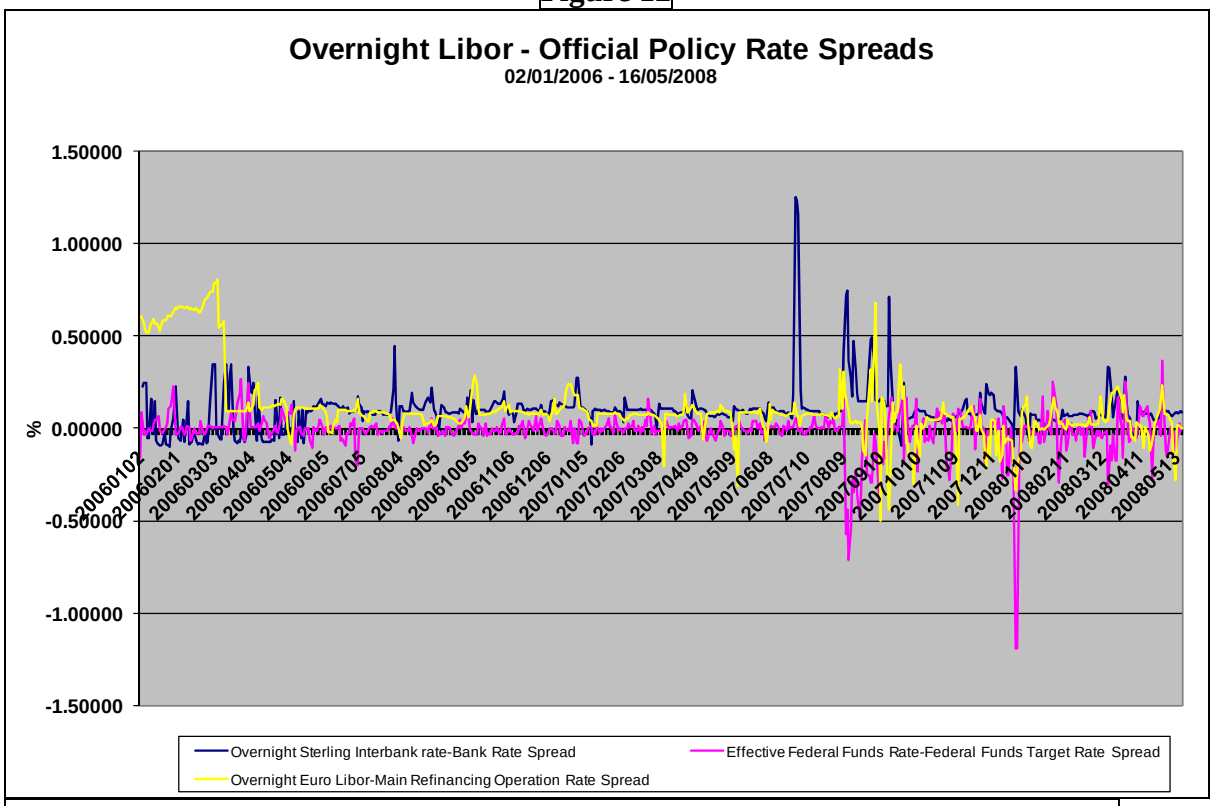
(a) Asset-weighted average five-year premia.
(b) Large complex financial institutions.
Chart taken from Bank of Engladn, Inflation Report May 2008

Figure 11



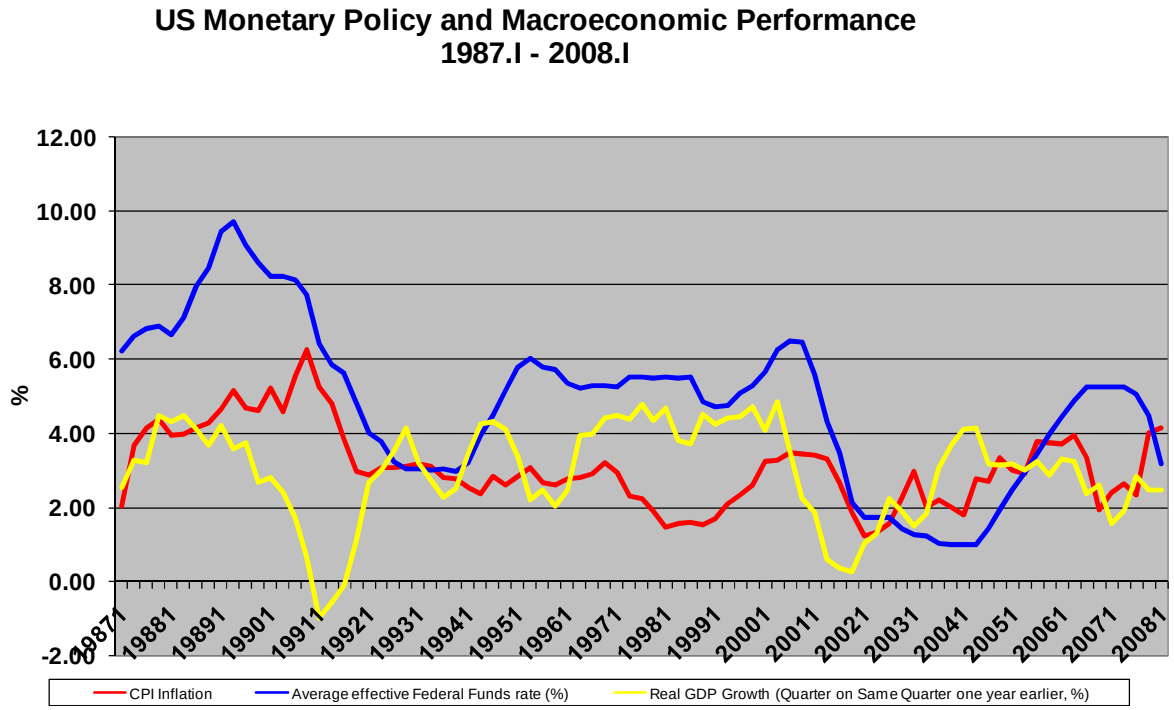
Source: Central bank of Iceland

Figure 12



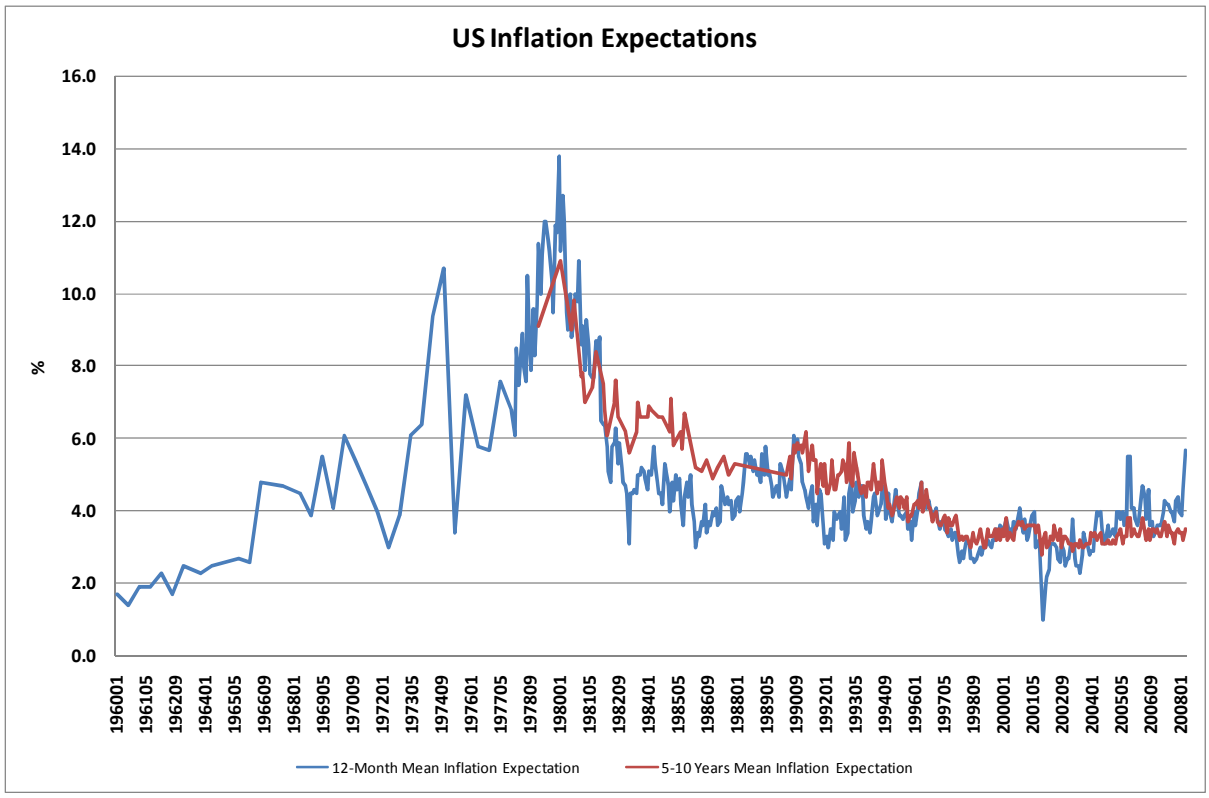
Source: Reuters, Federal Reserve Board, Bank of England and European Central Bank

Figure 13



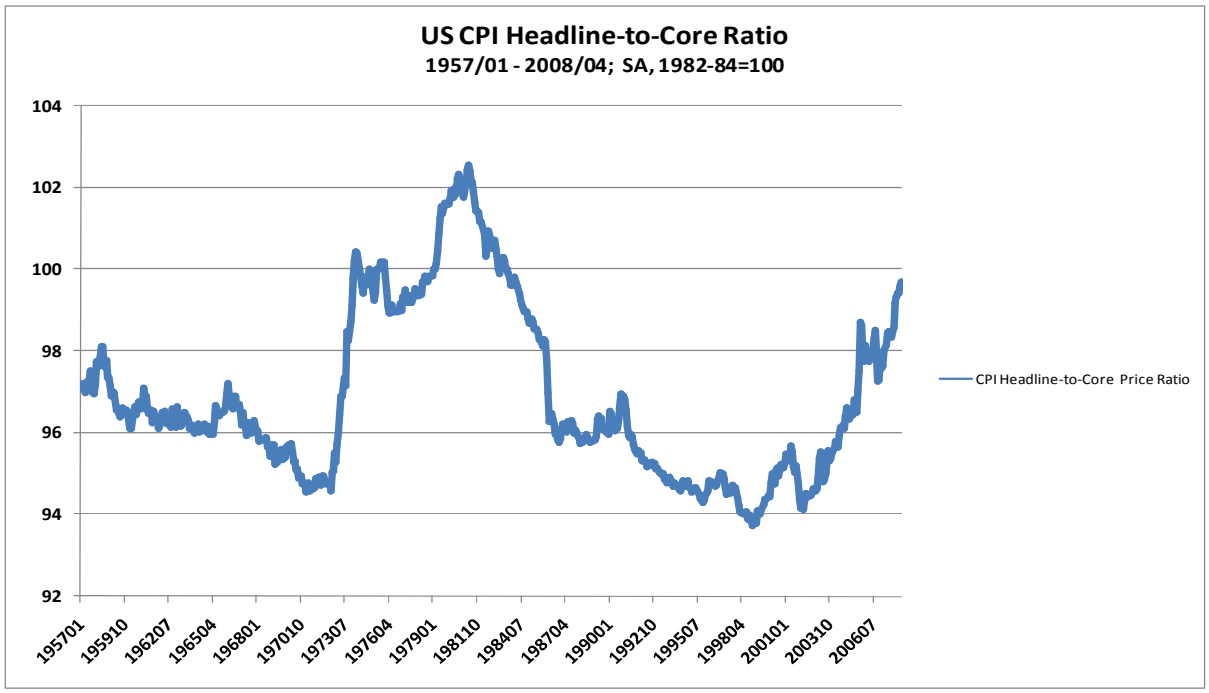
Source: Bureau of Labor Statistics, Bureau of Economic Analysis and Federal Reserve Board.

Figure 14



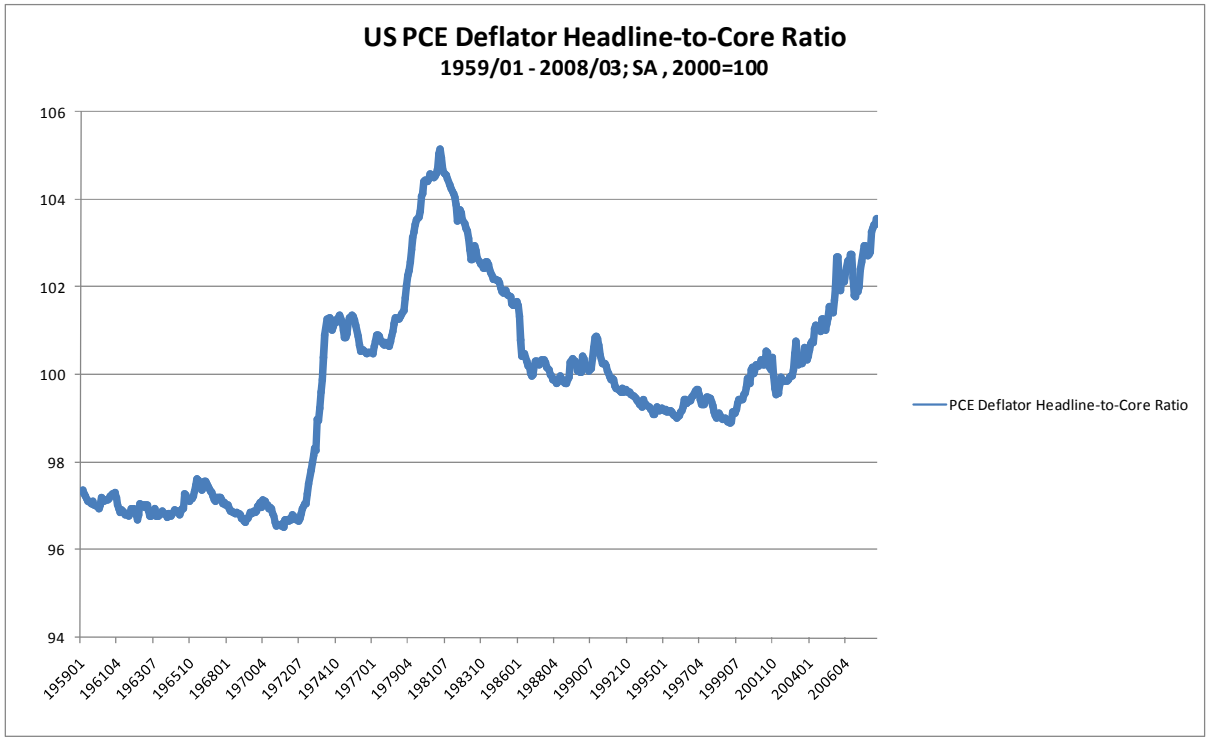
Source: University of Michigan

Figure 15



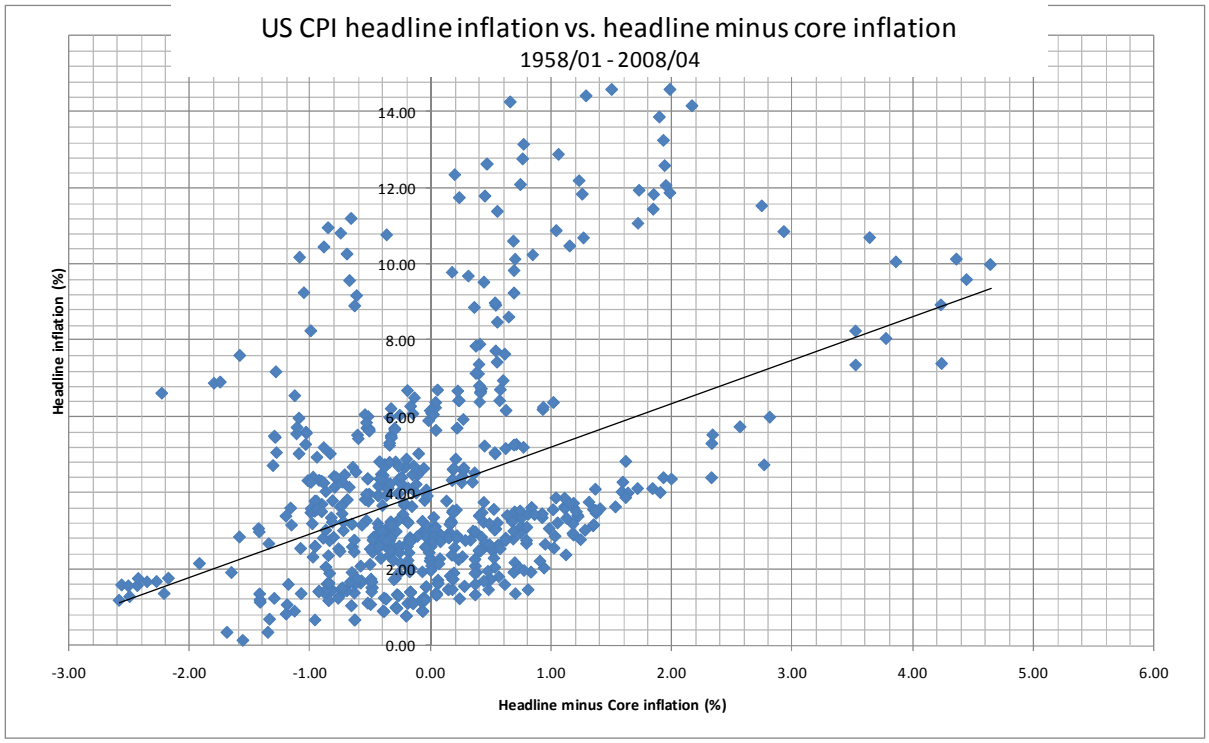
Source: Bureau of Labor Statistics

Figure 16



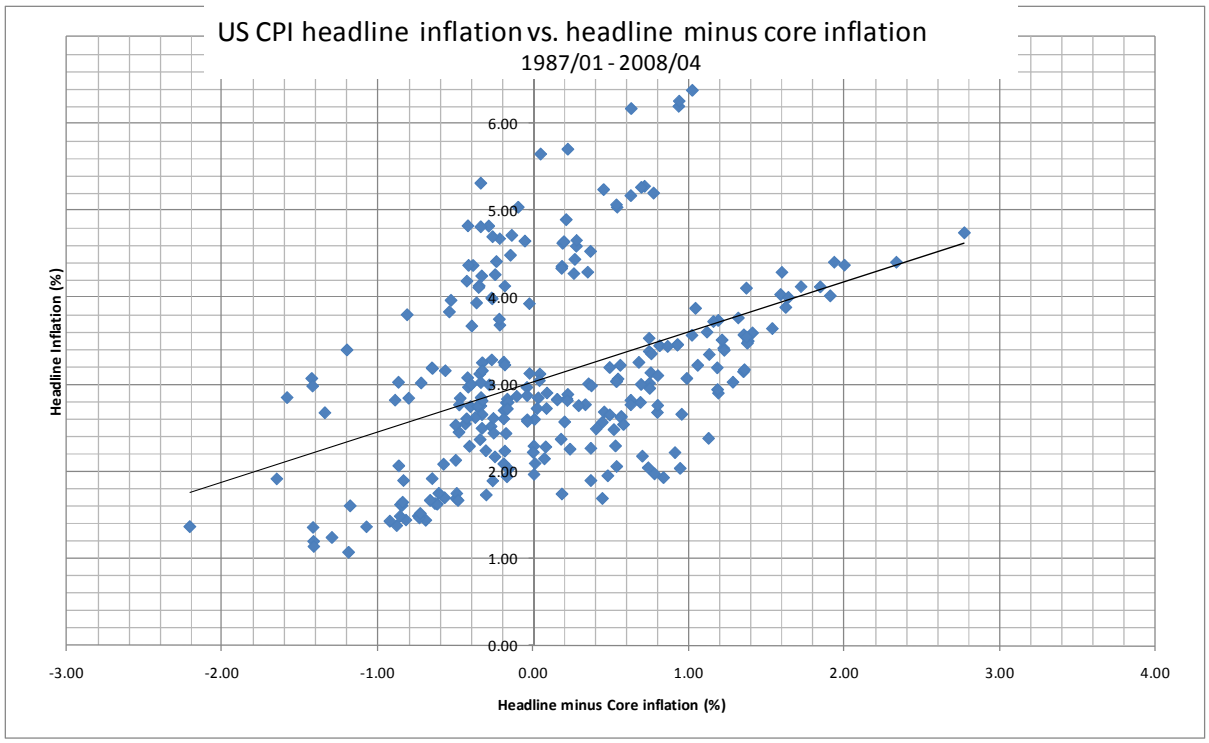
Source: Bureau of Economic Analysis

Figure 17



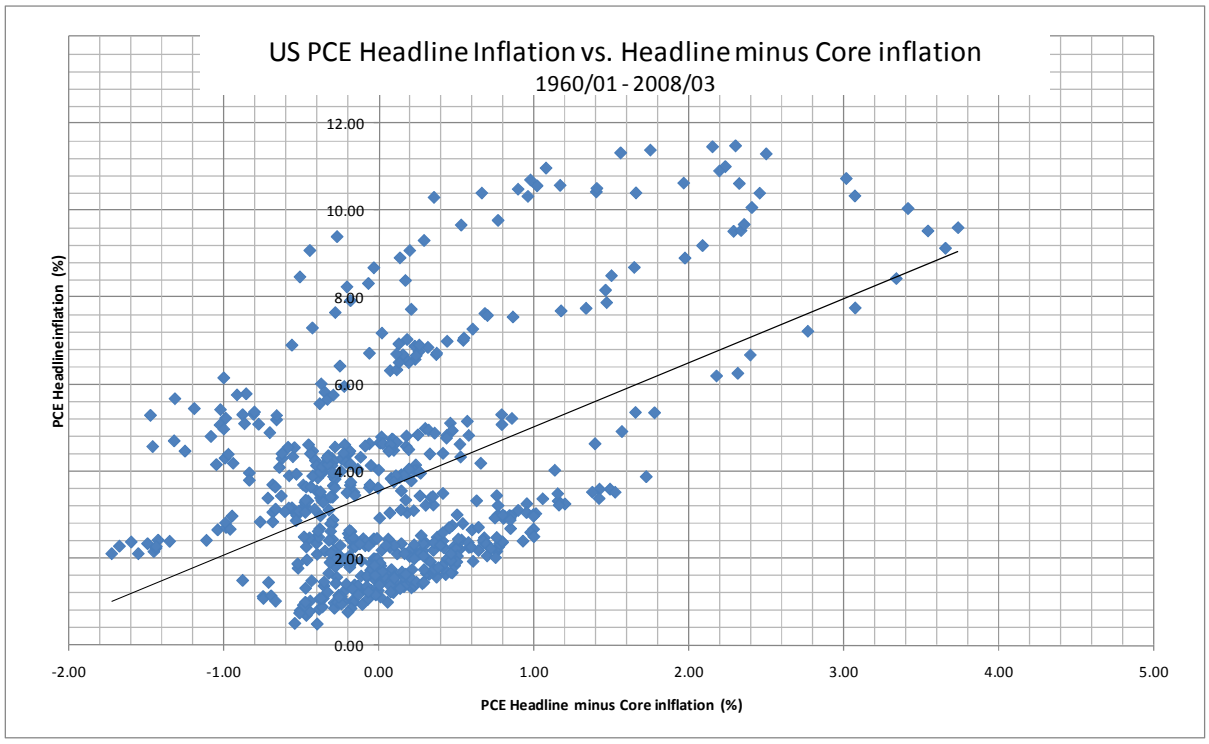
Source: Bureau of Labor Statistics

Table 18



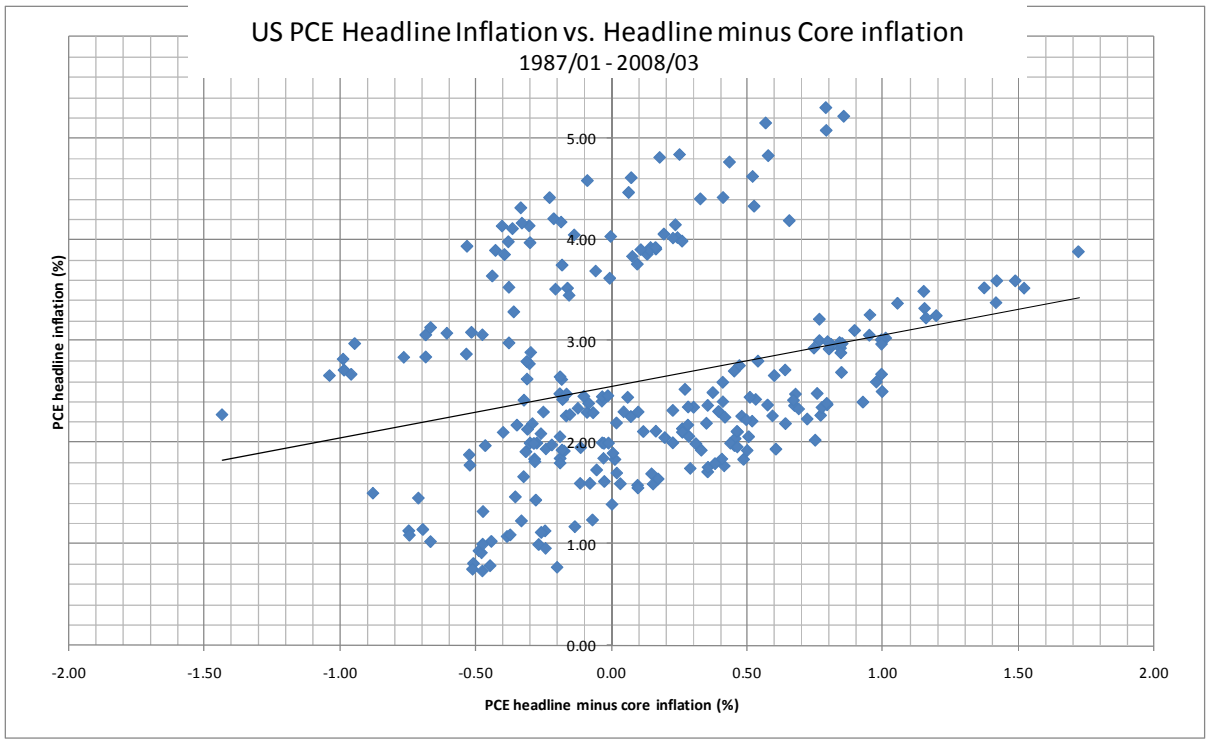
Source: Bureau of Labor Statistics

Table 19



Source: Bureau of Economic Analysis

Table 20



Source: Bureau of Economic Analysis