Quantitative and Qualitative Analysis in Social Sciences
Volume 3, Issue 2, 2009, 1-43
ISSN: 1752-8925

The Lessons from the Current Crisis for Macro-theory and Policy

Elias Karakitsos[a]
Guildhall Asset Management Ltd
Cambridge Centre for Economic and Public Policy

Abstract

This paper questions the validity of the New Consensus Macroeconomics (NCM) or Neo-Wicksellian model in explaining the recent credit crisis and dealing with it from a policy perspective. It attempts to rectify the drawbacks of the NCM models from a theoretical and policy perspective. First, it introduces a wealth effect in consumption, which is necessary if the effect of bubbles is to be detected and ultimately prevented. Second, it endogenises the wealth effect in consumption by explaining separately financial and housing wealth. Third, it endogenises potential output and the natural interest rate so that erroneous policy implications are bypassed. It is shown that the dynamic adjustment of the reformulated model to a credit crisis is capable of explaining the stylised facts of asset-led business cycles, such as the 1930s, Japan in the 1990s, and the US experience of the 2000s. It analyses the credit crisis for a leveraged economy and highlights the potential problems a central bank is likely to face when it targets just inflation and the output gap. It suggests a new policymakers' objective function that is more appropriate for the current economic environment. Finally, it assesses the merits and perils of wealth targeting.

JEL Classifications: E13, E32, E43.

Keywords: Wealth effect, natural rate of interest, real profit rate, potential output, neo-Wicksellian model, new consensus macroeconomics, monetary policy, monetary rules, credit crisis.

Acknowledgements: I am grateful to participants at the EFMA Annual Conference (Athens, June 2008), the 5th International Conference on Developments in Economic Theory and Policy (Bilbao, July 2008), and the Conference on Housing Market Challenges in Europe and the US: Any Solutions Available?, Central Bank of Austria (Vienna, September 2008) for helpful comments. The usual disclaimer applies.

[a] Hedge Fund Manager of Guildhall Asset Management Ltd, and Associate Member of the Centre for Economic and Public Policy, University of Cambridge, UK; email: eliask@guildhall.gg

1 Introduction

This paper uses the K-model (see Arestis and Karakitsos, 2004) to assess the likely fall in US house prices and the consequences for the economy in terms of growth, inflation and interest rates. From a theoretical viewpoint it examines the relevance of the New Consensus Macroeconomics (NCM) or Neo-Wicksellian models in the light of the current credit crisis. From a policy perspective it is argued that a monetary policy rule based on inflation and the output gap may be insufficient to prevent the ramifications of the credit crisis. This drawback is due not only to the limited nature of the policymakers' objective function, but also to the structure of the NCM paradigm. In particular, the NCM models suffer from a number of deficiencies. First, there is an internal inconsistency in that the policy implications advocated in NCM models are assumed rather than derived explicitly from such models. The propositions that inflation is under the direct control of the central bank, while output and unemployment in the long run are not, are imposed on the model rather than demonstrated theoretically in a convincing manner. Second, the NCM models are based on the transversality assumption which leads to the conclusion that commercial banks do not exist in the model, nor monetary aggregates or liquidity preferences. Interestingly enough, the absence of monetary aggregates may be at the root of the current woes. Financial innovation in the last ten years or so has made traditional monetary aggregates obsolete as measures of the overall liquidity. Hence, the NCM models cannot detect and monitor the liquidity in the economy that has been responsible for the finance of three major bubbles in the last ten years (internet, housing, and commodities) and other minor ones, such as private equity and shipping. Fourth, the NCM models ignore the role of wealth in affecting the decisions of households to spend and save, which is likely to drive the effects of the ongoing credit crisis on the economy in the next two years.

This paper attempts to rectify some of these drawbacks of the NCM models and the way monetary policy should be designed. First, it suggests that the policymakers' objective function should be augmented to include a target on asset price inflation in a way that does not impede the free functioning of financial markets. The variable that suggests itself as target is the household net wealth as percent of disposable income. Second, it introduces a wealth effect in consumption, which is necessary if the effect of bubbles is to be detected and ultimately prevented. Third, it endogenises the wealth effect in consumption by

explaining separately financial and housing wealth. Fourth, it endogenises potential output and the natural interest rate so that erroneous policy implications are bypassed.

The paper is organised as follows. Section 2 puts the current crisis in a long-term perspective and shows the deficiencies of the NCM structure. Section 3 assesses empirically the likely impact of the credit crisis on the US economy. Section 4 reviews the NCM models. Section 5 extends the structure of the NCM models. Section 6 analyses the stability and steady-state properties of the system. Section 7 analyses the dynamic adjustment of the model to a credit crisis and shows that the model is capable of explaining the stylised facts of asset-led business cycles, such as the 1930s and Japan in the 1990s. Section 8 analyses the credit crisis for a leveraged economy and highlights the potential problems a central bank is likely to face when it targets just inflation and the output gap. Section 9 reviews the role of central banks and suggests a new policymakers' objective function that is more appropriate for the current economic environment. Section 10 analyses the merits and perils of wealth targeting, while Section 11 summarises the arguments and concludes.

2 The Credit Crisis in a Long-term Perspective – Too Much Liquidity

The prevalent view is that the current credit crisis has its origin in the bust of the housing bubble. But what is missing from this view is that the finance of a bubble is only possible through a corresponding increase in credit – no credit, no bubble. Thus at the heart of the current woes lies the excessive liquidity that was put in place in the last ten years or so. This liquidity financed in the first instance the internet bubble, but because there was no deleverage following the burst of this bubble the liquidity went on to finance other bubbles, including housing, private equity and commodities. Thus, the housing bubble is a transformation of the previous internet bubble.

The excessive liquidity in the 2000s was the result of two forces: financial innovation and easy monetary policy in the US and Japan. In the US, Greenspan injected liquidity and cut interest rates following the Asian-Russian crisis of 1997-98, which was only partially drained later on. Afraid of deflation in the aftermath of the burst of the internet bubble, Greenspan cut interest rates from 6.5% to 1% and injected huge liquidity. Moreover, he was late and slow in draining that liquidity and reversing the rate cuts. Ben Bernanke has imitated Alan Greenspan and injected further liquidity following the ongoing credit crisis

that erupted in the summer of 2007. This liquidity financed the commodity bubble, which was the last one in the current cycle, as it affected consumer price index (CPI) inflation. Whereas central banks are loath in hiking rates to curb asset price inflation, a surge in CPI-inflation falls squarely into their realm. Monetary policy was tightened in some countries, like the euro-area, or prevented central banks in cutting rates, like the UK. Japan also contributed to the huge liquidity in the global economy. The Bank of Japan printed money aggressively in 2001-04 by buying back JGBs (Japanese Government Bonds) from financial institutions. The monetary base increased at nearly 20% per annum in the three years to 2004, in what is called the era of 'quantitative easing'. But even before that the monetary base was increasing at 7% per annum in 1993-99. This huge liquidity bolstered the yen 'carry-trade', which acquired its own momentum by leading into yen depreciation that further bolstered yen carry-trade.

It is also true that financial innovation has played an equally, if not more, important role than easy monetary policy in creating the huge liquidity of the 2000s. The financial innovation followed the repeal of the US Glass-Steagall Act in 1999. The new regime allowed financial institutions to separate loan origination from loan portfolio. Banks were no longer obliged to keep their own loan portfolio. It was at the discretion of the banks to dispose of their loan portfolio in accordance with risk management. This financial innovation encouraged banks to provide ***risky*** loans without applying the three C's to each borrower - Collateral, Credit history and Character - since they could easily sell these mortgages or other loans to an underwriter, or act as an underwriter to sell to the public exotic mortgage backed securities. This led to the unprecedented growth of the sub-prime market (loans to borrowers with poor credit history or with questionable ability to service their loans in adverse economic conditions) especially in the last three years to 2007. Banks set up Structured Investment Vehicles (SIVs) with a simple legal structure (trust or just a limited liability company) that required a very small capital base. This created a 'shadow-banking' working in parallel to banking, but outside the regulatory umbrella and sowed the seeds for the current credit crisis.

The SIV operations were financed by borrowing from the short end of the capital markets that is linked to the LIBOR. This short-term capital was then used to buy the risky segment of the loan portfolio of the mother company. The loan portfolio was then re-packaged in the form of Collateralised Debt Obligations (CDO), which was sold to other banks and the personal sector. In doing so, the SIVs made profits for themselves for as long as LIBOR remained below the rates of CDOs. The housing bubble burst when the yield

curve became inverted with long-term interest rates lower than LIBOR. This confirms the myopic attitude of financial institutions in making profits and raises the issue of whether management acts in the best interest of shareholders in the long run. The cynics would say that as the remunerations of management are linked to current profits they have an incentive to make risky investments that would hurt in the long run the interests of shareholders. If and when these investments turn sour a new management would be called in to clear the mess. The old management will walk away with huge profits.

The complex structure and highly illiquid nature of the CDO market has complicated the task of credit rating institutions, which erroneously assigned AAA status to many worthless papers. The overstated credit rating has contributed to the growth of the CDO market in the upswing of the cycle, but also to its downfall in the downswing; thereby further aggravating the losses of financial institutions during the credit crisis.

The CDO market injected huge liquidity into the system,[1] which was not reflected in monetary aggregates and, therefore, not monitored by central banks with respect to its implications for financial markets and the economy. The sale of CDOs to international investors made the US housing bubble a global problem and provided the transmission mechanism for the contagion of the world economy and Europe, in particular, where the losses are even bigger than in the US. The banks were so greedy in providing risky loans that in the upswing of the cycle the pace of accumulation was faster than the pace of unloading them from their books. Thus, when the credit crisis started many banks found a higher than desired stock of CDOs in their balance sheets. The losses from CDOs and the bankruptcy of SIVs further exacerbated the losses of financial institutions that have so far reached nearly $700 billion and they are likely to exceed $1 trillion. Reputation effects have forced many banks, such as Citibank, to incorporate the balance sheets of the SIVs into their books.

In good times the financial innovation reduced the risk of the loan originators and convinced central bankers that there was a minimal systemic risk of contagion following the

[1] So far we have used the term liquidity in a loose context, which clearly needs to be defined as it has different meanings in different contexts. In the macro-economy liquidity is defined as total lending or total deposits depending on whether one looks at the asset or the liability side of the consolidated banking balance sheet, although the two measures would give a slightly different number. In the textbook treatment this liquidity is a (variable) multiple of the monetary base and fluctuations in liquidity will be reflected in monetary aggregates. However, in the last ten years there has been in addition a parallel banking, totally unregulated, which has been providing loans (for housing, cars, student loans) that are financed by asset backed securities. The multiplier is unity, but the issuance of asset backed securities, in theory, could be infinite, if the yield curve is positively sloped. Clearly, this asset backed security lending will not necessarily be reflected in the monetary aggregates, as it drops out of the calculation once it becomes the asset of the personal sector and the liability of a non-bank entity. I would like to thank Giuseppe Fontana for pointing the need to define liquidity.

decline in house prices. Central bankers on both sides of the Atlantic underestimated the systemic risk from the collapse of the sub-prime market with claims in the spring of 2007 that only a few people would be hurt with minimum damage for the economy as a whole. This led the Fed under Ben Bernanke to keep interest rates high as late as August 2007. But there was a drastic reversal of this policy following the plunge of equity prices and the widening of credit spreads in August. The Fed injected liquidity and cut interest rates aggressively from 5.25% to 1.0% in the last twelve months. The Fed also took extraordinary steps in the spring of 2008 to extend liquidity to brokers and investment banks in addition to commercial banks and injected further liquidity by accepting as collateral in its lending poor quality assets. This has further exacerbated the risks to the economy from this prodigious liquidity, while providing extra fuel to the last phase of the commodities bubble before its burst in the summer of 2008.

Thus, instead of encouraging de-leverage and taking steps to drain the excess liquidity that has been at the root of all problems in the current decade, central banks rushed to act as lender of last resort and prevent the risk from becoming systemic, thereby posing a threat to the whole financial system in the long run. The Fed adopted a risk management approach to the current crisis with the epitome the bailout of Bear Stearns in March 2008, which set a precedent for the bailouts of Fannie-Mae, Freddie-Mac and AIG in September 2008, but the bankruptcy of Lehman Bros, which fuelled the losses of financial institutions. The Fed, for reasons of moral hazard, suggested a low price for the takeover of Bear Stearns by JP Morgan, which, however, penalised shareholders and not the management that was responsible for the bad investments.

While there is no doubt that the Fed response is right in the short run, it is wrong from a long-term perspective. The prodigious liquidity injected since the outbreak of the crisis came back to haunt us through the last phase of the commodities bubble in the first half of 2008, as it fanned CPI-inflation and called for central banks to act. Some central banks, such as the ECB, hiked rates, while others were prevented from cutting rates at a time that growth was weakening, thus precipitating the downturn in the global economy since the third quarter of 2008. The commodity bubble burst in the summer of 2008, as expectations of decoupling between the growth rate of BRIC (Brazil, Russian Federation, India, and China) and the mature economies were dashed, in view of the international contagion of the credit crisis.

3 The Consequences of the Credit Crisis – An Empirical Assessment

The credit crisis is the outcome of financial distress, which in the refined Minsky model is the third stage of a bubble cycle: displacement, euphoria, distress, panic and crash. The credit crisis can be seen as unfolding in three stages. In the first stage credit spreads are widening as banks become unwilling to lend to each other for fear of contagion from potential losses on the collateral assets of the borrowing banks. In the second stage the losses of the financial institutions are unravelling, while in the third stage the ramifications to the economy are felt. Credit spreads widened since the summer of 2007, although coordinated central bank efforts have succeeded at times in suppressing them (see Figures 1 and 2**)**.

Figure 1

Liquidity and Credit Risk vs. Credit Risk (Libor OIS vs. Libor Repo)

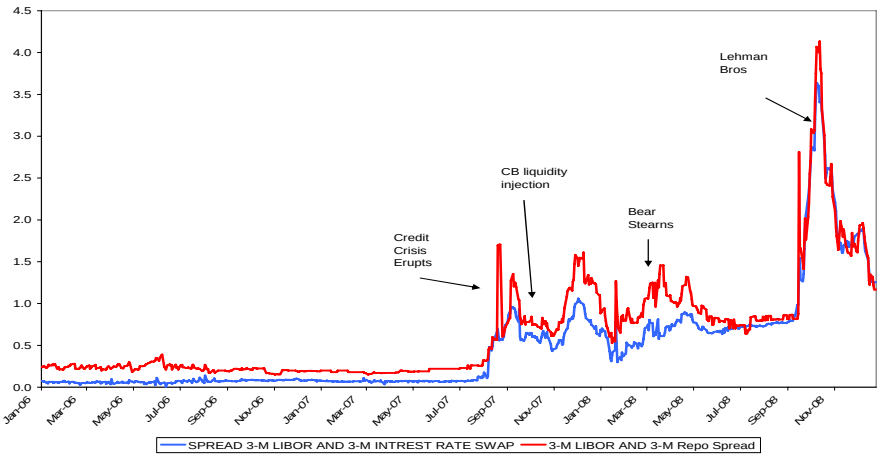
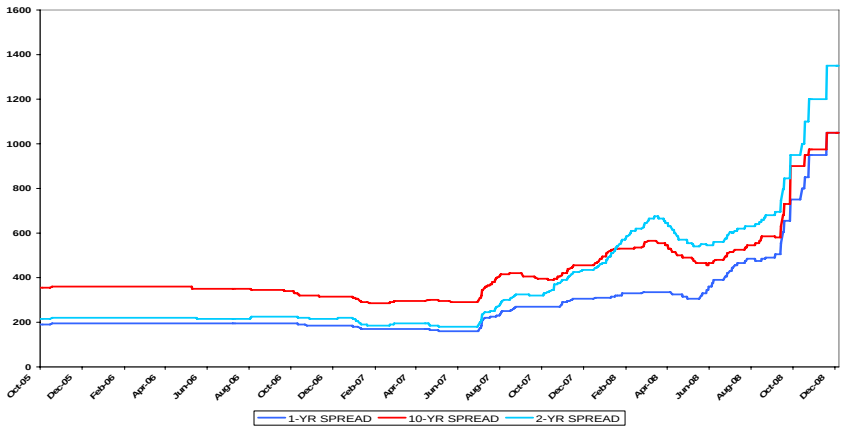


Figure 2

B US Treasury Spread



In spite of central bank action the credit crisis deepened with credit spreads widening yet again culminating to the pinnacle and the panic in September and October of 2008. The losses of financial institutions have amounted so far to $1.3 trillion, as asset-backed securities have lost around eighty percent of their value. Since the outbreak of the crisis the systemic risk has fluctuated but mainly it has remained high. It subsided with the bailout of Bear Stearns, but surged again in the autumn of 2008, as Fannie Mae and Freddie Mac that hold or guarantee nearly half of mortgage-backed securities ($5.4 trillion) came to a bankruptcy point and had to be bailed out by the US Treasury. In spite of the bailout of the two giants in the US mortgage market, the systemic risk remained high with the bankruptcy of Lehman Bros in mid-September and finally with the near collapse and subsequent bailout of AIG. The crisis has brought the demise of the investment-bank model and the remaining institutions (Morgan Stanley and Goldman Sachs) have run for cover behind the façade of commercial banks. The losses of financial institutions are likely to exceed $3 trillion in the near future.

The ramifications to the economy are likely to stem from the response of the banks to these losses – tightening of lending standards, higher cost of lending, lower availability of credit, hoarding of money balances. The only certain way that banks will get out of this mess in the long run is through a very steep yield curve in government bonds. The Fed will likely move to a zero interest rate policy with the fed funds rate around 0.25-0.50%, while the 10-year yield will hover around 3% offering almost 3% gain in the banking system. The credit crunch will impair GDP growth and trim the rate of growth of potential output, as even companies with good ideas and profitable new products will be denied credit. On the positive side, the credit crunch will enable households and companies to curb their debt through time, thus rebuilding their impaired balance sheets. But as asset prices (houses, shares, commodities, commercial real estate, vessel prices, corporate bonds) fall the net wealth of the personal sector will be further eroded, thus forcing the savings ratio up and consumer expenditure down. With consumption falling companies will respond by shedding their labour force, cutting production and curtailing investment expenditure, thus further harming the incomes of households. This is the asset and debt deflation process!

The K-model provides an assessment of the short-term effects of this asset-debt deflation process. US nationwide house prices (median price of existing homes) have so far (September 2008) fallen 17% and the K-model suggests that in the trough of the first (and last?) cycle house prices are likely to fall by 30% from their peak in mid-2006 (see Figure

3). Relative house prices have so far fallen more than 25% and will be eroded by another 15% by the end of 2009 (see Figure 4**)**.

Figure 3

Median price – Existing homes

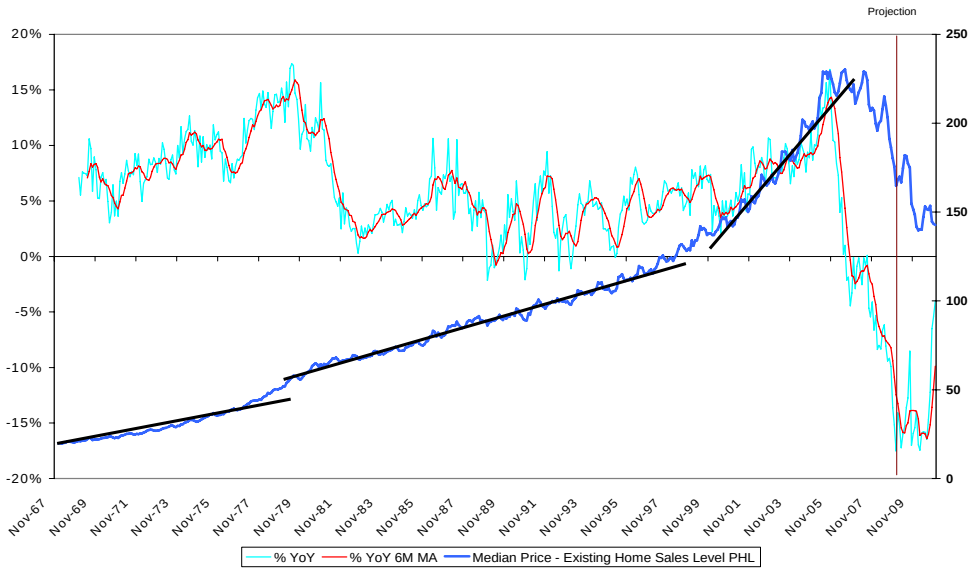
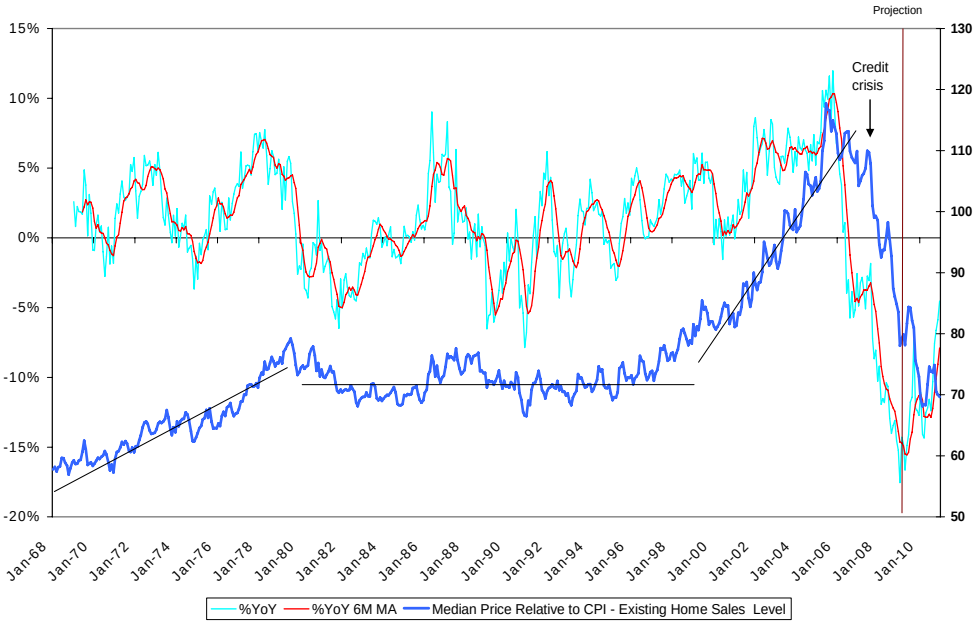


Figure 4

Relative median price – Existing homes

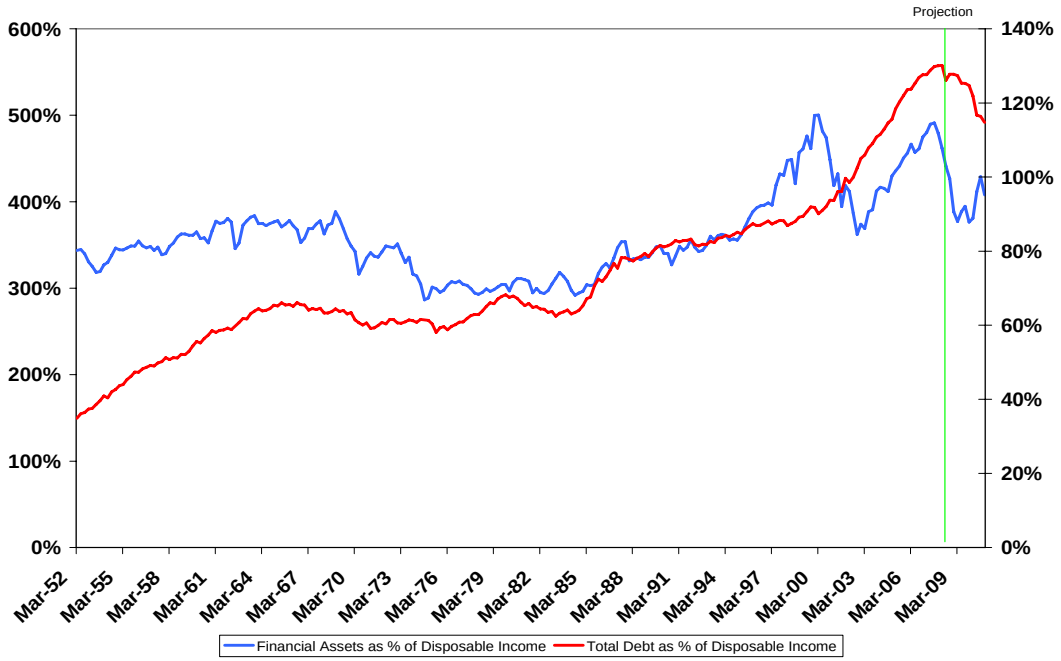


The K-model suggests that the trough of the housing market is likely to be hit towards the end of 2009. A year after house prices peaked equity prices commenced falling, thus putting further downward pressure on the wealth of households. Financial wealth has declined by 9% by the end of June 2008 from its peak in September 2007 and the K-model suggests that

further losses are likely with the benchmark S&P 500 bottoming at around 700 by the end of 2009 (see Figure 5). In the second quarter of 2008 households reduced for the first time their mortgage debt by more than 3%. The K-model suggests that mortgage debt will decline by 13% by the end of 2009 (see Figure 6). The net effect of the decline in house prices and equities and the reduction of debt on personal sector wealth has by June 2008 been 10%, but it is likely to be slightly bigger by the end of 2009 (see Figure 7**)**. Consumers are likely to retrench as a result of the decline in wealth, thus prompting firms to shed labour. The K-model suggests that job losses will mount in the next twelve months and bottom probably at the end of 2009 (see Figure 8). The combined effect of a fall in net wealth and real disposable income will curb consumption growth to 0.5% in 2008 and just 0% in 2009 (see Figure 9). Businesses are bound to curtail investment. The K-model suggests that investment will fall by 5% in 2008 and 2% in 2009 (see Figure 10). Export growth, the only robust component of aggregate demand so far, will fall to -7% in 2009 (see Figure 11). The overall effect on GDP is expected to be 1% in 2008 and -0.6% in 2009 (see Figure 12). Core CPI-inflation will decline in the course of the next twelve-months unravelling a deflation scenario in response to a widening negative output gap and because of the burst of the commodities bubble, as the theory of decoupling between BRIC and western world has collapsed (see Figure 13).

Figure 5

Financial assets and debt of the personal sector



The process is likely to involve second-round effects. As house prices and equity prices continue to fall the losses of financial institutions are magnified with further deflationary effects on the economy. The risks are on the downside with house prices likely to overshoot their long-run equilibrium of 30%. In the absence of policy intervention these second-round effects take hold and the asset-debt deflation process deepens. Judging from the experience of past crises, such as Japan in the 1990s, the Great Depression in the 1930s, and the railways in the late 1800s, the deflation process takes around ten years to unwind.

Two parameters will shape the accuracy of the forecast - the extent of house price drop and the losses of financial institutions. The policymakers will have to break the vicious cycle of bank losses and house price drops by operating both on the demand and supply of credit, if they are to succeed in curbing the asset and debt deflation process.

Figure 6

Gross, net real estate of households and mortgage cebt

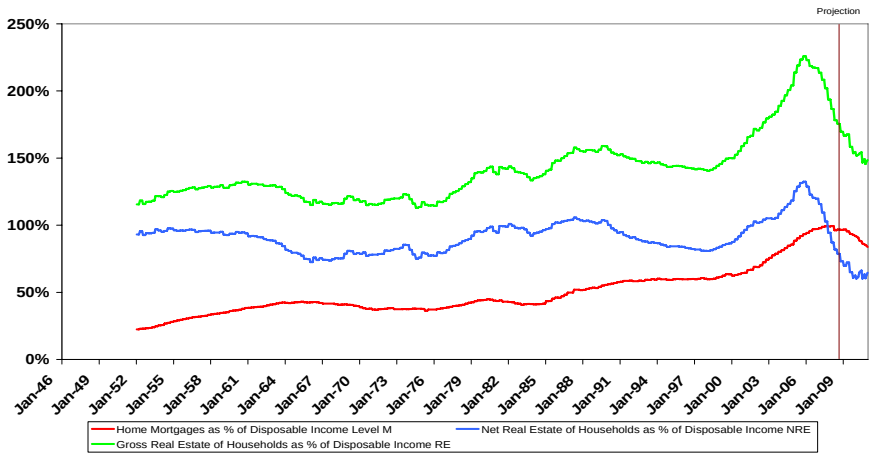


Figure 7

Household net wealth

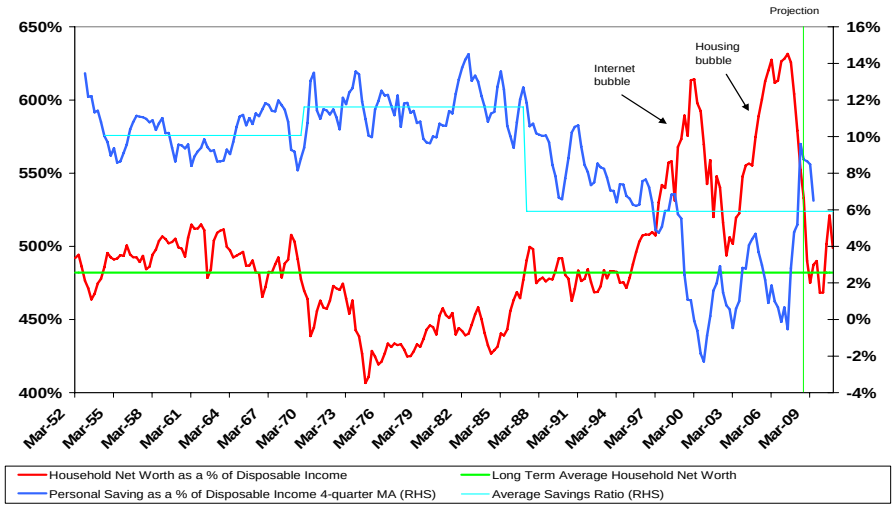


Figure 8

US employment short-run equilibrium

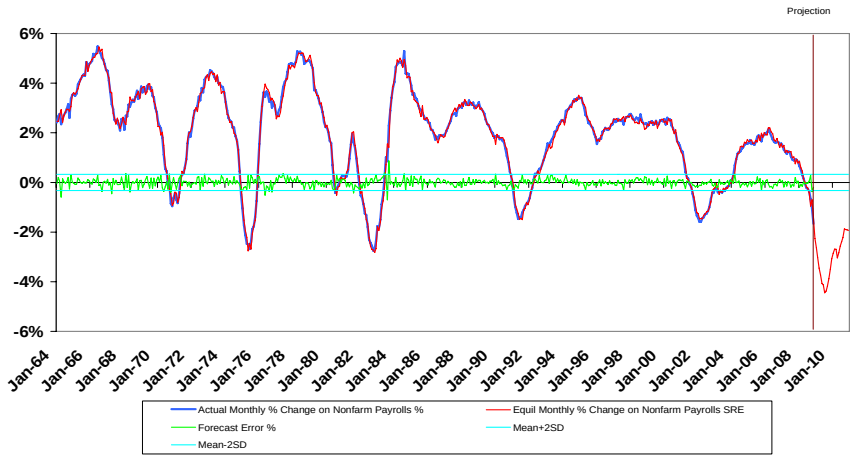


Figure 9

Real consumer expenditure

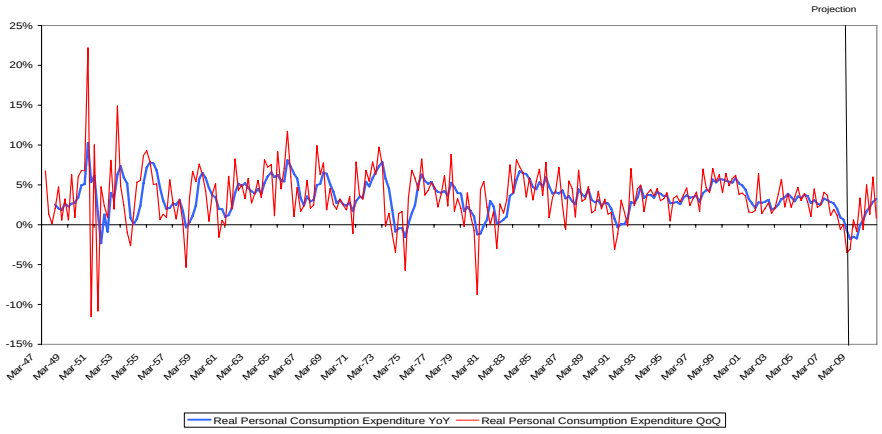


Figure 10

Real gross private domestic investment

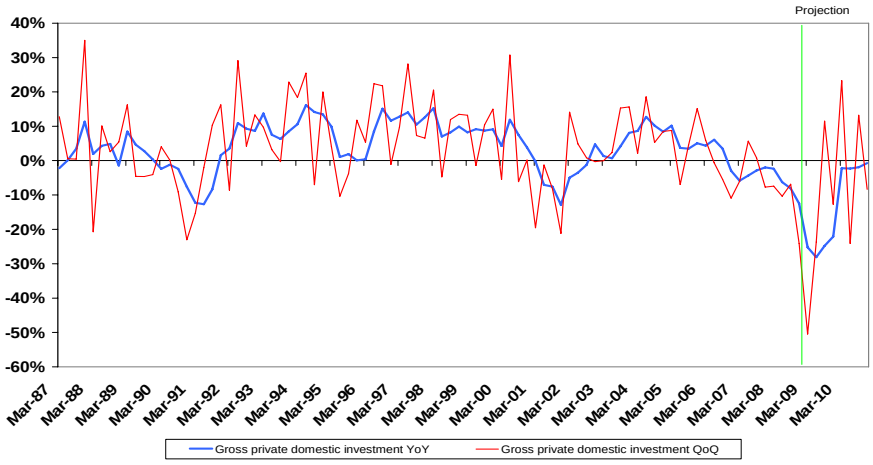


Figure 11

Real exports of goods & services

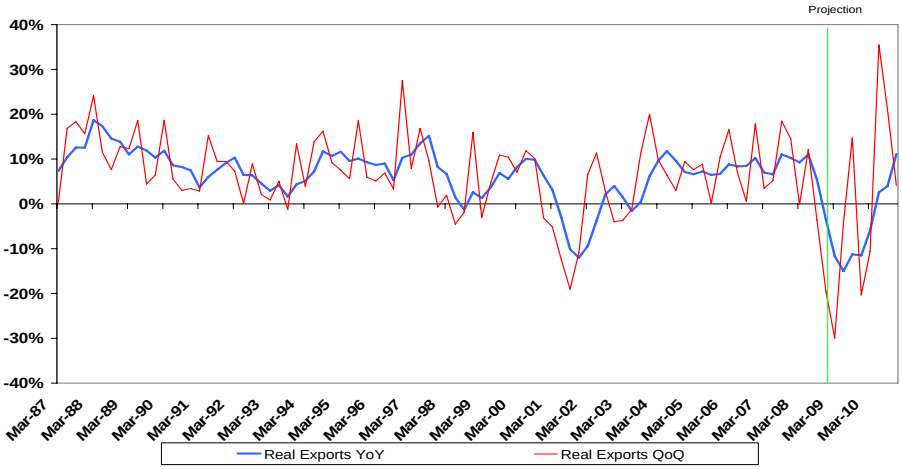


Figure 12

US GDP

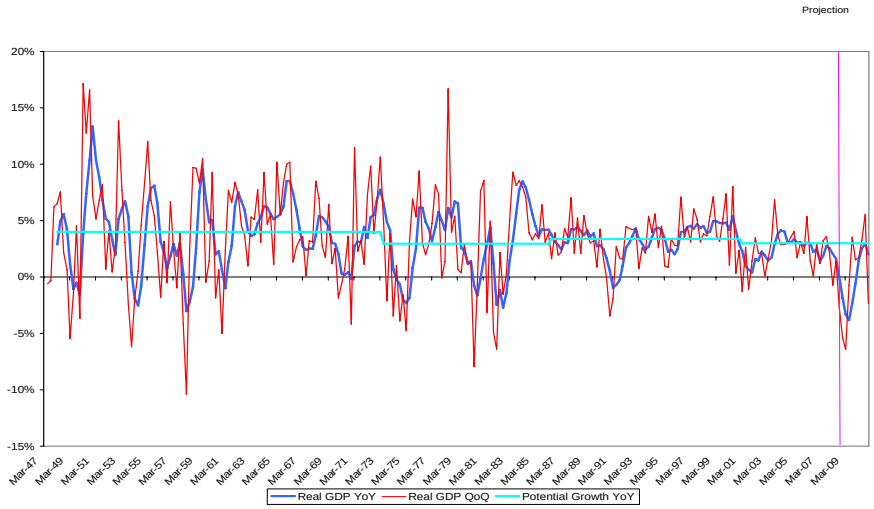
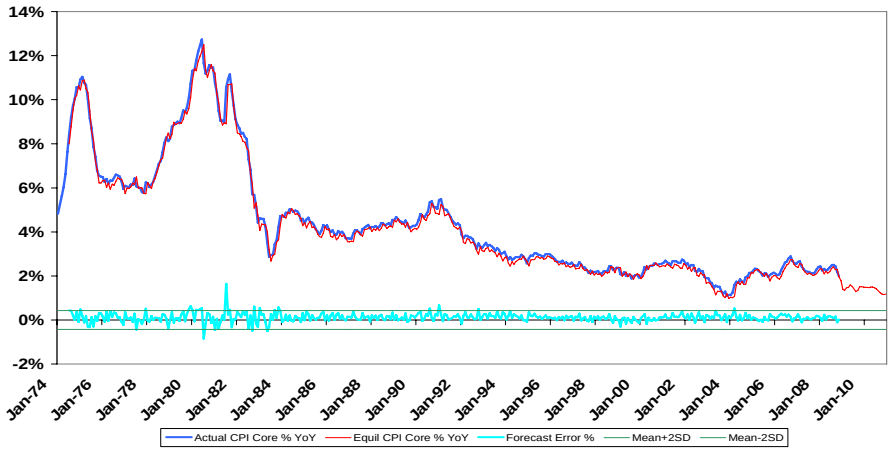


Figure 13

Core CPI inflation – Short-run equilibrium



4 Neo-Wicksellian Models

The natural rate of interest has played a key role in theories of output and inflation determination in dynamic general equilibrium New Consensus Macroeconomic models (see, for example, Rotemberg and Woodford, 1995; Arestis, 2007). These models combine inter-temporally optimising agents from the real-business-cycle school with imperfect competition and nominal rigidities from traditional Keynesian models. These nominal rigidities, i.e. stickiness in prices and/or wages, imply that changes in the nominal short-term interest rate affect short-term *real* rates, and thus, in turn, aggregate real activity and inflation. Woodford (1997) has described these models as 'Neo-Wicksellian', and, to repeat, we follow this tradition in this contribution. In these models the natural interest rate is defined as the equilibrium real interest rate that would prevail in a fictitious economy where there are no nominal rigidities, i.e. in an economy in which nominal adjustment is complete.

As the Neo-Wicksellian models are derived from inter-temporal optimisation, the emphasis is on the inter-dependency between current economic variables and expectations about their future realisations. Thus, current output and inflation depend on the entire path of expected future interest rates. This feature has immensely affected the theory and practice of monetary policy, as it assigns a major role to the management of private sector expectations and consequently to the credibility of the central bank as an important element in anchoring inflation expectations (see, for example, King, 2005; Arestis, 2007; Weber, Wolfgang and Worms, 2008).

Neo-Wicksellian models adopt all the principles of the original Wicksellian theory. Money is neutral in the long run, not because money is a 'veil', but because inflation is influenced by the interest rate gap, and not by the forces of demand for and supply of money. Say's Law does not hold in the short run; it does, though, hold in the long run. Consequently, disequilibrium in one market (money or goods) is transmitted to the other in the short run; but not so in the long run. Money is endogenous, although the word 'residual' is used to describe it (see, for example, Arestis, 2007). The endogeneity of money implies that the traditional LM-curve is redundant and is replaced by a monetary rule that specifies how the central bank sets interest rates. In Neo-Wicksellian models the natural interest rate is defined as the rate that equilibrates aggregate demand with aggregate supply, namely at the intersection of the 'new' IS-curve with the fixed supply of goods. In accordance with this definition the natural interest rate plays a crucial role in modern monetary policy. In

terms of monetary rules of the Taylor type, the real interest rate is equal to the natural interest rate at the long-run equilibrium. This provides a definition of the stance of monetary policy. When the real is equal to the natural rate of interest, monetary policy is neutral. A higher real interest rate than the natural implies tight policy and *vice-versa*.

In Neo-Wicksellian models the central bank controls the rate of inflation through changes in the rate of interest, which affects the output gap - the discrepancy between an endogenous demand for goods and an exogenous supply - with the latter affecting prices and price expectations in the short run. The assumption of an exogenous supply of goods and the requirement that in the long run the output gap should be zero implies that demand is always adjusting to supply and ensures the neutrality of monetary policy. Monetary policy can influence the rate of inflation, but not output (or the growth rate of the economy) and unemployment in the long run, i.e. the Philips curve is vertical. The rate of growth is determined in the long run by supply considerations, such as multi-factor productivity, the rate of growth of the labour force, market flexibility, especially labour market etc., all of which are beyond the control of the monetary and fiscal authorities.[2] With output converging to its exogenously given supply unemployment will always converge to its exogenously given NAIRU (non-accelerating inflation rate of unemployment).

What is stunning is that the original insight of the natural rate of interest as the reward of capital (the real profit rate) has been lost. In modern models it is simply a long-run equilibrium real interest rate. The attraction, therefore, has shifted from the original role of the real profit rate in determining inflation to a real interest rate that can define neutral monetary policy. The 'Wicksellian-muddle' may have significantly contributed to this diversion. Wicksell's (1898) insight is that as long as there is a positive divergence between the real profit rate and the loan rate, inflation will continue to rise. This may be self evident, as any divergence between the two rates will affect demand in the economy, which**,** with a fixed supply, will lead to rising inflation. The natural interest rate should not be defined as the rate consistent with stable inflation and, therefore, the rate that equates demand and supply in the goods market.

In Neo-Wicksellian models the natural rate of interest is a constant. The real profit rate that plays such an important role in micro-economics is simply a constant in macro-economics. It is about time to remove this anomaly and endogenise the profit rate. In doing

[2] Clearly fiscal policy is ineffective within the NCM analysis. It may have temporary short-run effects but none in the long run.

so, other anomalies in macro, such as the counter-cyclical behaviour of the real wage rate, may also be remedied.

5 A Reformulated Neo-Wicksellian Model

In this section we extend the model developed by Arestis and Karakitsos (2007) to deal with the current credit crisis.

$$D_t(=Y_t) = a_0(G-T) + a_1 Y_t + a_2 Y_{t-1} + a_3 E_t(Y_{t+1}) + a_4[R_t - E_t(P_{t+1}) - RR_t] + a_5 NW_{t-1} + \varepsilon_{1t}, \quad (1)$$
$$a_0, a_1, a_2, a_3, a_5 > 0, \text{ and } a_4 < 0,$$

$$Y_t^s = q + b_1 Y_t + b_2 RR_t + \varepsilon_{2t}, \quad (2)$$
$$b_1, b_2 > 0,$$

$$Y_t^g = Y_t - Y_t^s = \kappa, \quad (3)$$
$$\kappa = 0 \text{ or } \kappa \neq 0,$$

$$w_t = q + E_t(P_{t+1}) + \eta\ (U_t - U^n) + \varepsilon_{3t}, \quad (4a)$$
$$\eta < 0,$$

$$U_t = U^n + \theta\ Y_t^g, \quad (4b)$$
$$\theta < 0,$$

$$w_t = q + E_t(P_{t+1}) + \delta\ Y_t^g + \varepsilon_{3t}, \quad (4c)$$
$$\delta = \eta.\ \theta > 0,$$

$$ulc_t = w_t - q, \quad (5)$$

$$P_t = d_0 + d_1 ulc_t + d_2 Y_t^g + d_3 P_{t-1} + \varepsilon_{4t}, \quad (6)$$
$$d_1, d_2, d_3 > 0,$$

$$RR_t = f_1(P_t - ulc_t) + f_2 Y_t + f_3 R_t + \varepsilon_{5t}, \quad (7)$$
$$f_1, f_2 > 0, \quad f_3 < 0,$$

$$R_t = (1-\gamma_0)[RR_t + E_t(P_{t+1}) + \gamma_1 Y_{t-1}^g + \gamma_2(P_{t-1} - P^T) + \gamma_3(NW_{t-1} - NW^T)] + \gamma_0 R_{t-1}, \quad (8)$$
$$\gamma_0, \gamma_1, \gamma_2, \gamma_3 > 0,$$

$$NW = h_1\ NFW + h_2\ NHW, \quad (9)$$
$$h_1, h_2 > 0,$$

$$NFW = \psi_1 EP, \quad \psi_1 > 0, \tag{10}$$

$$EP = p_1 ERP + p_2 RR + p_3 (RC - r), \quad p_1, p_3 < 0,\ p_2 > 0,\ p_1 < p_3, \tag{11}$$

$$ERP = e_1 R + e_2 r, \quad e_1, e_2 > 0, \tag{12}$$

$$r = n_1 R, \quad n_1 > 0, \tag{13}$$

$$NHW = \text{NHW}(HP), \text{ where } HP = \varphi_1 (RC - r), \quad \varphi_1 > 0, \tag{14}$$

$$E_t(X_{t+1}) = X_{t+1} + \varepsilon_{6t}, \quad \lim_{T \to \infty} X_T = X_{T-1}. \tag{15}$$

All variables are expressed as rates of growth (log-differences): Y is (the rate of growth of) output, which is equal to the rate of aggregate demand (D); Y^s is (the rate of growth of) the supply of output (potential-output); Y^g is the output gap, the difference between the growth rates of current output and potential output; R is the nominal short-term interest rate; RR is the natural interest rate or real profit rate; w is (the rate of growth of) the nominal wage rate; q is (the rate of growth of) multi-factor productivity; *ulc* is (the rate of growth of) unit labour cost; P is the inflation rate; P^T is the central bank target inflation rate; U is the unemployment rate as per cent of the labour force; U^n is the NAIRU; NW = net household wealth, NHW=net housing wealth, NFW = net household financial wealth, HP=house prices, EP = equity prices, ERP = equity-risk premium, RC = corporate yield, r = government bond yield, long-term rate of interest; PE = price earnings ratio; and $E_t(X_{t+1})$ is the expectation of variable X in period t+1, as with information at time t.

Equation (1) describes the demand for goods and services as a positive function of current, past and future output and a negative function of the discrepancy between the real interest rate and the natural interest rate. Equation (1) is the 'new' IS-curve derived from the inter-temporal optimisation by households of current and future consumption subject to an estimate of the lifetime resources. The latter consist of labour income and accumulated wealth through savings and the valuation of assets (Rottenberg and Woodford, 1995, 1997; Wooford, 2003). Fiscal policy has a role to play in aggregate demand in the form of a balanced budget ($G - T$). The coefficient a_0 can be equal to unity to reflect the short-run balanced budget multiplier, but in reality all that is required is that it is positive and less

than unity. This term is not important, as the influence of fiscal policy can be operated through the stochastic process ε_{1t}. Consequently, output is demand determined in the short run; hence, $D = Y$ as in equation (1). As a result, equation (1) is an equilibrium condition in the goods market; it determines the equilibrium level of output at all times - demand is always equal to supply. This implies rejection of Say's Law in the short run and puts demand at the centre of the economy.

However, with this specification the IS cannot deal with the current crisis. What is needed is a traditional wealth effect that depends on the housing and the equity market. Whereas the housing and the equity markets decoupled in the aftermath of the burst of the internet bubble and the onset of the decline of housing prices, the two are now moving in tandem, as the collapse of the housing market has repercussions on the equity market. Hence, a significant negative wealth is developing that threatens to plunge the economy into a deep and protracted recession. Thus, the inclusion of the *NW* variable in equation (1).

The explicit introduction of a long-run, as opposed to a short-run, supply function of output is recognition of the importance of the capital accumulation process in determining the potential productive capacity of the economy through savings and investment and in the role of the latter in affecting multi-factor productivity. This implies a rejection of Say's Law not only in the short, but also in the long run - a feature that it is absent from the New Wicksellian (NCM) type of models. Equation (2) is derived from the simultaneous decision of households on how much to consume and save and of firms on how much to invest. The inter-temporal decision of firms on how much to invest depends on current profitability multiplied by the inverse of the discount rate (the marginal efficiency of capital) less the current estimate of the expected average rate of growth of profitability (see Arestis and Karakitsos, 2007). Thus, the coefficient b_2 in equation (2) is capturing the impact of the expected future profitability on current decisions. Mutatis mutandis, the inter-temporal decision of households on how much to consume and save depends on the current level of income multiplied by the inverse of the discount rate (the elasticity of substitution between current and future consumption) less the current estimate of the expected average rate of growth of future income. Thus, the coefficient b_1 is capturing the impact of expected future income on current decisions. The two decisions (of the firms and households) are not independent from each other, since savings is equal to investment in equilibrium. This equilibrium is achieved by the simultaneous determination of income (output) growth and the rate of growth of profitability. The levels determine the rate of growth of potential

output, which only affects the economy in the long run through the pricing of output and the factors of production. Hence, the long-run supply (or potential output), equation (2), is a positive function of output and of the profitability rate.[3] The potential capacity of the economy is also influenced by the rate of multi-factor productivity, q, which in the context of this model is assumed to be an exogenous variable.

Output affects the level of demand faster than supply and this implies that the sum of $a_1+a_2+a_3$ exceeds b_1. In reality the capital accumulation process depends on the entire history of the profit rate. However, for the purposes of our analysis the current value is sufficient to capture the essence of the process, while avoiding an artificial hysteresis effect - see equation (2).

The importance of the long-run supply of (or potential) output lies in determining the output gap. The output gap, Y_t^g, is the difference between the level of output, Y_t, which is demand determined, and the level of the long-run supply (or potential) output, Y_t^s, which is gradually adjusting to the level of demand and the capital accumulation process. The output gap is constant in the long run, which can be either zero or non-zero as shown in equation (3). If the shocks to the economy are transient then the output gap is zero in the long run. But if the shocks are long lasting then the output gap is simply a constant, which can be positive or negative depending on the nature of the shock.

The output gap is important in the pricing of the supply of output and the factors of production. Wage inflation, w_t, is equal to productivity, q, and expected inflation, $E_t(P_{t+1})$, in the long run, see equation (4a). This is the fair share of wages, which assumes a constant distribution of output between capital and labour. The fair share of wage inflation is also the rate associated with the NAIRU level of unemployment. But wage growth can be greater or lower than the fair share depending on whether unemployment is above or below the NAIRU level (Ball and Romer, 1990). But unemployment depends exclusively on the level of output through 'Okun's Law'. When the output gap is zero the level of unemployment is equal to the NAIRU level, see equation (4b). When the output gap is positive**,** the level of unemployment falls below the NAIRU level and *vice versa*. In this simple model the NAIRU level is simply a constant in line with the NCM model.

[3] Equation (2) should, of course, contain the rate of growth of the labour force, as it is derived from a production function. This factor is more important than capital in explaining the secular growth of the economy. However, since in the current model we are interested in business cycles rather than in secular growth**,** we can safely omit the rate of growth of the labour force. Including it, provided it is exogenous, will not alter the results in any case.

Elimination of the discrepancy of unemployment from NAIRU by the output gap results in equation (4c). On the assumption that productivity is exogenous, the unit labour cost (ulc_t) follows wage inflation on a one-to-one basis - as in equation (5).

The price of output is a mark-up on the remuneration of the variable cost of production, which is labour. Hence, inflation (P_t) is a mark up on the rate of growth of unit labour cost (ulc_t), equation (6). The mark-up depends positively on the output gap (Y_t^g) on the assumption that firms operate in monopolistic competition. Inflation depends on past inflation reflecting costs of adjustment in prices, such as *menu-costs* (for example, Calvo, 1983).

Equation (7) is in line with the true spirit of Wicksell (1898), that the natural interest rate (RR_t) is the return on capital or the real profit rate. This is a positive function of the profit margin, the excess of the price of output over unit labour cost, and the volume of output less the impact of the interest rate (R_t) on capital stock. Homogeneity implies that $f_1 = f_2$**;** however**,** in general this condition need not apply. The impact of the interest rate on capital stock can be thought off as the mechanism through which monetary policy affects profits. An increase in the real rate of interest adversely affects business as well as consumer confidence by indicating willingness by the central bank to create a negative output gap for a period of time. A relevant example is when the central bank wishes to fight a cost-push inflation that emanates from the rest of the world, say from an increase in the price of oil.

Equation (7) relies heavily on the Wicksellian comparison between *RR* and *R*. In this context, *RR* is compared with the cost of borrowing money (*R*), so that when the two deviate from each other banks and entrepreneurs play an important role in investment and savings decisions. Two important implications of our endogenisation of *RR* follow. The first relates to the assignment of an essential role to the difference between *RR* and *R*, the loan rate. This reinstates the significant role of commercial banks in the investment/savings process, which, unlike in Wicksell's (1898) original analysis, is completely missing from the Neo-Wicksellian approach (see, also, Goodhart, 2004; Fontana, 2006). The second implication relates to distributional effects. To illustrate, we may assume that due to negative output gap the rate of interest is reduced by the central bank, thereby initiating an expansionary monetary policy. The fall in R leads to an excess of investment over savings, which leads to higher prices. Higher profits emerge as a result of the ensuing inflation,

which causes redistribution from wages to profits. This fills the gap between investment and savings, and RR converges to the lower level of real *R*. In other words, it is the redistribution of real income from wages to profits that causes *RR* to revert to the lower real *R*.

The central bank operates monetary policy via a simple feedback rule that relates the level of the nominal interest rate to the output gap and the deviation of observed inflation from its target (see equation (8)). Such simple feedback rules have been popularised in the literature by Taylor (1993) and Svensson (1999, 2003), although their appeal in conducting credible monetary policy that affects favourably inflation expectations and the optimal derivation of their parameters had already been demonstrated by Artis and Karakitsos (1983) and Karakitsos and Rustem (1984, 1985). In the long-run equilibrium, when inflation is equal to the central bank target and the output gap is zero, the nominal short-term interest rate is equal to the natural interest rate and expected inflation. The lagged interest rate in equation (8), often ignored in the literature, represents interest rate 'smoothing' undertaken by the monetary authorities (see, for example, Rotemberg and Woodford, 1997; Woodford, 1999; Clarida, Galí and Gertler, 1998, 2000). It actually reflects the willingness of the central bank to implement systematic and consistent change in monetary policy - one direction - and avoid stop-go policies.

However, this specification of the objective function does not deal with the current credit crisis. It is incapable of preventing the ballooning of a bubble, while in the downswing it does not drain the excess liquidity thereby laying the seeds for the next bubble. This is exactly what has happened in the 2000s - we had three major bubbles (internet, housing, and commodities) all of which were financed with the same liquidity that was never removed from the system. In line with the analysis of Section 5 the policy objective function is augmented to include a term that penalises net wealth from its target.

Equations (9)-(14) endogenise in a rudimentary manner the wealth effect in consumption.[4] They do so by explaining separately net housing wealth (*NHW*) and net financial wealth (*NFW*). The former is affected by house prices (*HP*), which depend on the credit spread ($RC - r$);[5] while the latter mainly by equity prices. In the model equity prices depend on the natural interest rate (the real profit rate), the equity-risk premium (*ERP*), and credit risk (this variable shows that the spread between corporate bond yields, *RC*, and

[4] For an empirical model along these lines, the K-model, see Arestis and Karakitsos (2004).
[5] In the K-model, the housing market consists of 10-equations, but in reduced form it may simply collapse to the credit spread.

government bonds, *r*, is widening when credit risk increases). The last two variables are important in capturing any contagion effects from housing to consumption via the wealth effect.[6] The equity risk premium depends on short- and long-term interest rates in relation to corporate earnings. For example, the bond market sell-off in the second quarter of 2007 raised the equity risk premium and lowered the value of equities. In the model we explain the government bond yields in a traditional way, thereby also endogenising the equity risk premium.

Housing and financial wealth are related to each other and in some cases they move in opposite ways thereby offsetting each other and therefore the impact on consumption. In the first half of 2000s the equity market fell, but the housing market was booming. Between 2006 and the summer of 2007 the US housing market cooled down, while the equity market moved up, thus again minimising the impact on consumption. These major recent trends provided support to the view that the housing market can be an isolated event with minimum repercussions for the economy as a whole. However, since the onset of the credit crisis in the summer of 2007 the two markets have moved in tandem thus threatening to plunge the economy into a deep and protracted recession.

Expectations in this model are assumed to be formed rationally, equation (9). This entails that such expectations are on average correct, as the error over the forecast period is purely random with a zero mean and a constant standard deviation. Rational expectations require the imposition of a transversality condition. The most common transversality condition is that of stationarity, which implies that in the limit, as the forecast horizon tends to infinity, it makes no material difference and the expectation of a variable in successive periods is equal, beyond a remote point of time.

The system of equations (1)-(14) can easily be reduced to six equations:

$$Y_t = a_o(G-T) + a_1 Y_t + a_2 Y_{t-1} + a_3 E_t Y_{t+1} + a_4[R_t - E_t(P_{t+1}) - RR_t] + a_5 NW_{t-1} + u_{1t}, \tag{16}$$

$$\begin{aligned} Y_t^g = {} & a_0(G-T) - q + (a_1 - b_1)Y_t + a_2 Y_{t-1} + a_3 E_t(Y_{t+1}) \\ & + a_4[R_t - E_t(P_{t+1})] - (a_4 + b_2)RR_t + a_5 NW_{t-1} + u_{2t}, \end{aligned} \tag{17}$$

$$P_t = d_0 + d_1 E_t(P_{t+1}) + d_3 P_{t-1} + (d_4) Y_t^g + u_{3t}, \tag{18}$$

where $d_4 = d_1\delta + d_2 > 0,$

[6] Interestingly enough, the trouble in the US subprime market has the effect of raising credit risk. In July 2007 credit spreads widened significantly (around 400 bps) and caused a correction in equities.

$$RR_t = q + f_1[P_t - E_t(P_{t+1})] + f_2 Y_t + f_3 R_t + f_4 Y_t^g + u_{4t}, \tag{19}$$

where $f_4 = -f_1\delta < 0,$

$$R_t = (1-\gamma_0)[RR_t + E_t(P_{t+1}) + \gamma_1 Y_{t-1}^g + \gamma_2(P_{t-1} - P^T) + \gamma_3(NW - NW^T] + \gamma_0 R_{t-1} + u_{5t}, \tag{20}$$

$$NW_t = \Omega_1 R_t + \Omega_2 RR_t + \Omega_3 RC + u_{6t}, \tag{21}$$

where $\Omega_1, \Omega_3 < 0,$ and $\Omega_2 > 0.$

The system of equations (16)-(21) determines the six endogenous variables:

$$Y_t^g,\ Y_t\ ,\ P_t,\ R_t,\ RR_t,\ \text{and}\ NW_t.$$

The similarities and differences with the NCM (or Neo-Wicksellian) models are now apparent. The NCM model is simply equations (17), (18), and (20) with the last two terms in (17) and the penultimate term in (20) being omitted in relation to their respective equations as above. In our reformulated model there are three more equations**:** equation (16), which determines the equilibrium level of output from the level of demand in the economy; equation (19), which determines the rate of profit, which is treated as a constant in NCM models; equation (21), which determines net wealth. Our model is obtained by adding the last two terms in equation (17), which reflect (i) the influence of the profit rate in determining the output gap through demand and the long-run supply of potential output; and (ii) the wealth effect on consumption. In equation (21) we have added a wealth target.

6 Steady-state and Stability of the System

In the long-run equilibrium (steady-state) the output gap is zero or simply a constant; inflation expectations are realised and equal to the target inflation rate (i.e. $E_t(P_{t+1}) = P_{t+1} = P^T$); and wealth is equal to the target. Hence, the system is reduced to:

$$Y = \frac{1}{A}[a_0(G-T) - q + a_4(R - P^T) + B\ (RR)], \tag{22}$$

where $A = b_1 - a_1 - a_2 - a_3 < 0, \quad B = -a_4 - b_2 > 0,$

$$P^T = \frac{1}{C}[d_0 + d_4\kappa], \tag{23}$$

where $C = (1 - d_1 - d_3) > 0, \quad d_4 > 0,$

$$RR = q + f_2 Y + f_3 R, \tag{24}$$

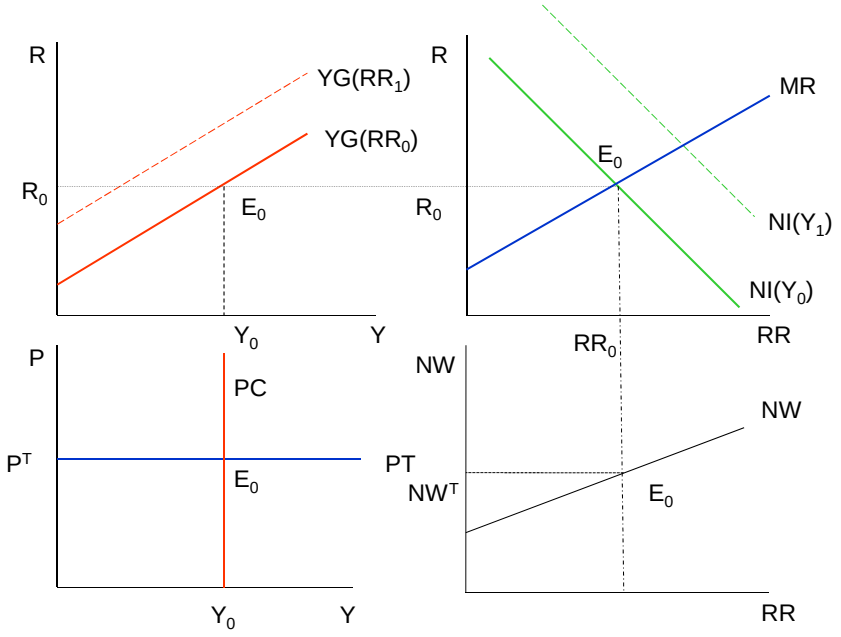
$$R = RR + P^T, \tag{25}$$

$$NW^T = \Omega_1 R + \Omega_2 RR + \Omega_3 RC. \tag{26}$$

Figure 14a shows the long-run equilibrium. The curve YG represents long-run equilibrium in the goods market, where the output gap is zero or simply a constant. In the (R, Y) space the curve is positively sloped, since an increase in the rate of growth of output increases demand more than supply. To restore equilibrium (i.e. zero output gap) the rate of interest must increase to reduce demand to the level of supply. This is a representation of equation (22).

Figure 14a

The steady-state of the model



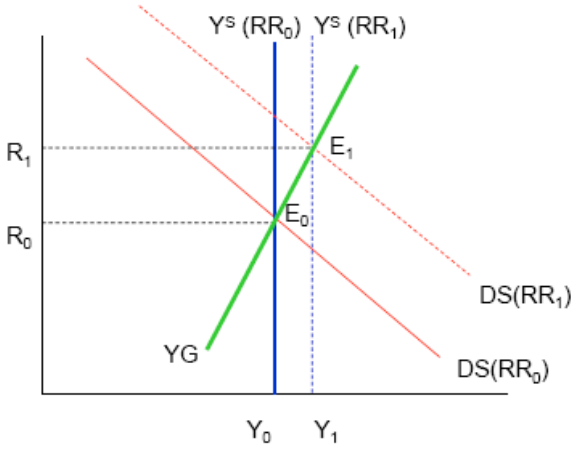
An increase in the profit rate would increase both demand and supply (see equations (1)-(2) and Figure 14b), but demand increases more than supply ($B > 0$ in 22 for the stability of the system). To restore zero output gap the interest rate would have to rise to reduce demand to the level of supply. Hence, the YG-curve would shift to the left in terms of Figure 14a. Furthermore, an increase in the rate of growth of multi-factor productivity will shift the YG-curve to the right.

Equation (23) is portrayed in the (P, Y) space of Figure 14a, where the PT line intersects the vertical axis at P^T. The PT-curve is the central bank inflation target, which is independent of the rate of growth of output as shown in equation (23). It intersects the

vertical axis at the target inflation rate P^T. We next deal with equation (24), which is plotted in the (R, RR) space of Figure 14a as the NI-curve. It represents equilibrium of the profit rate and is negatively sloped. An increase in the rate of interest reduces the profit rate by adversely affecting the business and consumer confidence. An increase in output or a rise in multi-factor productivity shifts the NI-curve to the right. The MR-curve represents the central bank feedback rule, equation (25). It is positively sloped with a coefficient of unity. The nominal short-term interest rate is equal to the profit rate plus the target inflation rate. Equation (26) is plotted in the *(*NW, RR*)* space of Figure 14a and is a positive function of the profit rate. An increase in the interest rate or the corporate yield shifts the curve down.

Figure 14b

Derivation of the YG-curve



Long-run equilibrium is attained at E_0. The intersection of the NI-curve with the MR-curve determines the short-term interest rate, R_0, and the profit rate RR_0. Given the levels of the two variables, R_0 and RR_o, the YG-curve determines the long-run equilibrium rate of growth of output, Y_0. The inflation rate is always equal to the target inflation rate at the intersection of the vertical Phillips curve. In the long run, wages are growing at the rate of productivity and the target inflation rate, while unemployment is equal to the NAIRU. The target level of wealth is determined from the exogenously given corporate yield RC, the interest rate R_0 and the profit rate RR_0.

The stability of the system requires that $A < 0$ in equation (22). This requires that as demand and output increase, demand rises at a faster rate than supply (i.e. $a_1 + a_2 + a_3 > b_1$). If this condition is not satisfied, a negative demand shock that creates a recession will create a positive output gap and hence inflation will rise. If the coefficient b_1 is higher than

$(a_1 + a_2 + a_3)$, the system would then become unstable in that as output declines, the output gap and inflation increase *ad infinitum*.

The stability of the system also requires that $B > 0$ in equation (22). This condition entails that the shift in the Y^s-curve in Figure 14b is smaller than the shift in the DS-curve (i.e. $b_2 < -a_4$). Otherwise, the system is again unstable. A negative demand shock that creates a recession induces the central bank to lower the interest rate and the natural rate increases. This creates a positive output gap that increases inflation. If $b_2 > -a_4$ and, hence, $B < 0$, the system leads to increasingly lower output and higher output gap**,** and, thus, higher inflation.

If $A > 0$ and $B < 0$, then the system is unstable in an oscillatory manner. A negative demand shock leads to periods of lower output, higher output gap, and rising inflation followed by the reverse pattern. The amplitude of the cycles is increasing through time.

The steady state effects of the credit crisis that erupted in the summer of 2007 can be analysed as follows. Excessive liquidity in the system combined with lack of central bank targeting of wealth implies that the NW-curve was higher than the target. Rising risk aversion (a widening of credit spreads) leads to a downward shift in the NW-curve and the YG-curve as housing and financial wealth fall. The central bank responds by cutting interest rates to offset the deflationary gap and with this action prevents the de-leveraging (drain of liquidity); thereby perpetuating the excessive liquidity and laying the seeds for a new bubble. This has fuelled the commodity bubble, which has fanned inflation. Interest rates now need to rise to control inflation; it is simply a matter of timing. If central banks had pursued a wealth target earlier in the business cycle, then the NW-curve would have been at equilibrium and the current malaise would have been avoided.

7 The Dynamic Effects of a Credit Crisis

The dynamic effects of the credit crisis are analysed by simulating a numerical analogue of the theoretical model. The equation coefficients are calibrated to fit the stylised facts and satisfy the stability conditions; they are given in Table 1. The credit crisis is portrayed in the model by a widening of credit spreads - corporate bond yields increase over government bond yields and money market rates over central bank rates. In the simulations it is assumed that for four years credit spreads widen by 450 bps, consistent with the stylised facts of the current crisis. As a result, net wealth falls from its steady-state value of 3% to -10% in the

next three years, as both equities and house prices plunge, but then gradually recovers (see Figure 15a). Net wealth overshoots its initial steady-state by 1.5% and then converges to it. The whole dynamic adjustment lasts for ten years, which is consistent with the experience of the 1930s and Japan in the 1990s.

Table 1: Numerical model.

Y - Equation

a(1)	a(2)	a(3)	a(4)	a(5)
0.3	0.25	0.25	-0.4	0.13

P - Equation

d(1)	d(3)	d(4)
0.3	0.3	0.16

RR - Equation

f(1)	f(2)	f(3)	f(4)
0.2	0.85	-0.25	-0.04

R - Equation

G(0)	G(1)	G(2)	G(3)
0.5	0.75	1.5	0.3

NW - Equation

Z(1)	Z(2)	Z(3)
-0.1	1	-1.2

YS - Equation

b(1)	b(2)
0.2	0.2

The fall in net wealth creates a recession with a negative output gap, which reaches a trough at nearly -3% in three years (see Figure 15b). But then the economy recovers and converges to its initial steady-state in ten years, while overshooting it for a short period of time. Potential output growth also diminishes during the credit crisis by a maximum of 1%, but ultimately returns to its initial steady-state (see Figure 15b). The fall in potential output mitigates the negative output gap and therefore it has a stabilising effect on the deflationary impact of the credit crisis. The decrease in potential output is due to lower growth and the impact of declining profitability on the capital accumulation process.

As a result of the negative output gap inflation falls by less than 1% in three years and then converges to its initial steady state, largely following the path of the output gap (see Figure 15c). The central bank has two targets, inflation and the output gap. As inflation falls

below the central bank target and the economy falters with a negative output gap the central bank responds by cutting interest rates aggressively from 4.5% to less than 0.5% in four years, consistent with the stylised facts of Japan in the 1990s and the US in 2000s. A year after the economy begins to recover the central bank gradually removes the accommodation bias. During the overshooting it lifts the interest rate above the target level, but then it takes it back to its initial steady-state (see Figure 15c). The profit rate (the natural interest rate of the Wicksellian model) plays an equally important, if not greater, role than interest rates in weathering the credit crisis and restoring the initial steady-state. It falls initially, in response to the negative output gap, but it is the first to recover, as the central bank cuts interest rates and company pricing power returns early in the cycle (see Figure 15c).

Figure 15a

Net wealth

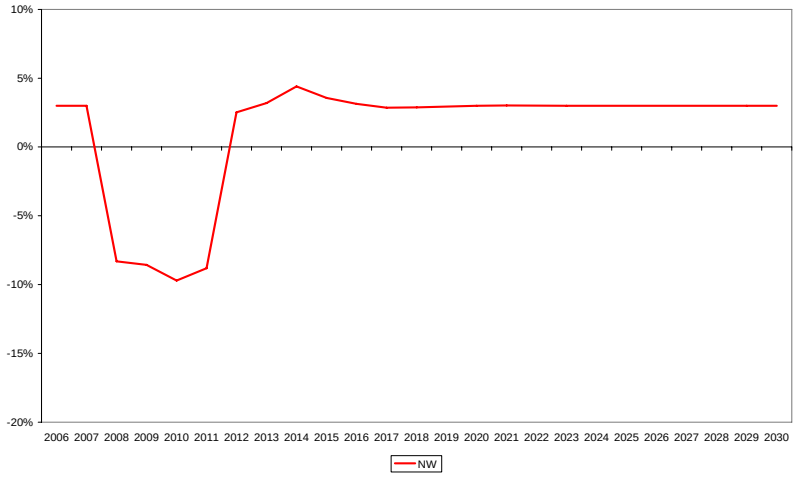


Figure 15b

Output gap and potential output

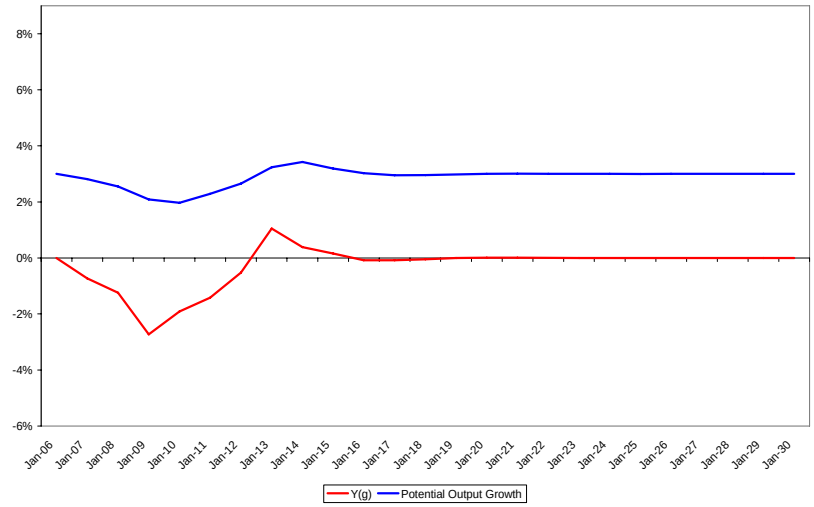
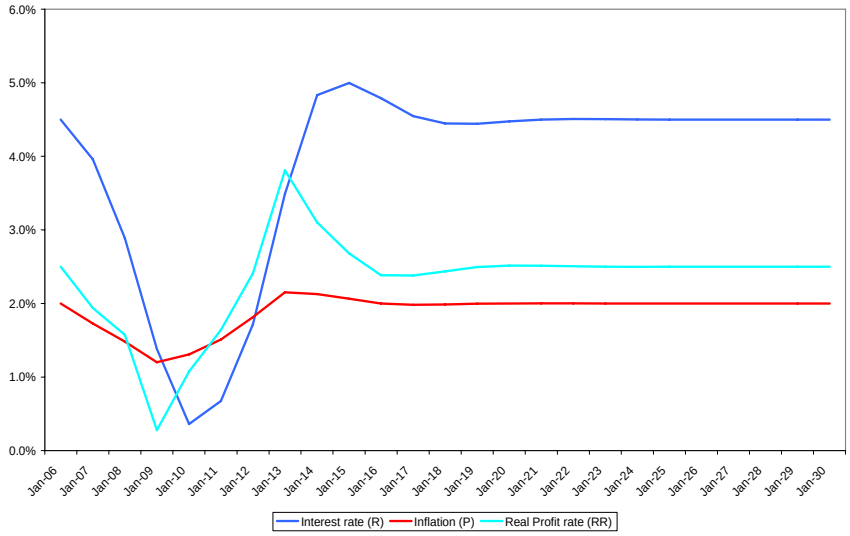


Figure 15c

Interest Rate, inflation, and real profit rate



The simulations show that the model captures the stylised facts of asset and debt deflation, caused by bank losses during the burst of an asset bubble that trigger the widening of credit spreads. The credit crisis causes larger swings in the output gap than in inflation, a characteristic of all asset and debt deflations and shows the importance of the output gap as a target of central bank policy. Reliance on inflation alone is likely to exacerbate and prolong the deflationary impact of the credit crisis.

8 Sensitivity Analysis – Leveraged Economics

The central role of wealth in an asset and debt deflation process reveals the drawback of NCM models to detect the roots of the current crisis and deal with its consequences. Net wealth depends on interest rates, as they affect house prices and equities. The other major determinant of net wealth is profitability that influences aggregate demand and equities. Both the interest rate and profit sensitivity of net wealth are related to the degree of leverage of the economy. In a highly leveraged economy both sensitivities are elevated; in fact, the more leveraged the economy, the higher these sensitivities are. As an example, consider the implications of SIVs that created a parallel banking outside the control and regulation of the authorities, which have contributed significantly to the expansion of liquidity. SIVs used to finance their activities through the London money market. Their profitability depended on the yield curve (the relationship between short-term and long-term interest rates). In fact, they went bust as the yield curve became slightly inverted, thus making them very sensitive

to changes in interest rates. A small rise in money market rates above mortgage rates was sufficient to cause the collapse of the SIVs. Since the asset backed securities issued by SIVs are held by the personal sector, the net wealth of households becomes very sensitive to changes in interest rates.

As an example of the high sensitivity of net wealth to profitability consider the investment banks that are highly leveraged; they operate with 30-40 times leverage. Because of the high degree of leverage they are also very sensitive to short- and long-term interest rates. A small fall in their assets is sufficient to wipe out their capital base and make them insolvent. No wonder, therefore, that the most important victims of the credit crisis were Bear-Stearns, Lehman Brothers and Merrill Lynch. In the upswing of the asset cycle investment banks made huge profits that boosted the net wealth of households, but in the downswing they made huge losses that dragged down equities and hence the net wealth of households. Banks have operated with a smaller degree of leverage than investment banks - around 20 times their capital. Their profitability is also very sensitive to interest rates, which again contributes to fluctuations in personal sector wealth through equities. Leveraged buy-outs (LBOs) were another frequently used method throughout the upswing of the asset-cycle to acquire companies and boost the net wealth of households through enhanced equity profitability. They are also very sensitive to changes in interest rates.

Thus, it is important to explore the sensitivity of the dynamic path of the economy to interest rates and profitability, as this enables the study of leveraged economies, a characteristic of the current credit crisis. The results of these simulations are reported in Figures 16a and 16b with respect to interest rates and Figures 17a and 17b with respect to profitability. Figure 16a shows that the economy oscillates around the initial steady-state for a quarter of a century, instead of converging in ten years; moreover, interest rates and profitability tend to move away through time from their initial steady-state; in other words the system tends to instability. Figure 17a shows that with a high net wealth response to profitability the output gap remains negative for 25-years, while Figure 17b shows that the improvement in net wealth from profitability is offset by the higher interest rates engineered by the central bank.

Therefore, in a leveraged economy the central banks face a much more difficult problem in stabilising the economy. A high response of net wealth to interest rates and profitability would prolong the credit crisis, as the central bank is forced to move interest rates up and down the target rate (see Figures 16a-b). An ever increasing response of net wealth to interest rates and profitability makes the system unstable and the economy never converges

to its initial steady-state, following a temporary credit crisis. The oscillatory central bank behaviour, which ultimately causes instability, is due to the cyclical pattern of profitability. The response of a central bank to a credit crisis might delay the recovery, if not cause long-term instability (meaning that the recovery would be followed by another deeper and more protracted recession later on) because of the higher response of the economy to profitability than to interest rates. This differential speed of adjustment is not just a feature of this model, but a stylised fact of the real world. Given that the real profit rate plays an important role in stabilising the economy, as it moves faster than interest rates and, given the influence of the interest rate on the real profit rate, which is responding to economic developments, it is not unreasonable that the central bank may destabilise a highly leveraged economy.

Figure 16a

Response of net wealth to interest rates (output gap)

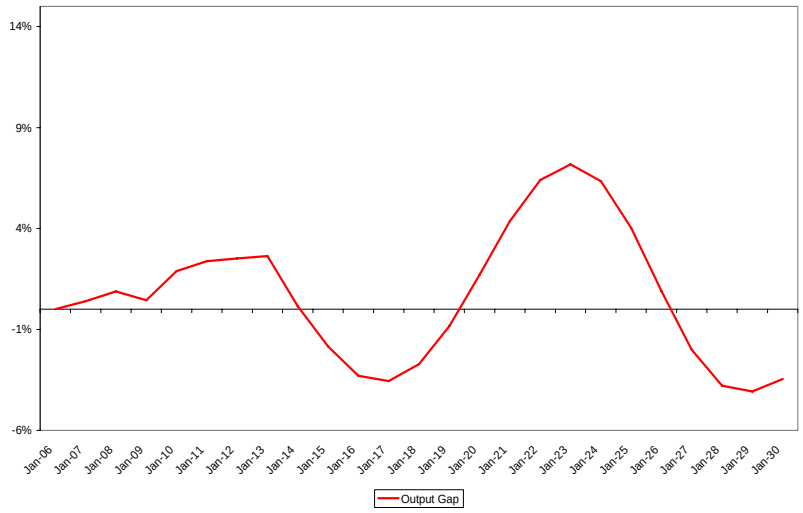


Figure 16b

Response of Net Wealth to Interest rates (interest rate, inflation, real profit rate)

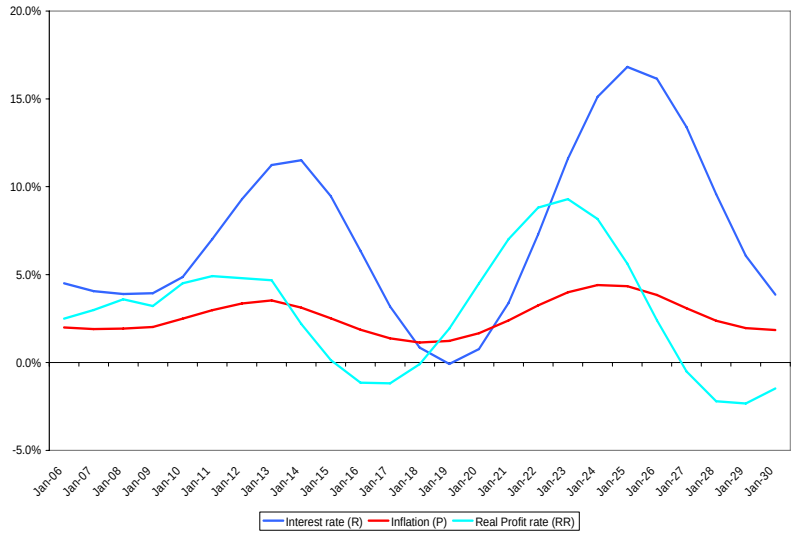


Figure 17a

Response of net wealth to profitability (output gap)

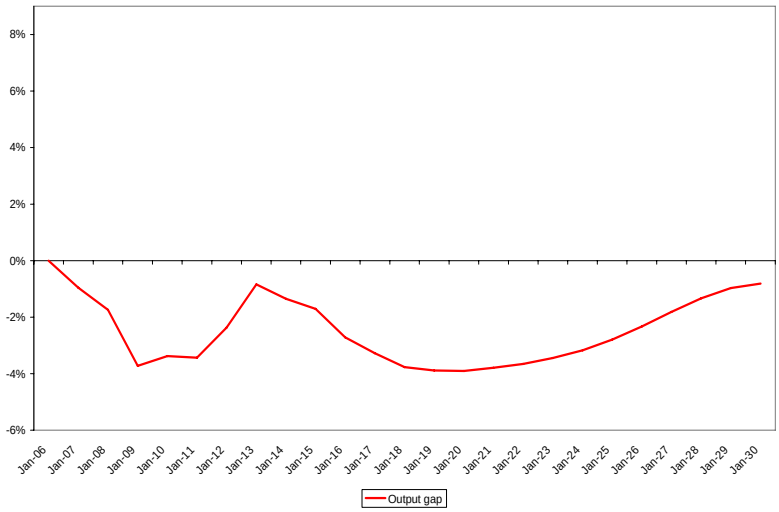
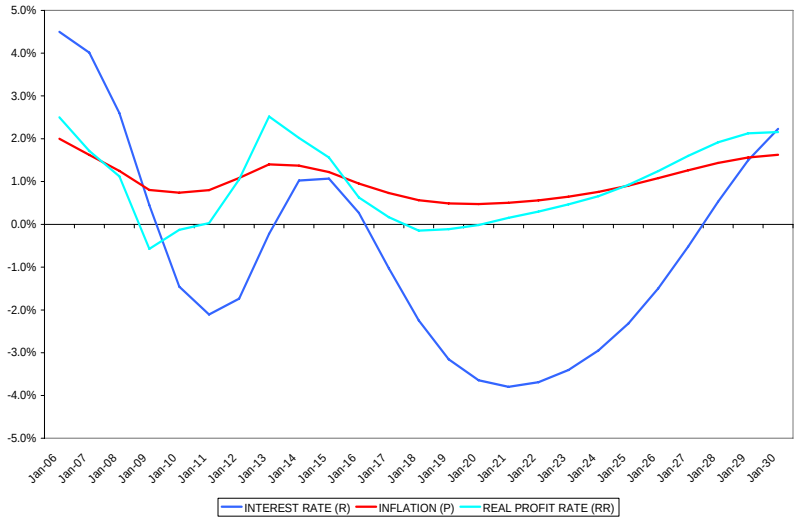


Figure 17b

Response of net wealth to profitability (interest rate, inflation, real profit rate)



9 The Role of Central Banks in the Current Crisis

All major central banks have an aversion to bailing out speculators when asset bubbles burst, but ultimately, as custodians of the financial system they have to do exactly that. They justify their actions as stemming from the goal of preventing the burst of the bubble from taking its toll on the economy. The intention may be different, but the result is the same: speculators, careless investors and banks are bailed out. A far better approach is for central banks to widen their scope and target the wealth of the personal sector by using interest rates both in the upswing and in the downswing of a cycle thereby avoiding moral

hazard. A wealth target would not impede the free functioning of the financial system as it deals with the consequences of the rise and fall of asset prices on the economy and is not a target of asset prices - equities or houses. It will also help control liquidity, which is at the heart of the current crisis and results from securitisation, without interfering with the financial engineering of banks.

One cannot but sympathise with those who argue that when bubbles burst central banks should not rescue speculators, careless investors or banks that encouraged the sale of such assets in the upswing of the cycle. For if they do, they would only encourage one way bets in future bubbles, as investors would be sure that in the downswing they would be bailed out by central banks. Many commentators during the crisis have advocated policies that avoid moral hazard. Central bankers share these concerns, but as custodians of the financial system they have to take action when markets are dysfunctional. In the current crisis they have injected temporary liquidity and provided direct loans to banks in trouble, but at a penal rate. At the beginning of the crisis central banks refrained from lowering rates that would turn the temporary injection of liquidity into a permanent one, thereby avoiding moral hazard issues. But as the crisis deepened the Fed, but not the ECB, cut interest rates and turned temporary liquidity into permanent. This raises the issue of whether merely concentrating on inflation, central banks are rather too monolithic. Leamer (2007) makes the point well when he argues that the Fed's focus on issues other than housing has given us the overheated housing market this decade, the unravelling of which is threatening to plunge the US economy into recession. The experience of many countries, including of course the US, shows that successful control of CPI-inflation does not guarantee control of asset price inflation. The thrust of the argument is succinctly summarized by Borio (2008) labelling it as a 'paradox of credibility', implying that, the more a central bank succeeds in keeping prices stable, the more likely that signs of an overheating economy will show up first in asset bubbles.[7]

The standard argument against asset price targeting is that it interferes with the free functioning of financial markets in particular but also with the economy as a whole. Moreover, it is out of the realm of central banks, as it is the result of 'irrational exuberance', or it reflects market forces, and, thus, proactive monetary policy; according to Alan Greenspan (2005), it would require the authorities to outperform market participants.

[7] "Paradoxically, these endogenous responses to credible monetary policy increase the probability that latent inflation pressures manifest themselves in the development of imbalances in the financial system, rather than immediate upward pressure on higher goods and services price inflation" Borio and Lowe (2002, p. 22).

Central bankers prefer to deal with the consequences of the burst of a bubble by minimizing the damages to the real economy. The success of Alan Greenspan after the burst of the internet bubble has given some credence to such an approach, which has been adopted by all four major central banks. But the current housing bubble is viewed as the result of those successful policies that Alan Greenspan pursued in the first half of 2000s that deflected the burst of the internet bubble from plaguing the economy into a 1930s style depression.

The way to avoid these problems is to monitor and target the implications of asset prices on the spending patterns of consumers. The variable that lends itself as a primary candidate for this purpose is the net wealth of the private sector. Net wealth is defined as the assets (financial and tangible) less the liabilities of the personal sector, which include mortgage debt and consumer credit. Although in the short run the ratio of net wealth to disposable income can fluctuate widely, in the long run it is trendless, as it shows the number of years it takes for households to buy a house and build financial wealth that would finance consumption for the rest of their lives and to leave bequests to their heirs. This ratio can neither be on an upward nor downward trend in the long run, as it would imply intergenerational changes in savings habits. The reason that net wealth is such an ideal variable to monitor (and control) bubbles is that it is at the heart of the transmission mechanism of asset prices and debt to consumption.

For the US economy the average net wealth since the end of WWII is around five times the annual disposable income. At the peak of the equity bubble net wealth hit a post world war high of 6.2 times the annual disposable income, making the bubble transparent. It was deflated as equity prices fell, but a new bubble of the same magnitude emerged because of housing. The Fed can have a target range of net wealth, say, 4.3-5.3 times the annual disposable income in the same manner as it has an implicit target of 1-2% for the core Personal Consumption Expenditures PCE-inflation. The target range may be revised to take account of demographics and even announced by central banks if they wish to anchor expectations of asset price inflation. Monetary policy should be tightened as the ratio of net wealth to disposable income raises much above this threshold and vice-versa. This would allow asset price booms, but it would prevent them from becoming bubbles that will ultimately burst with huge adverse consequences for the economy as a whole. Such an approach will also help regulate financial engineering. Securitisation implies a transfer of risk from banks to the personal sector and makes banks more willing to promote both lending and the sale of asset backed securities to the personal sector. It is this financial engineering that allowed US housing to become a bubble. Financial engineering is so

complex that central banks would have a tough time if they wanted to measure, monitor and control the total liquidity in the economy. A wealth target will check the consequences of this liquidity, while not impeding the financial engineering of the banks.

10 The Merits and Perils of Wealth-targeting

So far, we have shown that if monetary policy is guided solely by inflation, then the central bank is unlikely to deal adequately with a credit crisis. The reason for this important conclusion is that in an asset-led business cycle the volatility of the output gap is greater than the volatility of inflation. In the upswing of the cycle when credit expands and asset prices soar, inflation remains subdued for two reasons. First, potential output increases in the upswing, thus dampening the positive output gap and containing inflationary pressures. Second, cyclical productivity improvements, which appear as structural as they did in the late 1990s in the US, reduce unit labour cost thus putting a lid on inflation. On the other hand, the expansion of credit and the soaring asset prices increase output disproportionately compared to a standard demand-led business cycle. Therefore, a central bank is well advised to have two targets in an asset-led business cycle - inflation and the output gap. With these two targets and despite the fact that the central bank is using only one instrument - interest rates - it is more likely to be successful in dealing with a credit crisis and the consequences of the burst of the asset bubble. However, in a highly leveraged economy, like the US, even the two targets of inflation and the output gap are likely to prove inadequate to deal with the crisis. As the degree of leverage increases guidance of monetary policy by these two targets is likely to lead to a prolonged crisis and possibly to instability because of the differential speed of the economy to changes in interest rates and profitability. In this section we explore the merits of complementing the traditional targets of economic policy by wealth targeting. In the simulations reported in this section the priority on the wealth target in the central bank objective function (8) now becomes operative with $\gamma_3 > 0.3$. The results are summarised in Figures 18a-c.

The widening of credit spreads leads to a smaller reduction in net wealth and therefore to a milder recession (see Figure 18a). The negative output gap is just -0.9% with wealth targeting and -2.7% without (see Figure 18b). The milder recession results in a smaller profit fall under wealth targeting and this necessitates smaller rate cuts by the central bank (see Figure 18c). The swings in interest rates are thus smaller under wealth targeting and

this enables the economy to weather the burst of the bubble with smaller costs in terms of output lost. Therefore, a mild wealth targeting is beneficial in the central bank task of stabilising the economy in an asset-led business cycle.

Figure 18a

Net wealth with mild and no wealth targeting

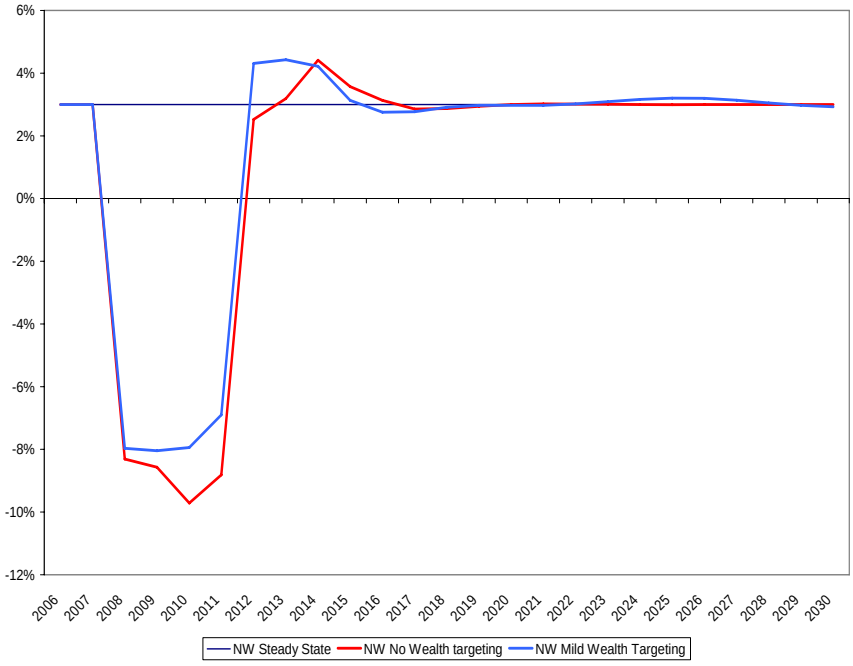
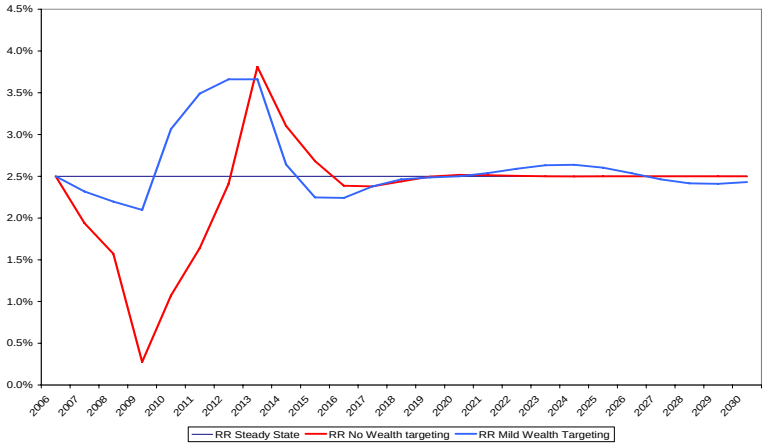


Figure 18b

Output gap with mild and no wealth targeting

Figure 18c

Real profit rate with mild and no wealth targeting



This makes it necessary to examine what would happen to the dynamic adjustment of the economy if the central bank went wild with enthusiasm on wealth targeting. This situation is examined by simulating the model with $\gamma_3 = 0.3$. The results are summarised in Figures 19a-c. The central bank achieves in arresting initially the fall in net wealth and the recession is milder than without wealth targeting, but deeper than with mild targeting. However, in time the swings in interest rates are too large and given the lags in the effects of monetary policy and the fast response of demand and wealth to profitability, this volatility destabilises the economy. Hence, excessive wealth targeting leads to a prolonged recession and risks destabilising the economy. Therefore, a mild wealth targeting is preferable to both no wealth targeting and excessive wealth targeting. The simple rationale of this conclusion stems from the fact that in the real world profitability adjusts faster than interest rates and the economy responds faster to changes in profitability than to interest rates.

Figure 19a

Net wealth with excessive wealth targeting

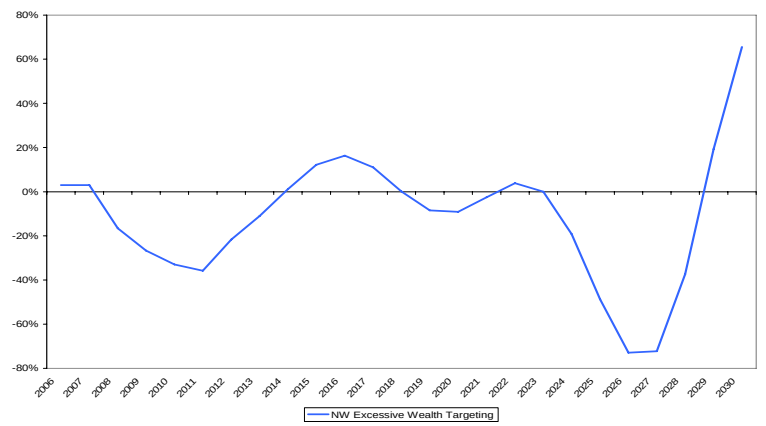


Figure 19b

Output gap with excessive wealth targeting

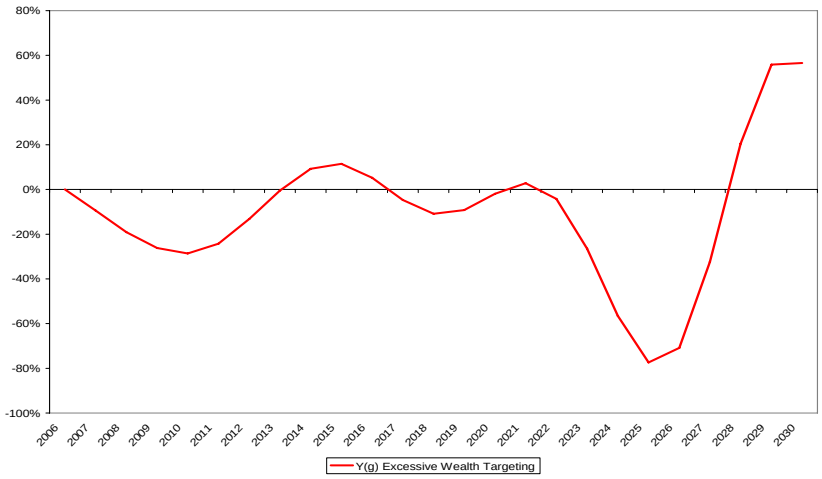
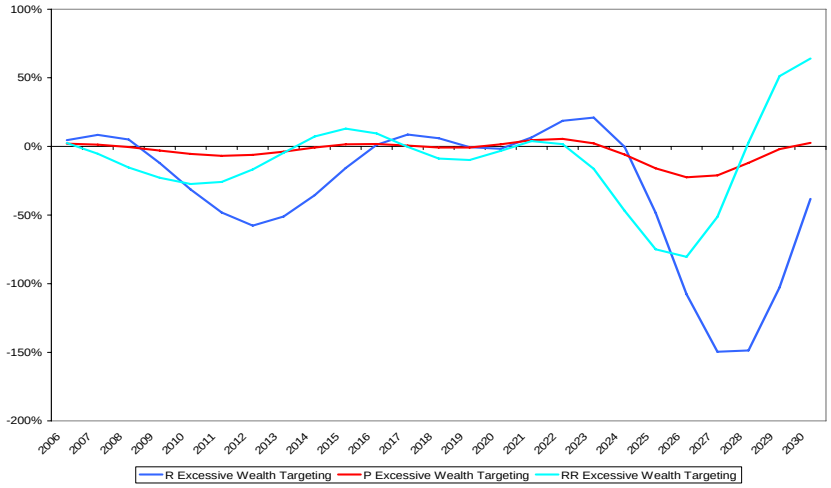


Figure 19c

Interest rate, inflation and real profit rate with excessive wealth targeting



11 Summary and Conclusions

Financial innovations, along with very accommodating monetary policy in the US and Japan in the last ten years or so have combined to create huge liquidity in the US and the global economy. This liquidity has financed consecutively three major bubbles (internet, housing, and commodities) and other minor ones, such as private equity and shipping.

Securitisation has enabled the sale of complex securities, such as CDOs, to the personal sector and the financial institutions of other countries, thus providing the transmission mechanism of contagion of the US housing market to the global economy. The losses of

banks have so far amounted to $700 billion and the crisis has cost the life of the most eminent financial institutions.

Central banks have not been able to detect and monitor this liquidity, which has taken place in a parallel banking system outside regulation and, therefore, not reflected in traditional monetary aggregates. The approach initiated by Alan Greenspan and adopted by other central banks is to deal with the consequences of the burst of the bubble and not with their causes. They have not attempted to prevent the ballooning of these bubbles. Every time a bubble has burst central banks have injected liquidity to avoid the systemic risk from threatening the financial system. Moreover, they have cut interest rates to deflect the asset and debt deflation that follows the burst of a bubble, thus making the temporary injection of liquidity permanent. These practices have maintained, if not fuelled, the excessive liquidity. The commodity bubble, however, promises to be the last one, as it feeds directly CPI-inflation, which central bankers are not willing to tolerate, although there is increasing resistance amongst politicians and financial markets alike for a delay of this tightening, as the major economies are in the middle of a slowdown that may develop into a deep and protracted recession. Evidence now suggests that even the commodity bubble has burst as the de-coupling theory, namely that the BRIC countries would be able to sustain their growth momentum even as growth in the Western World wanes, which has given rise to the last phase of exaggeration in this bubble in the first half of 2008, has collapsed. Since the summer of 2008, the prevalent view is that growth in the BRIC countries would be adversely affected by the downturn in the US, Europe, and Japan. Moreover, the very fast deleverage that is now taking place in the financial system suggests that the commodities bubble would be unable to recover.

To some extent these mistakes in the conduct of monetary policy are due to the wrong specification of the policy objective function and the underlying theoretical NCM model, which forms the intellectual basis as a constraint in the optimisation of economic policy. This paper has argued that the policy objective function should be augmented to include mild, but not excessive, wealth targeting in addition to the traditional targets of inflation and the output gap. Such an addition will make sure that asset price booms do not grow to become bubbles, while it sidesteps the undesirable task of killing financial innovations and enforcing old regimes, such as forcing banks to be responsible for the portfolio of loans they originate, simply for the sake of avoiding bubbles. But, whereas mild wealth-targeting may be beneficial to the central bank task of stabilising the economy, excessive wealth targeting is likely to prove harmful in terms of output-loss and is also likely to lead to instability. This

important conclusion stems from the fact that profitability responds faster than interest rates and the economy reacts faster to changes in profitability than to interest rates. In terms of policy two more conclusions can be drawn. First, in an asset-led business cycle reliance on inflation alone in guiding monetary policy is likely to prove inadequate in dealing with the problems of the burst of a bubble. This is due to the higher volatility of output than inflation in an asset-led cycle. Thus, reliance on inflation as well as on the output gap is more likely to prove more efficient in dealing with the consequences of the burst of the bubble. Second, in a leveraged economy, like the US, reliance on even the two traditional targets of inflation and the output gap is likely to prove problematic. The more leveraged the economy is, the longer the crisis and the higher the risk of instability.

The current credit crisis is also due to the wrong specification of the NCM models that gives rise to erroneous policy implications. In this respect, there are three defects in the NCM models. First, they ignore the wealth effect in consumption. Second, they treat the LM-curve as a residual and therefore cannot detect the liquidity that is financing bubbles. Third, they treat potential output and the natural interest rate as exogenous and therefore assume that the economy will always return to the same long-run equilibrium irrespective of whether shocks are transient or permanent. In these models inflation is under the control of the central banks, but output and unemployment are not. This paper suggests that the NCM models should be re-specified to take care of these problems.

According to the K-model, US relative house prices, which have already fallen by more than 25% since their peak in July 2006, are likely to fall by another 15% by the end of 2009. Even nominal house prices, which have already fallen by 17% in the same time period, are likely to fall by another 12% by the end of 2009. This fall in house prices, followed by further losses in financial wealth with the benchmark S&P 500 bottoming at around 700, will probably drag the US economy into recession through a weakness in consumption. Inflation will dissipate to 1.5% in the next twelve months, while the Fed is likely to pursue a zero interest rate policy. However, the risks are on the downside as house prices are likely to overshoot their long-run equilibrium, thus triggering second-round effects in bank losses and the wealth of the personal sector. The precise forecast will depend on the final estimate of the bank losses, which are now estimated at $1 trillion.

References

[1] Arestis, P., and A. Ross (2007). What is the New Consensus in Macroeconomics? in Is There a New Consensus in Macroeconomics? P. Arestis (Ed.). Palgrave Macmillan, Houndmills, Basingstoke.

[2] Arestis, P., and E. Karakitsos (2004). The Post-bubble US Economy: Implications for Financial Markets. Palgrave Macmillan, London and New York.

[3] Arestis, P., and E. Karakitsos (2007). Unemployment and the Natural Interest Rate in a Neo-Wicksellian Model, in Unemployment: Past and Present, P. Arestis and J. McCombie (Eds). Palgrave-Macmillan, London and New York.

[4] Artis, M. J., and E. Karakitsos (1983). Memorandum of Evidence on International Monetary Arrangements. Fourth Report from the Treasury and Civil Service Committee on International Monetary Arrangements, (H.M.S.O. London) HC 21-III, 142 - 206.

[5] Ball, L., and D. Romer (1990). Real Rigidities and the Non-neutrality of Money. Review of Economic Studies, 57, 179-198.

[6] Borio, C. (2008). The Financial Turmoil of 2007-?: A Preliminary Assessment and Policy Considerations. BIS Working Paper 251.

[7] Borio, C., and P. Lowe (2002). Asset Prices, Financial and Monetary Stability: Exploring the Nexus. BIS Working Paper 114.

[8] Calvo, G. (1983). Staggered Prices in a Utility Maximising Framework. Journal of Monetary Economics, 12, 383-398.

[9] Clarida, R., Galí J., and M. Gertler (1998). Monetary Policy Rules in Practice: Some International Evidence. European Economic Review, 42, 1033-1068.

[10] Clarida, R., Galí J., and M. Gertler (2000). Monetary Policy Rules and Macroeconomic Stability: Evidence and Some Theory. Quarterly Journal of Economics, 115, 147-180.

[11] Fontana, G. (2006). The 'New Consensus' View of Monetary Policy: A New Wickselian Connection? Levy Economics Institute Working Paper 476, Levy Economics Institute of Bard College, New York.

[12] Goodhart, C. A. E. (2004). Review of Interest and Prices by M. Woodford. Journal of Economics, 82, 195-200.

[13] Greenspan, A. (2005). Reflections on Central Banking. Remarks at The Greenspan Era: Lessons for the Future, Symposium sponsored by the Federal Reserve Bank of Kansas City, Jackson Hole, Wyoming, 25-27 August.

[14] Karakitsos, E., and B. Rustem (1984). Optimally Derived Fixed Rules and Indicators. Journal of Economic Dynamics and Control, 8, 33-64.

[15] Karakitsos, E. and B. Rustem (1985). Optimal Fixed Rules and Simple Feedback Laws in the Design of Economic Policy. Automatica, 21, 169-180.

[16] King, M. (2005). Monetary Policy: Practice Ahead of Theory. Mais Lecture, Cass Business School, City University, London.

[17] Leamer, E. (2007). Housing is the Business Cycle. Proceedings, Federal Reserve Bank of Kansas City 149-233.

[18] Rotemberg, J. J., and M. Woodford (1995). Dynamic General Equilibrium Models with Imperfectly Competitive Product Markets, in Frontiers of Business Cycle Research, 243-293, T. J. Cooley (Ed.). Princeton University Press, Princeton.

[19] Rotemberg, J. J., and M. Woodford (1997). An Optimization-based Econometric Framework for the Evaluation of Monetary Policy. NBER Macroeconomics Annual 1997, 297-346, Cambridge, MA.

[20] Svensson, L. E. O. (1999). Inflation Targeting as Monetary Policy Rule. Journal of Monetary Economics, 43, 607-654.

[21] Svensson, L. E. O. (2003). What is Wrong with Taylor Rules? Using Judgement in Monetary Policy through Targeting Rules. Journal of Economic Literature, XLI, 426-477.

[22] Taylor, J. B. (1993). Discretion Versus Policy Rules in Practice. Carnegie-Rochester Conference Series on Public Policy, December, 195-214.

[23] Weber, A. A., Wolfgang L., and A. Worms (2008). How Useful is the Concept of the Natural Real Rate of Interest for Monetary Policy? Cambridge Journal of Economics, 32, 49-64.

[24] Wicksell, K. (1898). Geldzins und Güterpreise, Verlag Gustav Fischer, Frankfurt. Interest and Prices, English translation in R. F. Kahn (1965), Kelley, New York.

[25] Woodford, M. (1997). Doing Without Money: Controlling Inflation in a Post-monetary World. Mimeo, Princeton University.

[26] Woodford, M. (1999). Optimal Monetary Policy Inertia. NBER WP 7261, Cambridge, MA.

[27] Woodford, M. (2003). Interest and Prices. Princeton University Press, Princeton.