

How Robust is the New Conventional Wisdom in Monetary Policy?

The surprising fragility of the theoretical foundations of inflation
targeting and central bank independence * **

Willem H. Buiter,
Professor of European Political Economy
European Institute
London School of Economics and Political Science,
Universiteit van Amsterdam, NBER and CEPR

April 15, 2007

* Paper to be presented at the Bank of England's Chief Economists' Workshop, 16-18 April 2007. An earlier version of this paper was presented at the 2006 Central Bank Governors' Symposium "Challenges to Monetary Theory", at the Bank of England on June 23, 2006. Earlier versions of this paper were presented at the Norges Bank's Conference on Monetary Policy 2006, Evaluating Monetary Policy, 30 March 2006, and at the 37rd Konstanz Seminar on Monetary Theory and Policy, May 30 - June 2, 2006. I would like to thank Gianluca Benigno, Pierpaolo Benigno, Jarle Berge, Mario Blejer, Guillermo Calvo, Stephen Cecchetti, Vittorio Corbo, Lawrence Christiano, Casper de Vries, Stefan Gerlach, Svein Gjedrem, Kjersti Haugland, Rachel Lomax, Manfred Neumann, Jorunn Paulson, Huw Pill, Robert Rasche, Martin Redrado, Irma Rosenberg, Michael Saunders, Anne Sibert, Zdenek Tuma, Jurgen von Hagen, Axel Weber and Fredrik Wulfsberg for helpful comments. Alan Blinder offered wide-ranging and insightful comments on an earlier version of the paper, and I am greatly in his debt. None of the aforementioned bear any responsibility for the content of this paper.

** © Willem H. Buiter 2006, 2007.

Abstract

Flexible inflation targeting - the minimisation of the expected discounted sum of current and future period losses, with the period loss function given by the weighted sum of squared deviations of inflation from a constant target rate and the squared output gap - cannot be rationalised, except in a single, practically uninteresting special case, using conventional welfare economic criteria. Woodford's assertion to the contrary, based on New-Keynesian dynamic stochastic general equilibrium models, is generically incorrect for that class of models. New-Keynesian models imply that optimal monetary policy implements the Bailey-Friedman Optimal Quantity of Money rule and that actual inflation fully validates or accommodates the *inflation heuristic* - the inflation generated by rule-of-thumb price and/or wage setters.

Flexible inflation targeting is also inconsistent with the mandates of leading inflation targeters like the Bank of England and the ECB. These mandates are lexicographic in price stability (from now until Kingdom Come) and all other objectives, with price stability in pole position. A lexicographic mandate does not permit a trade-off between inflation volatility and output gap volatility in the monetary policy maker's objective function. A lexicographic ordering of the price stability objective for the monetary authority makes sense even if, for whatever reason, the true objective function were of the flexible inflation targeting variety. This is because there is no evidence that monetary policy can systematically contribute to output gap stabilisation beyond what is the natural by-product of the single-minded – lexicographic - pursuit of price stability in the medium and long term.

Operational independence of the central bank is limited by the central bank's intertemporal budget constraint. Price stability, or an externally imposed inflation target, may not be independently financeable by the central bank. In that case, active budgetary support from the Treasury is necessary to make the inflation target financeable.

Independent monetary policy is fully compatible with coordinated and cooperative monetary and fiscal policy.

Central bank operational independence precludes substantive accountability; it is compatible only with a weak form of formal accountability: reporting obligations.

Central bank independence will only survive if it is viewed as legitimate by the polity and its citizens. A necessary condition for this is that the central bank restricts its activities and public discourse to its natural core mandate: price stability and the capacity and willingness to act as lender of last resort. The Protocol on the Statute of the ESCB and the ECB has given the ECB a mandate that goes beyond this natural core mandate, by assigning the ECB a key formal advisory role in the quintessentially political process of Eurozone enlargement. Furthermore, the ECB follows a long-established continental European tradition of central banks routinely and vocally participating in the public debate on fiscal sustainability and structural reform. These are areas that are both beyond the ECB's (already over-ambitious) Treaty-based mandate and beyond its domain of competence. Such behaviour represents a threat to its continued independence.

JEL Classifications: D6, E3, E4, E5, H0

Key Words: Flexible inflation targeting; welfare economics; New-Keynesian dynamic stochastic general equilibrium models; central bank independence

Author details:

Professor Willem H. Buiter CBE, FBA
Chair of European Political Economy,
European Institute
London School of Economics and Political Science
Houghton Street
London WC2A 2AE
United Kingdom
Tel.: + 44 (0)20 7955 6959
Fax: + 44 (0)20 7955 7546
E-mail: w.buiter@lse.ac.uk
Web: <http://www.nber.org/~wbuiter/>

Table of Contents

Introduction. P1

I. Inflation as moral failure. P. 5

II. The conventional welfare economic foundations of inflation targeting. P. 9

IIA. The welfare economics of inflation when the pecuniary opportunity cost of holding money is non-zero, with or without nominal price and wage rigidities. P. 11

IIB. The welfare economics of inflation when the opportunity cost of holding money does not affect welfare. P. 15

IIB1. Menu costs. P. 15

IIB2. Tax and benefit distortions and other failures of indexation in the public and/or private sectors. P. 16.

IIB3. A Caveat. P. 17

IIC. Relative price distortions and inefficient output gaps due to nominal rigidities: Old-Keynesian wine in New-Keynesian bottles. P. 19

IID. The foibles of flexible inflation targeting. P. 31

III. The useful but dangerous myth of central bank independence. P. 41

IIIA. The financial mechanics of central bank Dependence. P. 47

IIIA.1 The intertemporal budget constraints of the central bank and the treasury. P. 52

IIIA2. Can central banks survive with ‘negative equity’? P. 58

IIIA.3 Is the inflation target independently financeable by the central bank? P. 60

IIIA.4 Other aspects of necessary co-operation and co-ordination between central bank and treasury. P. 66

IIIA.3a Recapitalizing the central bank. P. 67

IIIA.3b Helicopter drops of money. P. 68

IV. The Political economy of limited central bank

independence. P. 71

IVA. The operationally independent central bank as a solution to a commitment problem. P. 72

IVB. Incentives and institutions for efficient monetary policy making. P. 74

IVB.1 Monetary policy making by committee. P. 75

IVB.1a Shirking. P. 75

IVB.1b Groupthink and other group decision-making Pathologies. P. 76

IV.C The legitimacy of delegated monetary policy Authority. P. 82

IVC.1 Operational independence precludes substantive accountability. P. 82

IVC.2 Limiting the domain of unaccountability, or central banks should stick to their knitting. P. 86

IVC.2a The ECB and Eurozone enlargement. P. 88

IVC.2b Central banks, fiscal sustainability and structural reform. P. 90

IVC.2c Should the central bank care about fiscal sustainability because of its impact on financial stability? P. 91

IVC.2d Private sector threats to financial stability. P. 97

IVC.3 From independent central bank to minimalist independent monetary authority. P. 101

IVC.3a Taking the monetary authority out of financial supervision and regulation. P. 103

IVC.3b Taking the monetary authority out of the clearing and settlement business. P. 103

IVC.3c Taking the monetary authority out of the financial stability business. P. 105

IVC.3d Taking the monetary authority out of the lender-of-last-resort business. P. 109

IV.D Threats to central bank independence. P. 110

V. Conclusions. P. 112

¹ See e.g. Cukierman, Webb and Neyapti (1992), Cukierman (2006), Alesina and Summers (1993), Posen (1993), McCallum (1995), Beetsma and Bovenberg (1997), Campillo and Miron (1997), Forder (1998), Blinder (1999), de Haan and Kooij (2000), Ozkan (2000), Posen (1993), Buiters (2004, 2005)

Introduction

Whenever a near-universal consensus takes hold of the economics profession, it tends to be at least half wrong. A concern that this may be happening in the areas of inflation targeting and central bank independence first prompted the writing of this monograph.

A commitment to price stability through the pursuit of an inflation target by an operationally independent central bank has become the canonical model of monetary policy in an open economy with a floating exchange rate. The Reserve Bank of New Zealand led the way with inflation targeting in 1989 and 1990. The United Kingdom was an early convert in 1992 (see King (1997)). The European Central Bank has an inflation target that dare not speak its name. Japan, exiting at last from many years of quantitative easing with the short nominal interest rate at zero, has adopted a target range for the CPI inflation rate.² Norway has adopted an inflation target, and so have Sweden and Iceland.³ Of the leading central banks only the Fed has not adopted inflation targeting, and with the changing of the guard from Alan Greenspan, a long-standing opponent of inflation targeting, to Ben Bernanke, a long-standing proponent of inflation targeting, we are likely to see a gradual *de facto* adoption of inflation targeting in the US also.

As regards central bank independence, *operational* independence is now widely considered to be a sine-qua non for medium-term macroeconomic stability. In the EU Treaty, central bank independence has been made a qualifying condition for membership in the

² The Bank of Japan Law states that the Bank's monetary policy should be "aimed at, through the pursuit of price stability, contributing to the sound development of the national economy."

³ In Norway, the government sets the operational inflation target of 2½ per cent for CPI-ATE, a 'core' measure of inflation. In Sweden, the Riksbank's itself sets the operational price stability objective; it aims to keep inflation around 2 per cent per year, as measured by the annual change in the CPI. The Central Bank of Iceland's main objective is price stability, defined as a 12-month rise in the CPI (Consumer Price Index) of 2½%.

Eurozone. The Bank of Japan Law states: *"The Bank of Japan's autonomy regarding currency and monetary control shall be respected."*

There is also a general consensus that the ability and willingness of the central bank to act as lender of last resort is an essential part of its mandate. This follows from the central bank's role in ensuring financial stability, which is written into the legal documents establishing any central bank's⁴ Some central banks are deeply concerned that the mere mention of the central bank's lender of last resort function will significantly boost moral hazard in the financial sector and render more likely the occurrence of crises calling for lender of last resort interventions. Such central banks prefer to create an atmosphere of 'constructive ambiguity' about whether and when they might act as lender of last resort.

The lender of last resort function requires the central bank to stand ready to lend freely, at a penalty rate and against good collateral. In normal times, there would not be any takers for this facility. During liquidity crises, the extension of central bank credit through its lender of last resort role would not endanger price stability, because it merely accommodates a sharp increase in liquidity preference. If the central bank's actions solve the liquidity crisis, the emergency credit will be retired in due course, again without prejudice to the price stability target. During a solvency crisis, there either is no good collateral, and the central bank will not act as a lender of last resort, or the central bank overestimates the quality of the collateral and gets stuck with non-performing under-collateralised loans. In the first case, the fiscal authority will have to decide whether to recapitalise the defaulting financial institutions. In the second case, the fiscal

⁴ For instance, in the case of the ECB, Article 3.3. of the Protocol on the statute of the European System of Central Banks and of the European Central Bank states: "..., the ESCB shall contribute to the smooth conduct of policies pursued by the competent authorities relating to the prudential supervision of credit institutions and the stability of the financial system."

authorities may have to recapitalise the central bank. Except in Sections IIIA and IVC below, the lender of last resort function of the central bank will not be considered further.

There now exists a vast literature on inflation targeting (see e.g. Federal Reserve Bank of Kansas City (1996), Bernanke and Woodford (2005), Rasche and Williams (2005) and Blinder (2006)). Much of this deals with the “how to’s” of inflation targeting, and exudes an air of confidence about what is often referred to as ‘international best practice’, that would seem premature, given the short history of inflation targeting (see Svensson (1997, 1999, 2001, 2005, 2006)). The appropriateness of inflation targeting outside the environment where it was pioneered - advanced industrial countries with functioning market economies and developed financial systems - is a subject of considerable discussion (see e.g. Batini, Kuttner and Laxton (2005) and IMF(2006)). There is also a voluminous and deeply misguided literature, pioneered by Woodford (2003, Chapter 6, Sections 2, 3 and 4) on the conditions under which inflation targeting can be justified using a conventional welfare economics criterion – the optimisation of a social welfare function that aggregates and respects individual preferences defined over current and future state-contingent consumption, leisure and, directly or indirectly, real money balances. The literature on central bank independence is also large and growing (see e.g. Cukierman, Webb and Neyapti (1992), Alesina and Summers (1993), Posen (1993), McCallum (1995), Beetsma and Bovenberg (1997), Campillo and Miron (1997), Forder (1998), Blinder (1999), de Haan and Kooij (2000), Ozkan (2000), Buiters (2004, 2005a)).

This paper is part of a venerable scholarly tradition that observes some reasonably well-functioning institutional arrangement or policy rule and comments: “I know it works in practice, but does it work in theory?” I am not the first one to have noticed the tension between the confident practice and rhetoric of modern central banking, and the paucity of anything

resembling robust positive microeconomic and sound normative welfare-economic foundations for that confidence. Mervyn King (2005) has reflected on the extent to which the practice of monetary policy now is ahead of the theory. I will elaborate on some of the issues he raised. Specifically, this paper takes aim at three propositions, which I put up here as convenient straw men:

Straw Man 1: There exist robust welfare economic foundations for price stability as the overriding objective of monetary policy.

Straw Man 2: Flexible inflation targeting presents ‘international best practice’ inflation targeting.

Straw Man 3: Central bank independence is (a) possible; and (b) desirable.

Section II will discuss Straw Men 1 and 2, while Sections III and IV tackle Straw Man 3. Before turning to the welfare economics of price stability in mainstream New Classical and New Keynesian dynamic stochastic general equilibrium models, I will briefly place the issues that can be addressed by these models in the context of a more comprehensive approach to the costs of inflation. The taxonomy in Table 1 is helpful in a discussion of the welfare economics of inflation. In the next Sections, I will concentrate on (3c) and (3d) and pay some attention to (3b). The other entries, other than inflation as moral failure, which is discussed in Section I, are touched on only in passing.

Table 1	
A taxonomy of the costs of inflation	
1. Inflation as <i>moral failure</i> (Bundesbank).	
2. Efficiency costs due to the impact of anticipated inflation on the pecuniary opportunity cost of holding cash	
	2a. <i>Shoe-leather costs</i> of active cash management (Allais (1947), Baumol (1952), Tobin (1956), Feldstein(1979)).
	2b. Distortions in the relative price of cash goods and credit goods (Lucas & Stokey (1987))
3. Efficiency costs when the pecuniary opportunity cost of holding cash is independent of the rate of inflation	
	3a. <i>Menu costs</i> of anticipated inflation (Caplin & Spulber (1987))
	3b. <i>Intertemporal relative price distortions</i> due to anticipated or unanticipated inflation (imperfect indexation of financial contracts, tax and benefit schedules) (Feldstein (1997), with or without nominal price or wage rigidities.
	3c. <i>Static relative price distortions</i> caused by nominal wage and/or price rigidities and imperfect wage and price indexation of incomplete price and wage contracts (Buiter & Jewitt (1981), Calvo (1983), Woodford (2003), Lucas (2000), Blanchard & Gali (2005)); can depend both on anticipated and unanticipated inflation.
	3d. <i>Absence of the long-run natural rate property</i> . Long-run output and/or employment gaps that vary with anticipated inflation due to imperfect indexation even in the long run (or comparing deterministic steady states)(Phillips (1958), Samuelson & Solow (1960), Tobin (1968), Woodford (2003), Benigno & Woodford (2005)).
4. Distributional consequences of imperfect indexation by markets or political institutions (Fischer (1981)).	

I. Inflation as moral failure

Outside mainstream economics, but inside central banks like the (old) Bundesbank, there exists a view that inflation is undesirable not because it is *inefficient* (it wastes resources in cash management, distorts relative prices and leads consumers and producers to confuse relative price changes and changes in the general price level) or *unfair* (it redistributes resources inequitably), but because it is *wrong*, morally unacceptable, evil or even a sin.⁵ This view of inflation as the moral equivalent of counterfeiting, theft or deceit has a long history, and can be traced back to

⁵ See e.g. the statements by Hans Tietmeyer and Helmut Schlesinger quoted in Tognato (2004).

the book of the Law.⁶ The terms ‘debasement’ or ‘debauching’ the currency convey this notion of immorality. It attaches both to commodity money, such as specie money, and to fiat money.

That the long-standing tradition of rejecting inflation on religious grounds survives is clear from the following quote from the Rev. William J. Larkin Jr. (1982): “*It violates the biblical commands to have just weights and not steal. Its immoral consequences are the oppression of the poor, especially the elderly; the promotion of sloth and covetousness; and the destabilization of society.*”

Larry Lindsey puts the issue well: “*Maintaining a currency as a store of value has both pragmatic and philosophical bases. The philosophical arguments can take on a great fervor, at times approaching a religious conviction. Some argue, for example, that money represents a covenant between government and people. In this view, destroying the value of a currency takes on a deep significance verging on immorality with respect to government policy. To adherents of this view, inflation is a form of theft.*” (Lindsey (1995, p. 5)). The pursuit of price stability through independent central banks, as embodied most starkly in the Bundesbank prior to EMU, has been characterised as a secular religion (Tognato (2004)).

An objection to inflation on moral grounds but from a secular perspective is the proposition that inflation is taxation without representation.⁷ Even fully anticipated inflation (which gets translated into market-determined nominal interest rates) constitutes a tax on non-interest-bearing currency.⁸ Unanticipated inflation represents a capital levy on holders of fixed interest nominal debt. Both the anticipated and the unanticipated inflation tax are levied without

⁶ Leviticus 19:35-36: “*Ye shall not cheat in measuring length, weight, or quantity. You shall have honest balances, honest weights, an honest ephah and an honest hin: ...*”. Amos 8: 5: “*We make the bushel small and the shekel great, and practice deceit with false balances,...*”.

⁷ “*... every new dollar that is created makes every dollar previously in existence worth somewhat less than it was worth before. This is the very heart of inflation. It is also taxation without representation with a vengeance.*”

Voorhis (1973). Jeremiah Horace (Jerry) Voorhis (1901-1984) was a member of the US House of Representatives.

⁸ The terms ‘currency’ and ‘cash’ are used interchangeably and refer to the monetary liabilities of the central bank.

legitimizing parliamentary approval.⁹ Without such legitimisation through the proper constitutional channels and institutions, the inflation taxes are theft; inflation is a pernicious, illegitimate stealth tax. Henry Wallich, a Governor of the Federal Reserve Board from 1974 till 1986 referred, in an address titled *Honest Money*, to the "...breakdown in our standards of measuring economic values as a consequence of inflation." "... inflation introduces an element of deceit into most of our economic dealings. Everybody makes contracts knowing perfectly well that they will not be kept in terms of constant values,..." a "... condition that is hard to reconcile with simple honesty." Wallich (1978).

Sometimes the characterisation of inflation as immoral means no more than that inflation is inefficient or unfair. Eugenio Solans, a member of the Governing Council and the Executive Board of the European Central Bank from 1999 till 2004, provides an example of the 'consequentialist' position, that theft through inflation is immoral because it represents undesirable redistribution and because, by undermining the incentives for productive effort and by necessitating the diversion of resources from production to safeguarding property against theft, it causes inefficiencies: "...I dared to qualify inflation as "immoral", for several reasons. Inflation unfairly deteriorates personal income and wealth. It distorts the proper functioning of public redistributive schemes, such as progressive taxation. It fosters speculation. It harms the weakest and the most vulnerable. (Solans (1999))". Lenin's famous statements that "*The way to crush the bourgeoisie is to grind them between the millstones of taxation and inflation.*" and "*The best way to destroy the capitalist system is to debauch the currency*", would also seem to fit the consequentialist view of the evils of inflation.

⁹ One could argue in rebuttal that by setting up and allowing the continued existence of a central bank that has the capacity to impose both the anticipated and the unanticipated inflation tax, the legislature gives its implied consent to the imposition of inflation taxes.

Popular inflation aversion often goes beyond the consequentialist characterisation of the immorality of inflation and appears to view inflation as intrinsically wrong, regardless of its consequences for efficiency and fairness. The survey-based paper by Robert Shiller (1997) on why Germans and Americans disliked inflation makes clear that inflation was deemed to be intrinsically evil in addition to being perceived as having deleterious consequences.¹⁰

When inflation is viewed as a sin, and when the pursuit of price stability by independent central banks becomes a secular religion, as it was for the Bundesbank and is now for the ECB, the rationale behind the approach of these institutions to a whole range of issues - accountability, openness, transparency, unanimity, dissent and collective responsibility – becomes clearer. A religion requires priests and a temple. In the priestly tradition, monetary policy is a cult whose high priests perform the sacred rites far from the prying eyes of the non-initiates.

Borrowing from Keynes, I would like to contrast the (high-) priestly view of central banking with the technocratic or dentist approach. Keynes once expressed the hope that economists might someday be thought of like dentists - that they would be regarded as apolitical professionals brought in to resolve technical problems (Keynes (1931, p.332)).¹¹ I strongly agree with this position, and would like to see his paradigm of the economist as dentist applied to central bankers in particular.

In a lecture given to celebrate the five-year jubilee of the UK inflation target, Mervyn King (King (1997)) gave the canonical description of what one might call the modern,

¹⁰ As pointed out to me in private correspondence by Alan Blinder, perhaps the most surprising message of Shiller's paper is that the public is hopelessly confused about what inflation is and does. At a casual-empirical level, I have found that many non-economists see no connection between past inflation of the general price level and past inflation of money wages. In particular, many appear wedded to the belief that they were robbed by past price inflation because there exists an alternative feasible universe with lower price inflation (or even price stability) but with the same growth rate of their own nominal wages that characterized the actual historical experience.

¹¹ The complete quote is: "*But, chiefly, do not let us overestimate the importance of the economic problem, or sacrifice to its supposed necessities other matters of greater and more permanent significance. It should be a matter for specialists – like dentistry. If economists could manage to get themselves though of as humble, competent people, on a level with dentists, that would be splendid*".

technocratic view of central banking, that is, central banking as dentistry. His view that “... a successful central bank should be boring ...” (King (1997, p. 14)) is very much in the spirit of Keynes’s statement.¹²

Dentists view excessive inflation as an error and a source of inefficient and inequitable economic outcomes. Dentists can have public professional disagreements: drill or extract? Priests cannot. If they do it means schism, heresy, religious wars. Dentists acquire their skills and knowledge through training and research and by trial and error involving live patients. The priest's true faith is revealed to God’s chosen. Dentists can make mistakes. The victims choose a different dentist. Priests cannot be seen to make mistakes. Dentists are accountable to their professional association, to their patients and, ultimately, to the courts. Priests are accountable to God alone.

II. The conventional welfare economic foundations of inflation targeting

This Section leaves morality and sin behind and focuses on models for which it is possible to construct a representative consumer/worker/price setter/shopper/portfolio selector and cash manager whose multi-period utility function is defined over current and future consumption (including leisure) and real money balances. Alternatively, and from the perspective of this paper, equivalently, a role for money is created through a shopping technology that uses real money balances as an input and/or a cash-in-advance constraint (see Buiter and Sibert (2006)). Price setting is according to the discrete time version of Calvo’s (1983) model of staggered, overlapping nominal price contracts. Opportunities for freely setting prices arrive randomly for a

¹² It should be noted that being boring is a necessary, not a sufficient condition for being a successful central bank.

continuum of monopolistic competitors. Constrained price setters follow a simple rule of thumb or heuristic, which can be interpreted as a simple price indexation rule. The inflation rate generated by the constrained price setters will be referred to as ‘the inflation heuristic’.

Slightly generalising Woodford (2003), it can be shown that that the loss function of the representative consumer can be approximated by

$$\Lambda_t = \sum_{j=t}^{\infty} \beta^{j-t} L_j \quad (1)$$

$$0 < \beta < 1$$

with

$$L_{j,t} \approx E_t \left[\left(\pi_{j,j-1} - \omega_{j,j-1} \right)^2 + \lambda (y_j - y_j^*)^2 + w (i_{j+1,j} - i_{j+1,j}^m)^2 \right] \quad (2)$$

$$\lambda > 0, w \geq 0, j \geq t$$

Here $\pi_{j,j-1}$ stands for period j producer price inflation, $\omega_{j,j-1}$ is period j core producer price inflation (the indexation rule used by constrained price setters in the Calvo model), y_j is the logarithm of period j real output, y_j^* is the logarithm of the efficient level of period j real output, $i_{j,j-1}$ is the one-period risk-free nominal rate of interest on non-monetary financial claims (‘bonds’) between periods j and $j-1$, $i_{j,j-1}^m$ is the one-period risk-free nominal rate of interest on cash (money) between periods j and $j-1$ and E_t is the conditional expectation operator at time t .

For that same class of models it can be shown, following Woodford (2003), that the following New-Keynesian Phillips curve can be obtained from a log-linear approximation to the equilibrium at a deterministic steady state:

$$\pi_{t,t-1} - \omega_{t,t-1} \approx \kappa (y_t - \hat{y}_t) + \psi (i_{t+1,t} - i_{t+1,t}^m) + \beta E_t (\pi_{t+1,t} - \omega_{t+1,t}) \quad (3)$$

$$\kappa > 0; 0 < \beta < 1$$

Here \hat{y}_t stands for the logarithm of the natural level of real output in period t , that is, the level of output that would prevail under full price flexibility. When there are real distortions (such as monopoly power or distortionary taxes), the natural level of output, \hat{y} need not equal the efficient level of output y^* . A full analytical statement of the arguments that follow in the next Section can be found in Buitert and Sibert (2006).

The fact that producer price inflation rather than consumer price inflation appears in the loss function reflects the common assumption in the New-Keynesian literature that nominal rigidities are associated with producer prices (prices at factor cost) rather than with consumer prices (market prices paid by consumers). In a closed economy, the difference between producer prices (of final goods and services) and consumer prices reflects indirect taxes and subsidies. With nominal producer prices predetermined, an increase in indirect taxes raises consumer prices. If nominal rigidities were attached to consumer prices, equations (2) and (3) would involve the rate of inflation of consumer prices. With nominal consumer prices predetermined, an increase in indirect taxes would reduce nominal producer prices. For the purposes of this paper, nothing hinges on whether nominal rigidity applies to producer prices or to consumer prices.

IIA. The welfare economics of inflation when the pecuniary opportunity cost of holding money is non-zero, with or without nominal price and wage rigidities

In what follows, money or cash means the monetary base: currency plus commercial bank balances held with the central bank. The nominal interest rate on money, i^m , is in practice zero for currency. It can be anything for balances with the central bank. Since money is

assumed to yield non-pecuniary services, in addition to being a risk-free store of value, bonds will only be held if $i \geq i^m$. I assume in what follows that this condition is satisfied. I assume that i is an instrument of the central bank and that i^m is either an instrument or exogenously set equal to zero.

While the short nominal interest rate, the monetary base and in an open economy, the nominal exchange rate or the stock of foreign exchange reserves, are alternative or, depending on the degree of international capital mobility, additional instruments, in practice, under a floating exchange rate regime, and when the lower bound on the short nominal interest rate does not bind ($i > i^m$), central banks use i as the policy instrument.

The pecuniary opportunity cost of holding money is $i - i^m$. When the lower bound on the short nominal interest rate binds ($i = i^m$), the nominal interest rate is not an instrument and the monetary instrument becomes the monetary base (or its components) and/or the nominal exchange rate or the stock of foreign exchange reserves. An example of this was Japan, which followed a monetary policy of ‘quantitative easing’ when the central bank’s interest rate (the target Uncollateralised Overnight Call Rate) was at the zero lower bound for the second time, between March 2001 and July 2006.¹³ Quantitative easing amounted to increasing the stock of commercial bank deposits/reserves with the central bank.

When $i > i^m$ private agents are encouraged to economise on their holdings of cash. Active cash management uses up real resources, as noted by Allais (1947), Baumol (1952) and Tobin (1956). Efficiency requires eliminating the pecuniary opportunity cost of holding money by setting

¹³ The Uncollateralised Overnight Call Rate target had also been at zero between February 1999 and September 2000; $i^m = 0$ in Japan.

$$i_{t+1,t} = i_{t+1,t}^m \quad \text{for all } t \quad (4)$$

There is a second distortion associated with a positive pecuniary opportunity cost of holding cash. In cash-in-advance models such as Lucas and Stokey (1987), there are both cash goods and credit goods. When $i > i^m$ the relative cost of producing and supplying cash goods is raised relative to that of credit goods (and relative to goods such as leisure, that are not traded at all but instead are consumed by the original owner of the endowment of time). This static relative price distortion too is eliminated when (4) holds.

Expected inflation matters for welfare, even with perfectly flexible nominal prices and wages, because it may affect the pecuniary opportunity cost of holding cash. That effect will be absent if the demand for real balances is independent of its pecuniary opportunity cost. This will be the case when the velocity of circulation of money is constant, as it is, for instance, in the simple cash-in-advance model where all goods are cash goods. The opportunity cost of cash channel through which inflation affects welfare can also be cut off by the authorities setting the nominal interest rate on bonds equal to the nominal interest rate on cash. This is a non-trivial task because currency is a negotiable bearer bond whose holders are anonymous. To pay interest, at a positive or negative rate, on currency requires either a mechanism like the one Gesell proposed for taxing currency (Gesell (1949), Goodfriend (2000), Buiter and Panigirtzoglou (2001, 2003) and Buiter (2005a)), or the introduction of a second, virtual currency, as proposed by Eisler (1932) and discussed by Buiter (2005b).

If neither option is feasible, and the rate on currency is zero ($i^m = 0$), then the opportunity cost of holding cash can only be reduced to zero by setting the short nominal interest rate on bonds equal to zero – that is by implementing Friedman’s Optimal Quantity of Money (OQM) rule:

$$i_{t+1,t} = 0 \quad \text{for all } t \quad (5)$$

While pursuing a zero nominal interest rate strategy will certainly eliminate the opportunity cost of holding cash, it may cause the authorities to lose control of the rate of inflation. Let \tilde{r} be the period t real interest rate, defined in terms of the private consumption bundle whose market price in period t is \tilde{P}_t .

The rate of inflation of the consumer price index is defined by $\tilde{\pi}_{t+1,t} = \frac{\tilde{P}_{t+1} - \tilde{P}_t}{\tilde{P}_t}$, so

$$1 + \tilde{r}_{t+1,t} = \frac{1 + i_{t+1,t}}{1 + \tilde{\pi}_{t+1,t}} \quad (6)$$

Therefore, by setting the nominal interest rate equal to zero, the rate of inflation of consumer prices equals minus the real interest rate (measured in terms of the composite consumption good).¹⁴ The optimal rate of producer price inflation (the inflation rate that matters from the point of view of minimizing static relative price distortions) is not in general equal to minus the real interest rate. There remains a way out of this dilemma, however. The consumer price index is linked to the producer price index through the indirect tax rate ζ , that is,

$$\tilde{P}_t = (1 + \zeta_t)P_t \quad (7)$$

so,

$$\tilde{\pi}_{t,t-1} = \left(\frac{1 + \zeta_t}{1 + \zeta_{t-1}} \right) \pi_{t,t-1} \quad (8)$$

where $\pi_{t,t-1} = \frac{P_t - P_{t-1}}{P_{t-1}}$ is the rate of inflation of producer prices. Thus, through appropriate use of

the tax wedge between consumer prices and producer prices, the government can, in principle, set the nominal interest rate equal to zero, which is required to implement the OQM rule, without

¹⁴ For instance, if the real rate of interest is independent of the rate of inflation (as will be the case in the model of Section III where it equals the rate of time preference $\rho = (1 - \beta)\beta^{-1}$), then the authorities would, by setting the nominal interest rate equal to zero, peg the rate of consumer price inflation at $\tilde{\pi} = -\rho$.

at the same time pegging down the rate of producer price inflation, which will have to be free to implement the rule that minimizes relative price distortions.

From the point of view of the welfare economic foundations of price stability as the overriding target of monetary policy, it is clear that the OQM property will not be satisfied when the consumer price inflation rate is zero, unless $i_{t+1,t}^m = (1-\beta)\beta^{-1}$ for all t . If the nominal interest rate on cash is zero, the OQM rule prescribes a negative rate of consumer price inflation in the deterministic steady state. As will be shown in Section IIC, zero producer price inflation also, generically, is not optimal.

IIB. The welfare economics of inflation when the opportunity cost of holding money does not affect welfare

IIB1. Menu costs

Even if the pecuniary opportunity cost of holding cash is zero (or if the real stock of money held is independent of its pecuniary opportunity cost), menu costs - fixed real costs of changing prices in terms of the numéraire - make inflation costly even when the frequency with which prices are adjusted can be optimally chosen by private price setters. Such menu costs should be interpreted broadly to include the time, effort and inconvenience, in a world with bounded rationality, of measuring, computing and calculating with an inconvenient yardstick whose length varies from period to period.

The implications of menu costs for the optimal rate of inflation depend crucially on the details of how menu costs are modelled. It makes a difference whether a real sunk cost is incurred every time a nominal price is changed, or only when a new contract (which may involve indexation clauses that apply for many periods) is negotiated. Nominal price changes that are the

result of the mechanical implementation of an invariant indexation rule may have lower menu costs than those that are the result of bargaining between buyers and sellers or the outcome of an auction. If menu costs are assumed to be particularly important for the goods and services that make up the cost-of-living index, this would drive the optimal inflation rate of the cost of living index closer to zero. If, as seems more plausible, menu costs are especially important for money wages (negotiating and bargaining over wages, whether bilaterally or through organised labour unions and/or employers associations is costly and time-consuming), a zero rate of money wage inflation would be the natural focus of monetary policy. With positive labour productivity growth, zero wage inflation would imply a negative rate of inflation for the cost of living, consumer and producer price indices.¹⁵

IIB2. Tax and benefit distortions and other failures of indexation in the public and/or private sectors.

Real-world tax and benefit systems are not inflation-neutral. Nominal interest paid often can be deducted from taxable profits as a business cost. Progressive income tax systems do not have the bands corresponding to different marginal tax rates indexed to the rate of inflation, causing ‘real fiscal drag’ (see Feldstein (1997) for a discussion of the issues involved). Both these features mean that even fully anticipated inflation will have real effects. Most private debt contracts are not index-linked, so unanticipated inflation will redistribute resources from creditors to debtors.

Incomplete index-linking constitutes an argument for price stability, provided the cost of introducing the necessary indexation to make the real economy inflation-neutral exceeds the cost of achieving and maintaining price stability. Parts of the tax and benefit system (e.g. social security benefits in the US) are index-linked, apparently at no great cost to the authorities or the

¹⁵ Holding constant producer taxes and indirect tax rates.

tax payers and benefit recipients. It continues to be something of a mystery why there are so few inflation-linked contracts and financial instruments issued in the private sector.¹⁶

Departures from full indexation in private or public contractual arrangements or price setting procedures can have serious efficiency consequences when the rate of inflation becomes very high. The efficiency losses associated with historical hyperinflations were often dramatic. The remarkable recoveries in output and employment following the end of hyperinflations is evidence of the destructive potential of hyperinflation.

Incomplete indexation can likewise have major redistributive consequences during periods of very high inflation. The destruction of the savings of the German Mittelstand during the hyperinflation under the Weimar republic in 1922-23 may well have been a contributing factor to the receptiveness of this socio-economic group to the ideas of Nazism.

IIB3. A Caveat

All inflationary distortions considered thus far, or rather, all sources of absence of super-neutrality of money and inflation, can occur even without any nominal wage or price rigidities. The failure of *superneutrality* of money through the effect of inflation- on the opportunity cost of holding money in models with perfectly flexible money wages and prices is not to be confused with a long-run non-vertical Phillips curve caused by non-homogeneities in the wage and price setting mechanism. Policy-relevant long-run inflation-unemployment trade-offs are those that are present when the demand for real money balances is independent of the rate of inflation. Such independence can be present because the opportunity cost of holding money is invariant under

¹⁶ For at least the past 20 years I have asked my banks (in the US and the UK) for an index-linked home mortgage – so far without success. The typical explanation was of the “we don’t offer it because we have never offered it” variety.

alternative rates of inflation, or because the demand for cash is unresponsive to its opportunity cost (a limiting case of which is the cashless economy).

Lucas's famous 2-period OLG model with money (Lucas (1972a)) generically exhibits absence of superneutrality of money. Even in the deterministic version of this model, a higher growth rate of the nominal money stock is associated with a higher rate of inflation and a level of output/employment that can be either higher or lower. There are no nominal wage or price rigidities. Money is not superneutral because money bears a zero nominal interest rate. It is also the only store of value. A higher rate of inflation therefore means a lower real rate of return to saving. Depending on the strength of the income effect and the intertemporal substitution effect, a lower real rate of return can either raise or lower the supply of labour. It would make no sense to regard a negative or positive association in the Lucas (1972a) model between the rate of inflation and the level of employment/output, as theoretical support for the existence of a long-run exploitable inflation-(un) employment trade-off of the kind that Samuelson and Solow (1960) and Tobin (1968) had in mind.

Such a claim is made in a recent paper by Wright et. al. (2005), which, like Lucas (1972a), analyses a model without nominal wage or price rigidities.¹⁷ The absence of superneutrality of money is once again due to the fact that the nominal interest rate on money is exogenous (zero). The cash-in-advance model has cash-goods and (de-facto) credit goods.¹⁸ A higher rate of inflation raises the nominal rate of interest and thus the opportunity cost of holding money and the relative price of cash goods. Depending on the relative strengths of income and substitution effects, higher inflation can be associated with a higher or a lower level of employment. Any policy that eliminates the financial opportunity cost of holding money (such

¹⁷ This paper was presented at an LSE seminar with the bold subtitle "Or, There is a Long-Run Exploitable Trade off Between Investment and Unemployment After All".

¹⁸ In the model, leisure is non-traded, so from a transactions technology point of view, it is like a credit good.

as paying interest on money at the same rate as on non-monetary credit instruments) will eliminate this ‘long-run Phillips Curve’. In what follows, I consider as long-run exploitable inflation-unemployment trade-offs only those systematic associations between inflation and output, employment or unemployment present even when the pecuniary opportunity cost of holding money is zero (or held constant) or if the demand for cash is independent of its pecuniary opportunity cost.

III.C. Relative price distortions and inefficient output gaps due to nominal rigidities: Old-Keynesian wine in New-Keynesian bottles

Some of the strongest claims that, in the presence of nominal wage and/or price rigidities, price stability (zero inflation going forward) can be shown to be the inflation objective implied by conventional micro-based welfare economic criteria, can be found in Woodford’s work (see e.g. Woodford (2003)). The refutation of this proposition in what follows will make use of the same Calvo-style price setting mechanisms as used by Woodford. A detailed and more technical analysis can be found in Buiter and Sibert (2006).

Consider in some greater detail the price setting rule-of-thumb adopted by the constrained price setters in the Calvo (1983) model.¹⁹ Each constrained price setter, j , follows in each period t , an indexation rule, $\omega_{t,t-1}^j$, that, in logarithmic form, satisfies equations (9) to (14); p_t^j is the logarithm of the price set by producer j at time t ; as before, p denotes the logarithm of the

¹⁹ There is monopolistic competition between profit maximising price-setting firms. Each firm produces one commodity and there is a continuum of perishable consumption goods on the unit interval. There is a constant common static substitution elasticity $\eta > 1$ between the different consumption goods. Each period, a constant fraction σ of randomly selected firms can choose to set its price freely and optimally; σ is also the constant per-period probability that a firm will be able to choose its price freely. The remaining fraction $1-\sigma$ of firms is constrained to update last period’s price using a simple *indexation rule* that satisfies (9) to (14)

aggregate producer price level and π is rate of inflation. Deterministic steady state values of variables are denoted by overbars.

$$p_t^j = \omega_{t,t-1}^j + p_{t-1}^j \quad (9)$$

with

$$\omega_{t_1,t_0}^j = \omega_{t_1,t_0}, \quad \forall j \quad (10)$$

$$\omega_{t_2,t_1} + \omega_{t_1,t_0} = \omega_{t_2,t_0} \quad (11)$$

$$\omega_{t_1,t_0} = -\omega_{t_0,t_1} \quad (12)$$

$$\omega_{t,t} = 0 \quad (13)$$

$$\bar{\omega} = \bar{\pi} \quad (14)$$

For the moment, I impose only weak restrictions on the indexation function of the constrained price setters. Equation (10), the assumption that the indexation function is the same for all constrained price setters, permits a significant simplification of the argument. In addition the indexation function is assumed to be recursive (11), symmetric (12), to have an identity transformation (13) and to have the property (14) that in the non-stochastic steady state, the actual rate of producer price inflation $\bar{\pi}$, equals the deterministic steady-state inflation rate, $\bar{\omega}$, implied by the indexation rule. This requirement, that the indexation rule is rational (at least) in steady state is a weak one, but has the implication that there is no deterministic steady-state inflation-output (or, in richer models with labour markets and well as output markets) inflation-unemployment trade-off across deterministic steady states. Surprisingly, some of the best-known New-Keynesian wage and price setting mechanism fail this very weak long-run rationality test. I will refer to (14) as the ‘*sure thing*’ principle that must be satisfied by any acceptable indexation rule of thumb (or expectation formation heuristic).

When choosing their price in period t , the unconstrained firms allow for their current and future monopoly power and for the fact that, if they are constrained in the future, they will follow the indexation rule given in (9) through (14). I will refer to $\omega_{t,t-1}$, the inflation rate generated by the indexation rule of the constrained price setters, as the *inflation heuristic*.

In general, \hat{y} , the level of output that would be produced if there were no nominal rigidities need not equal the efficient level of real output, y^* . In the model under consideration, the efficient or command optimum level of real output is the level of output that would be produced if there were no nominal rigidities, no monopoly power and no distortionary taxes.

From now on I consider only the case where optimal inflation policy can be determined without reference to the pecuniary opportunity cost of holding cash. This requires that one of the following three conditions is satisfied. First, the interest rate on cash can be set freely, and is therefore set to satisfy $i = i^m$; ²⁰ second, the demand for real cash balances is independent of the rate of inflation (this includes the cashless economy as a special case); or third, the indirect tax rate is used to make the consumer price inflation rate associated with $i = i^m$ consistent with a producer price inflation rate that minimises static relative price distortions and ensures an

²⁰ The real-world counterpart of 'cash' is the monetary base (currency in circulation plus commercial banks' reserves held with the central bank. There is no technical problem or administrative cost associated with paying the market rate of interest on banks' reserves held with the central bank. For instance, the Bank of England has recently started doing this, with reserves now remunerated at the Bank's official rate (see Bank of England (2006). Paying interest on currency is awkward, although not impossible, and is not current practice in any country I know of.

The sensitivity of the demand for a country's currency to either that country's short nominal interest rate or its inflation rate is generally negative and both statistically and economically significant. As much as 70% of all US\$ currency notes are now held abroad. This reflects legal dollarisation in countries with high and volatile inflation rates, as well as the foreign demand for dollars as a favoured means of payment and store of value by the world-wide criminal community. Of the US\$ notes held in the US, a large share is also likely to be held by those involved in the grey, black and outright criminal economy. The euro appears to be following the pattern set by the dollar. Because there are €500 and €250 currency notes, while the largest US\$ note is but for \$100, the euro should be an attractive substitute for the US\$ in the eyes of tax evaders and other crooks. For currencies mainly held outside the country of issuance (and especially for currencies held and used largely for illegal purposes), the responsiveness of their demand to conventional measures of their financial opportunity cost may well be lower than for more 'conventional' currencies.

inefficient output gap. This means that both the term $w(i_{j+1,j} - i_{j+1,j}^m)^2$ in the loss function (2) and the term $\psi(i_{t+1,t} - i_{t+1,t}^m)$ in the New-Keynesian Phillips curve (3), are equal to zero. The loss function now becomes

$$\Lambda_t \approx \sum_{j=t}^{\infty} \beta^{j-t} \widehat{L}_{j,t}$$

$$\widehat{L}_{j,t} = E_t \left[\left(\pi_{j,j-1} - \omega_{j,j-1} \right)^2 + \lambda (y_j - y_j^*)^2 \right]$$

$$\lambda > 0$$
(15)

and the New Keynesian Phillips curve can be written as follows:

$$\pi_{t,t-1} - \omega_{t,t-1} \approx \kappa (y_t - \hat{y}_t) + \beta E_t (\pi_{t+1,t} - \omega_{t+1,t})$$

$$\kappa > 0; 0 < \beta < 1$$
(16)

This class of models also has the property that, for given values of the parameters and other fundamentals governing the distortion in the output market, the ratio of the natural to the efficient level of output is constant, that is,

$$\hat{y}_t = y_t^* - \delta$$
(17)

Welfare-reducing relative price distortions occur whenever $\pi_{t,t-1} \neq \omega_{t,t-1}$ for all t . If, for instance, actual inflation exceeds the inflation heuristic, the relative prices of the constrained price setters will fall relative to those of the unconstrained price setters. However, if the natural level of output is below the efficient level of output, that is, $\hat{y}_t < y_t^*$, because of, say, the presence of monopoly power and the absence of correcting production subsidies, there will be welfare gains associated with policies that keep actual inflation $\pi_{t,t-1}$ above the inflation heuristic $\omega_{t,t-1}$, if this is possible.

For instance, consider the case where the gap between the actual rate of inflation and the core rate of inflation can be set at any constant value v , that is, $\pi_{t,t-1} - \omega_{t,t-1} = v$ for all t . This is

the case, for instance, in Calvo's original version of this New-Keynesian Phillips curve, which has $\omega_{t,t-1} = 0$ for all t , that is, constrained price setters keep their nominal prices constant regardless of the average rate of inflation or deflation of their competitors (see Calvo (1983)). Assume for simplicity that the natural and the efficient levels of output are constant, with $y^* > \hat{y}$, that is, $\delta > 0$. Since

$$y_t = \hat{y} + (1 - \beta)\kappa^{-1}\nu,$$

the deterministic steady state level of real output is perfectly controllable through the control of ν , the wedge between actual inflation and the inflation heuristic. For instance, the authorities could choose to set real output equal to its efficient level, y^* , even though the efficient level of output exceeds the natural level, by choosing an appropriate positive value ν^* for ν , given by

$$\nu^* = \kappa(1 - \beta)^{-1}(y^* - \hat{y}) = \kappa(1 - \beta)^{-1}\delta > 0$$

Woodford points out that, even if it were possible to keep actual output above its natural level, it will not be optimal to raise it all the way to its efficient level, because the welfare losses caused by the relative price distortions that occur whenever $\nu \neq 0$, have to be balanced against the welfare gains of getting actual output closer to the efficient level of output.

To argue that it is possible to keep actual inflation systematically above or below the inflation heuristic, even when comparing deterministic steady states, is to argue that the economy does not have the long-run natural rate property: there is a stable long-run trade-off between inflation and real output and, in richer models containing labour markets as well as product markets, between inflation and employment or unemployment. This trade-off exists even across deterministic steady states.

Key to the existence of a long-run inflation-output trade-off in the New-Keynesian Phillips curve model is the relationship between the inflation heuristic and actual inflation - the

re-incarnation of the relationship between expected and actual inflation characteristic of 1960s style expectations-augmented Old-Keynesian Phillips curves like the Samuelson-Solow (1960) and Tobin (1968) models - or even Phillips' original contribution (Phillips (1958)). The work of Phelps (1967) and Friedman (1968) undermined the plausibility of a stable Phillips curve trade-off and menu for policy choice in the long run. Lucas (1972b) convinced much of the profession that the long-run was only as long as it took for expectations to filter out the systematic components of the inflation process (and of the decision rule of the policy maker driving the inflation process).

It is ironic that after more than 30 years of disrepute, the behavioural anomalies that support a long-run non-vertical Phillips curve – indexation rules or expectation formation heuristics that violate the *sure thing principle* given in (14) - are once again central to the debate about optimal inflation policy. I consider this to be a clear example of technical regress. The Calvo specification for the inflation heuristic, $\omega = 0$, has a deterministic steady state Phillips curve that is indistinguishable, except for the convexity of Phillips's original relation, from Phillips's (non-expectations-augmented) unemployment-wage inflation trade-off, translated into price inflation - output gap space. This undesirable feature of Calvo's original model was noted in Buiter and Miller (1985). They proposed an alternative for which price setting is characterised by both price level inertia and inflation inertia, and which satisfies 'sure thing principle' and therefore has the long-run natural rate property.²¹

A few prominent examples of alternative specifications of the inflation heuristic, taken from the literature, are the following:

²¹ See also Buiter (1985) for an open-economy version of the Buiter-Miller model and Buiter (1986) for a discussion of the time-consistency of optimal disinflationary policy in this model.

- Calvo's model of the inflation heuristic (Calvo (1983)): zero indexation or constant nominal prices for the constrained price setters (this is also the assumption made for both wage and price setters in Benigno and Woodford (2005)):

$$\omega_{t,t-1} = 0 \quad (18)$$

- Yun's model of the inflation heuristic (Yun (1996)): full indexation to long-run average inflation.

$$\omega_{t,t-1} = \bar{\pi} \quad (19)$$

where $\bar{\pi}$, the long-run average rate of inflation, is identified with inflation in the deterministic steady state. This is similar to the indexation function proposed in Calvo *et. al.* (2003).

- Christiano *et. al.* (2001), Smets and Wouters (2003), Woodford (2003) and Giannoni and Woodford (2003): (one-period) lagged indexation (partial if $\gamma < 1$); Gali, Gertler and Lopez-Salido (2001) used the $\gamma = 1$ case.

$$\omega_{t,t-1} = \gamma \pi_{t-1,t-2} \quad (20)$$

- Buiter and Sibert (2006): current or contemporaneous indexation (partial if $\gamma < 1$)

$$\omega_{t,t-1} = \gamma \pi_{t,t-1} \quad (21)$$

- Buiter and Sibert (2006): indexation to one-period past expectation of current inflation (partial if $\gamma < 1$)

$$\omega_{t,t-1} = \gamma E_{t-1} \pi_{t,t-1} \quad (22)$$

Unlike Calvo's original model, Yun's model of the inflation heuristic obeys the *sure thing principle*. All the other indexation heuristics respect the sure thing principle only if there is full indexation: $\gamma = 1$.

If the natural level of output equals the efficient level of output ($\hat{y} = y^*$), the optimal inflation policy is the one that sets actual inflation equal to the inflation heuristic. As noted earlier, this can be achieved either through an appropriate nominal interest rate rule (if either the demand for money does not depend on the financial opportunity cost of holding money, or if there is a separate nominal interest rate on cash which can be used to achieve the OQM rule $i = i^M$ while leaving the nominal interest rate on bonds free, or if the economy is cashless), or through the appropriate use of the indirect tax rate. By setting actual inflation equal to the inflation heuristic, *whatever the inflation heuristic happens to be*, static relative price distortions are minimized. I summarise this discussion as a short proposition:

Proposition 1. In the generalised Calvo model of nominal rigidities, when the natural level of output is efficient ($\delta = 0$), the optimal inflation policy is to fully accommodate (validate) the inflation heuristic. Letting π^* denote the optimal rate of inflation, we have:

$$\pi_{t,t-1}^* = \omega_{t,t-1}$$

If the natural level of output is different from the efficient level, this Proposition will not hold, as explained earlier. However, if we require weak steady-state (or long-run) rationality of the indexation rule, that is, the *sure thing* condition (14) holds, the welfare gains from driving actual output towards its efficient level rather than towards its natural level will be ephemeral rather than permanent. The first-best policy would be to use fiscal or regulatory instruments (producer taxes/subsidies and anti-trust measures) to equate the natural and the efficient levels of output and to use the accommodation of the inflation heuristic rule of Proposition 1 to minimize relative price distortions and equate actual output to the common natural and efficient levels of output.

When will the optimal inflation rule - the inflation heuristic is fully accommodated - imply that zero inflation is optimal? One example, obviously, is Calvo's original indexation

rule, given in (18), since this has the inflation heuristic always equal to zero. The Calvo rule (which is also used in Benigno and Woodford (2005)) is, however, not a rule that makes sense in world with a sustained non-zero rate of inflation, because it violates the *sure thing principle* given in (14).

Woodford (2003) asserts that zero inflation is optimal even for the partial lagged indexation function (20). However, even with $\gamma < 1$, this indexation function gives $\pi_{t,t-1}^* = \omega_{t,t-1} = \gamma\pi_{t-1,t-2}$ as the optimal inflation rule, not zero inflation. In the body of his book, Woodford makes the erroneous assertion “*If the indexation parameter γ takes any value other than one, only zero inflation is consistent with an absence of price dispersion*” (Woodford (2003, p. 406)). In a footnote following this sentence, Woodford continues as follows: “*To be precise, an absence of price dispersion requires that prices change at a common rate π_t , satisfying the difference equation $\pi_t = \gamma\pi_{t-1}$, given some arbitrary initial rate of inflation. But when $\gamma < 1$, this implies zero inflation every period, at least asymptotically. A stationary policy regime that fully eliminates distortions resulting from price dispersion would have to be one with zero inflation at all times.*” Woodford (2003, p. 406, footnote 30). The first sentence of the footnote is correct. The second and third are, at best, misleading and, at worst, wrong. The correct version of the second sentence is: “*But when $-1 < \gamma < 1$, this implies zero inflation only asymptotically, unless the initial inflation rate happens to be zero*”.

The last sentence of the above quote from Woodford (2003) confuses a *stationary policy regime* with a *constant rate of inflation*. The optimal stationary policy regime when $-1 < \gamma < 1$ is $\pi_t = \gamma\pi_{t-1}$, not $\pi_t = 0$, which will always be sub-optimal unless the initial value of the inflation rate happened to be zero. If anything stationary were to be considered effectively equal

to zero, stabilisation policy could not exist - assuming that deviations of output from potential output and of the unemployment rate from the natural rate of unemployment are stationary!

If one evaluates the optimal inflation rule $\pi_{t,t-1}^* = \gamma\pi_{t-1,t-2}$ at the non-stochastic steady state with zero inflation (as Woodford does), then, with $\pi_{t-1,t-2} = 0$, it follows that $\pi_{t,t-1}^* = 0$. This result is, of course, seriously non-robust: any perturbation of the initial position from the (zero) deterministic steady-state inflation rate, will making zero inflation in subsequent periods sub-optimal. Also, if for any reason the inflation target were constrained to be a *constant* rate of inflation, then of course, with $\gamma < 1$, the only constant non-stochastic steady state rate of inflation is zero. In any case, the indexation rule (20) has little to recommend it, because with partial indexation, $\gamma < 1$, the model violates the long-run rationality requirement (14) and has a long-run (deterministic) output-inflation trade-off.

Thus Woodford's assertion that the desirability of targeting zero inflation can be derived from standard welfare economic considerations is generically incorrect.

If $\gamma = 1$ in equation (20) - the case of (one-period) lagged full indexation - any *constant* rate of inflation will be optimal. With $\gamma = 1$ and equation (21), we have full current indexation to actual inflation; any sequence of inflation rates can be optimal. With $\gamma = 1$ and equation (22), we have full current indexation to expected inflation, and any sequence of correctly anticipated inflation rates is optimal.

The result that the optimal inflation policy is for actual inflation to accommodate the inflation heuristic, whatever that happens to be, is valid for a wide class of models for which the deviation of output from its (efficient) natural level can be written as a function of current, past and anticipated future deviations of inflation from something that can be interpreted as 'the inflation heuristic'. Consider, for instance, the 'sticky information' based New-Keynesian

Phillips curve of Mankiw and Reis (2006). In their model, instead of opportunities to set prices freely arriving at random intervals, prices can be set freely in each period, but information relevant to the price setting decision arrives at random intervals. Prices therefore only change when such news arrives. In the simple case where output is linear in the labour input, the Phillips curve for the sticky information model can be written as:

$$\pi_{t,t-1} = \frac{\gamma}{1-\gamma}(y_t - \hat{y}_t) + \gamma \sum_{j=0}^{\infty} (1-\gamma)^j E_{t-1-j} [\pi_{t,t-1} + \Delta(y_t - \hat{y}_t)] \quad (23)$$

$$0 < \gamma < 1$$

The inflation heuristic for this model is given by

$$\omega_{t,t-1} = \gamma \sum_{j=0}^{\infty} (1-\gamma)^j E_{t-1-j} [\pi_t + \Delta(y_t - \hat{y}_t)].$$

When actual inflation is equated to the inflation heuristic, $\pi_t = \omega_{t,t-1}$, which ought to be feasible since period t the inflation heuristic depends only on information and expectations dated period $t-1$ and earlier, period t output equals its natural level, $y_t = \hat{y}_t$. When this inflation rule is followed consistently, output will be at its natural level in every period. In this model, any rate of inflation, and indeed any sequence of inflation rates can be optimal. An attractive property of the Mankiw-Reis model is that it does not have an exploitable output-inflation trade-off across deterministic steady states. Letting \bar{y} stand for the deterministic steady state level of actual output and $\bar{\hat{y}}$ for the deterministic steady state natural level of output, the deterministic steady state is given by

$$\bar{y} = \bar{\hat{y}}$$

Blanchard and Gali (2005) extend the basic Calvo model to include real wage rigidity through an ad-hoc first order partial adjustment model for the real wage. They do, however, retain the original Calvo pricing assumption that each constrained price setter keep his nominal

price constant – an indexation rule that violates the *sure thing principle*. Generalising this to allow for more general price indexation rules, their Phillips curve can be written as:

$$\pi_{t,t-1} - \omega_{t,t-1} = \beta E_t(\pi_{t+1,t} - \omega_{t+1,t}) + \frac{\sigma}{1 - \phi L} [\kappa_1(y_t - \hat{y}_t) + \kappa_2 \Delta(y_t - \hat{y}_t)] \quad (24)^{22}$$

$$\sigma, \kappa_1, \kappa_2 > 0; 0 < \phi < 1$$

with the gap between the natural and the efficient levels of output given by

$$\hat{y}_t - y_t^* = s_t + \theta(\hat{y}_{t-1} - y_{t-1}^*) \quad (25)$$

$$0 \leq \theta \leq 1$$

where s depends on changes in the exogenous preference parameter and in the exogenous level of labour efficiency. In the case where the taste and supply parameters are constant, $s_t = s = \theta\delta$, so equation (25) simplifies to:

$$\hat{y}_t - y_t^* = \theta(\hat{y}_{t-1} - y_{t-1}^* + \delta) \quad (26)$$

$$0 \leq \theta \leq 1$$

Because the constrained price setters' indexation rule does not satisfy the *sure thing principle*, the Blanchard-Gali model, like the model without sluggish real wage adjustment, has an exploitable output-inflation trade-off across deterministic steady states:

$$\bar{\pi} - \bar{\omega} = \frac{\sigma\kappa_1}{(1 - \beta)(1 - \phi)} (\bar{y} - \bar{\hat{y}}) \quad (27)$$

Since $\bar{\omega} = \omega = 0$ in the Blanchard-Gali model, there is an exploitable long-run trade-off between inflation and the output gap.

Given the irrational price indexation rule $\omega = 0$, the optimal rule for the rate of inflation in the Blanchard-Gali model can be quite complex. This is the case even when the natural level

²² ϕ is the coefficient of the lagged real wage in the real wage adjustment equation and σ measures the responsiveness of the average price level to costs.

of output is efficient.²³ While steady state welfare is maximized by equating actual inflation to the inflation heuristic, $\pi_{t,t-1} = \omega_{t,t-1} = 0$ does not characterise the optimum (state-contingent) inflation sequence from arbitrary initial conditions. An interesting subject for future research would be the analysis optimal inflation in the Blanchard-Gali model with an indexation rule that satisfies the *sure thing principle* and makes sense more generally in light of what think we know about the empirics of indexation rules and price expectation formation in a world with bounded rationality.

IID. The foibles of flexible inflation targeting

It follows from the analysis of the previous subsection, that the ‘flexible inflation targeting’ loss function advocated by Svensson (1997, 1998, 2001, 2005, 2006), given in equation (28) below, cannot be rationalised as an implication of conventional welfare economic criteria in a New-Keynesian setting unless (1) the target rate of inflation equals the inflation heuristic and the inflation heuristic happens to be constant: $\pi^* = \omega_{t,t-1}$ for all t , and (2) optimal quantity of money considerations (that is, the welfare costs associated with a non-zero pecuniary opportunity cost of holding money) can be ignored. Only under these conditions, does the conventional welfare economics-consistent loss function, given in (1) and (2) imply the flexible inflation targeting loss function in (28).

$$\Lambda_t \approx \sum_{j=t}^{\infty} \beta^{j-t} \tilde{L}_j$$

$$\tilde{L}_{j,t} = E_t \left[\left(\pi_{j,j-1} - \pi^* \right)^2 + \lambda (y_j - y_j^*)^2 \right] \quad (28)$$

$$\lambda > 0$$

²³ This requires both $\delta = 0$ and $\hat{y}_0 = y_0^*$, where period $t = 0$ is the initial period.

For reasons of space, I will assume in what follows that the efficient level of output, y_j^* , is the same as the natural level of output, \hat{y}_j . I will only in passing mention a key practical problem with the objective function (28) (and the Taylor rule (34) below): that the output gap is unobservable. It is true that throughout economics, most of the key variables (expectations, the natural rate of unemployment, the neutral rate of interest, for instance) are unobservable, but the problem is particularly acute with the output gap. Not only is potential output unobservable, actual output, GDP, is observable only in the sense that the national statistical offices produce highly noisy proxies for, or signals of, GDP. The increasing reliance of the MPC of the Bank of England on (often private) survey measures of economic activity and its growing exasperation with the unreliability and bias in the official GDP statistics lead me to view the output gap as the difference between two unobservable magnitudes – useful for qualitative insight, but quite useless as a policy target or an argument in a policy reaction function or decision rule.

The version of the flexible inflation targeting loss function that is the most dangerous one for policy makers is the one that replaces the period loss function in (28) with

$$\tilde{L}_{j,t} = \text{Var}_t \pi_{j,j-1} + \lambda \text{Var}_t y_j \quad (29)$$

$j > t$

where Var_t is the variance conditional on information at time t . The period loss function of (28) can be written as

$$\begin{aligned} \tilde{L}_{j,t} = & \text{Var}_t \pi_{j,j-1} + \lambda \text{Var}_t y_j \\ & + \left(\text{E}_t \pi_j - \pi^* \right)^2 + \lambda \left(\text{E}_t y_j - \text{E}_t y_j^* \right)^2 - 2\lambda \text{Cov}_t(y_j, y_j^*) + \lambda \text{Var}_t y_j^* \end{aligned} \quad (30)$$

where Cov_t denotes the covariance conditional on period t information. It follows that for (29) to represent a period loss function for the monetary authority that is equivalent to (28), the following assumptions had to be made:

- (1) $E_t \pi_j = \pi^*$: there is no inflation target bias (or the inflation bias is independent of monetary policy).
- (2) $E_t y_j = E_t y_j^*$: there is no output gap bias: the actual and optimal levels of output are the same on average (or the output gap bias is independent of monetary policy).
- (3) $\text{Cov}_t(y_j, y_j^*) = 0$ (or the conditional covariance is independent of monetary policy).
- (4) $\text{Var}_t y_j^* = 0$ (or the conditional variance of the efficient level of output is independent of monetary policy).

Assumption (4) is pretty standard. Assumption 3 is highly unlikely to be satisfied in most Old- or New-Keynesian models. Assumption 2 is certainly not satisfied, even in the long run (or for the unconditional expectations of the actual and efficient levels of output unless the ‘sure thing’ principle holds. Even if the ‘sure thing principle holds, it is not necessarily satisfied in the short and medium term. Assumption (1) is a necessary condition for effective inflation targeting, at any rate in the long run. To assume that it is automatically satisfied is to assume away all the technical problems, commitment problems and other political problems associated with inflation targeting. It is true that for many of the most popular New-Keynesian and Old-Keynesian models used to address inflation targeting, there are few technical obstacles to meeting the inflation target on average. Indeed, these models all share the property that, when the inflation rate is, on average, equal to the constant target rate of inflation, output gap is, on average, equal to zero. Commitment problems are assumed to have been solved magically by the act of creating an operationally independent central bank. So, with the ‘first moment’ problems of inflation targeting and output gap targeting solved, the monetary policy maker is left with just the problem of choosing the optimal combination of the conditional second moments of inflation and output.

This trivialises the central problem of inflation targeting, which is meeting the inflation target on average, going forward, that is, achieving a zero inflation bias. When $E_t \pi_j = \pi^*$, the key problem of the inflation targeting monetary authority, that of creating a credible nominal anchor, is solved. This is difficult to achieve in practice, and can never be taken for granted: the first moment problem is also the first-order problem. Monetary authorities in the UK, in the Eurozone, in the US, in New Zealand and in Turkey are concerned, as I write this paper, about the upward drift of inflation expectations above their inflation targets or tolerance ranges. The second-moments period loss function of (29), which assumes that there is no first-moments problem, is an extremely misleading and dangerous construct to dangle in front of the monetary authorities: the second moments are really of second order importance unless the first order first moments problem has indeed been solved.

The apparent similarity of Assumption 2, $E_t y_j = E_t y_j^*$ - no output gap bias - and Assumption 1, $E_t \pi_j = \pi^*$ - no inflation target bias - hides an important difference which can come back to haunt policy makers. For models with the (long-run) natural rate property, the servo-mechanisms of the market economy will tend to drive actual output towards potential output, at any rate in the long run, even without any policies designed to achieve that. There is no such built-in mechanism for ensuring that the actual rate of inflation will be driven towards the target rate of inflation, unless the policy authorities adopt rules (like the Taylor rule) that ensure that this will be the case: there may be a natural rate of unemployment, a natural level of output and a natural real rate of interest but there is no natural rate of inflation – the long-run equilibrium inflation rate is decided by the monetary authorities.

Not only is the flexible inflation targeting loss function generically inconsistent with conventional welfare economics, it is also quite incompatible with the price stability mandate

assigned to virtually every inflation-targeting central bank. For instance, the mandates of the Reserve Bank of New Zealand (RBNZ), of the Bank of England and of the ECB are *lexicographic* in price stability and all other *desiderata*: only without prejudice to, or subject to, the price stability objective being met, can other objectives, such as output, employment or exchange rate stabilisation be pursued.²⁴ Such a lexicographic ordering with price stability in first place, cannot be represented by a period loss function that trades off inflation volatility for output volatility. No positive weight on output stabilisation, that is $\lambda > 0$, however low, represents the lexicographic ordering of price stability. Nor does a zero weight on output stabilisation ($\lambda = 0$) represent a lexicographic ordering with price stability in the first position. Output stabilisation can be, and is, valued, but only without prejudice to the primary price stability objective. Alan Blinder (2006) also makes the point that the mandates given to the Bank of England, the ECB and most other central banks that have price stability as their primary objective (this excludes few central banks other than the Federal Reserve System and the Central Bank of Norway) implies a lexicographic ordering of price stability ahead of all other objectives and is therefore inconsistent with any version of the ‘flexible inflation targeting’ loss function.

The lexicographic ordering I believe to be inherent in the mandates of, for instance, the Bank of England and the ECB means that the monetary authority chooses a short nominal interest rate rule or a state-contingent sequence of short nominal interest rates to minimize first

²⁴ The Reserve Bank of New Zealand Act 1989 states: “The primary function of the Bank is to formulate and implement monetary policy directed to the economic objective of achieving and maintaining stability in the general level of prices.” The Bank of England Act 1998 states: “In relation to monetary policy, the objectives of the Bank of England shall be (a) to maintain price stability, and (b) subject to that, to support the economic policy of Her Majesty’s Government, including its objectives for growth and employment.” The Protocol on the Statute of the European System of Central Banks and of the European Central Bank (states: “In accordance with Article 105(1) of this Treaty, the primary objective of the ESCB shall be to maintain price stability. Without prejudice to the objective of price stability, it shall support the general economic policies in the Community with a view to contributing to the achievement of the objectives of the Community as laid down in Article 2 of this Treaty. The ESCB shall act in accordance with the principle of an open market economy with free competition, favouring an efficient allocation of resources, and in compliance with the principles set out in Article 4 of this Treaty.”

the following objective function, defined just over deviations of inflation from its target rate (assumed constant for simplicity):

$$\Lambda_t^\pi = E_t \sum_{j=t}^{\infty} \beta^{j-t} (\pi_{j,j-1} - \pi^*)^2 \quad (31)$$

$$0 < \beta < 1$$

If the optimal interest rate rule or state-contingent sequence of interest rates is unique, that is the end of the matter. If there are multiple optimal interest rules, the authority then chooses among these the one that minimises the present discounted value of current and future discounted squared output gaps, or whatever other subsidiary targets the central bank is mandated to pursue, without prejudice to the primary target, inflation.

$$\Lambda_t^{y-y^*} = E_t \sum_{j=t}^{\infty} \beta^{j-t} (y_j - y_j^*)^2 \quad (32)$$

$$0 < \beta < 1$$

It should come as no surprise that one of the most enthusiastic adherents of ‘flexible inflation targeting’, Norges Bank, does not have a lexicographic price stability target. The Regulation on Monetary Policy of 29 March 2001 commits Norges Bank to pursue stability of both the internal and the external value of the Norwegian Krone (but with greater emphasis on the stability of the external value of the currency than on its internal value), and to underpin fiscal policy by stabilising output and employment.²⁵ This smorgasbord of monetary policy objectives of ‘comparable’ value (that is, not lexicographically ordered) could, conceivably, be formalised in terms of a flexible inflation targeting (albeit with some penalty on exchange rate instability added to the loss function in (28)).

Alan Blinder (2006) has wondered whether it would not be more appropriate to characterise the flexible inflation targeting loss function as an output gap targeting loss function.

²⁵ The Regulation states: “Monetary policy shall be aimed at stability in the Norwegian krone’s national and international value, contributing to stable expectations concerning exchange rate developments. At the same time, monetary policy shall underpin fiscal policy by contributing to stable developments in output and employment.”

Recognising that the suggestion was tongue-in-cheek, it is important to be point out the differences between output gap targeting, flexible inflation targeting and inflation targeting with lexicographic preferences. Take, for concreteness the Neo-Keynesian Phillips curve of equation (16). Solving forward recursively and using the law of iterated expectations it implies:

$$\pi_{t,t-1} - \omega_{t,t-1} = \kappa(y_t - \hat{y}_t) + \kappa \sum_{i=1}^{\infty} \beta^i E_t(y_{t+i} - \hat{y}_{t+i}) + \lim_{i \rightarrow \infty} \beta^{i+1} E_t(\pi_{t+1+i,t+i} - \omega_{t+1+i,t+i}) \quad (33)$$

Targeting the output gap ($\lambda = \infty$), and even targeting it successfully by setting the current output gap and all future anticipated output gaps equal to zero, can leave both the price level and the rate of inflation indeterminate without this prompting further changes in interest rates: there is no nominal anchor under pure output gap targeting. With $y_t = \hat{y}_t$ and $E_t(y_{t+i} - \hat{y}_{t+i}) = 0$ for all $i \geq 1$, we are left with $\pi_{t,t-1} - \omega_{t,t-1} = \lim_{i \rightarrow \infty} \beta^{i+1} E_t(\pi_{t+1+i,t+i} - \omega_{t+1+i,t+i})$. Even if we rule out, on a-priori grounds, explosive rational bubbles, that is, even if we assume that $\lim_{i \rightarrow \infty} \beta^{i+1} E_t(\pi_{t+1+i,t+i} - \omega_{t+1+i,t+i}) = 0$, we are only left with the conclusion that $\pi_{t,t-1} = \omega_{t,t-1}$: current inflation equals the current value of the inflation heuristic, whatever that happens to be. Only if, miraculously, the inflation heuristic equals and remains equal to zero, does a successful targeting of the output gap provide a nominal anchor.

Flexible inflation targeting ($\infty > \lambda > 0$) would provide signals for the policy maker to change interest rates from the (contingent) path that sets current and anticipated future output gaps equal to zero, if despite the output gap being eliminated, the actual inflation rate were to differ from the target inflation rate. For models with the long-run natural rate property (models satisfying the sure thing principle $\bar{\omega} = \bar{\pi}$), it is possible to meet the inflation objective, on average and in the long run, while keeping the output gap at zero, on average and in the long run. Such models, when combined with the flexible inflation targeting loss function do, however,

permit trade-offs between inflation variability and output gap flexibility. For instance, when the inflation target is constant, there will typically be a trade-off between the asymptotic variance of inflation and the asymptotic expected squared output gap. Choosing any point on this trade-off other than the one corresponding to the minimum variability of inflation is inconsistent with the lexicographic ordering of price stability and other monetary policy objectives that is mandatory for, among others, the Bank of England, the ECB and the NZRB. Both pure inflation targeting ($\lambda = 0$) and lexicographic inflation targeting will result in the lowest feasible inflation variability being chosen.

Just because the flexible inflation targeting loss function (28) is incompatible with the mandate of central banks who have price stability as their primary objective, it does not follow that the monetary policy decision rule or reaction function favoured by many flexible inflation targeters, given in (34) is necessarily inappropriate.

$$\begin{aligned}
i_{t+1,t} - E_t \pi_{t+1,t} &= \hat{r}_{t+1,t} + \gamma_1 (E_t \pi_{t_1,t_0} - \pi^*) + \gamma_2 (y_t - \hat{y}_t) \\
\gamma_1 &> 0; \gamma_2 &\geq 0 \\
t_1 &> t_0 &\geq t
\end{aligned} \tag{34}$$

This Taylor rule ensures that the short nominal interest rate $i_{t+1,t}$ (the central bank's instrument) moves in such a way that the short real interest rate $r_{t+1,t} = i_{t+1,t} - E_t \pi_{t+1,t}$ rises when the output gap increases and when expected inflation increases relative to the inflation target. When the output gap is zero and inflation is at its target level, the short real interest rate according to the Taylor rule equals the natural or neutral real interest rate, the real interest rate that would prevail with output at potential and a sustainable current account balance. The short

interest rate responds to expected deviations of inflation from target over some future time interval of duration $t_1 - t_0 \geq 1$ starting in period $t_0 \geq t$.²⁶

The appearance of the output gap in the Taylor rule need not imply that the policy maker cares intrinsically about the output gap. Even with $\lambda = 0$ in the flexible inflation targeting loss function (28), the output gap could appear in the policy rule, decision rule or reaction function of the monetary authority because the output gap helps predict future inflation. Indeed, any variable that helps predict (Granger causes) future inflation (let's call this an inflation indicator variable) could (and in an optimising policy making framework should) be an argument in the decision rule. This suggests that a monetary authority for which price stability enters first in a lexicographic ordering of objectives could have a reaction function with a veritable kitchen-sink collection of inflation indicator variables as arguments: the output gap, the exchange rate (because exchange rate changes may feed through into the target price index and may therefore help predict future inflation; other asset prices (because they contribute, through a variety of channels to future inflation and may therefore help predict future inflation, the growth rate of monetary and credit aggregates (perhaps at a range of frequencies) etc.). The fact that the authorities respond (possibly in a non-linear and time-varying manner) to movements in these inflation indicator variables does not mean, of course, that it targets these indicator variables.

The conditions under which even the optimisation of the flexible inflation targeting loss function (28) would generate a feedback rule that resembles the Taylor rule in (34) are something of a mystery. The most mysterious part is the feature that inflation is targeted at some

²⁶ Let P_t be the price level in period t , then $\pi_{t_1, t_0} = \left(\frac{P_{t_1}}{P_{t_0}} \right)^{\frac{1}{t_1 - t_0}} - 1$, $t_1 \geq t_0$. The real interest rate in the Taylor rule could instead be some long-run expected real interest rate. Likewise, the output gap could be some function of past, present and anticipated future output gaps.

future point in time or over some future time interval, $t_1 - t_0$ in equation (34). Even when I was an external member of the Monetary Policy Committee of the Bank of England, from May 1997 till June 2000, great emphasis was placed, quite inappropriately in my view, on inflation two years ahead. Granted, the transmission lags from interest rate changes to the target price index are sometimes long and always variable and uncertain, as are the magnitudes of the impulse response function. It is virtually impossible to influence the inflation rate in a predictable manner in the short run. Attempts to do so could undermine the achievement of the inflation target further in the future. However, even the flexible inflation targeting objective function implies that the authorities should target inflation over a horizon that starts from the earliest period in which a predictable effect is possible till Kingdom Come.

The exclusive focus on inflation at some 2 to 3-year horizon or over some interval starting 1 or 2 years from now and ending 3 or 4 years from, now cannot, as far as I know, be rationalised starting from the flexible inflation targeting loss function and any existing monetary model. Milton Friedman argued that for the US of the 1960s (an economy with a very small traded goods sector and a low ratio of household financial assets and liabilities to disposable income, in a world with severely restricted capital mobility) changes in (some measure of the money supply would have their strongest effect on the price level at a two-year horizon (Friedman and Schwarz (1963), Friedman and Meiselman (1963)). Are inflation targeting central banks the slaves of this not even defunct economist, or have we inferred, erroneously, from the observation that the impulse response function (in a (structural) VAR framework) describing the dynamic response of inflation to a shock to the nominal interest rate has a peak at, say, N years, that the interest rate should therefore be used to target inflation at an N -year horizon?

III. The useful but dangerous myth of central bank independence

Independence is not a concept that fits comfortably into conventional economic discourse. Economists like to think in terms of preferences, constraints, endowments, beliefs, information, choices/actions and equilibrium concepts. Independence is clearly related to these common economic concepts, but the mapping is by no means one-to-one and onto. Most students of central banking would probably agree with the statement that a central bank is independent if it can use the instrument(s) of monetary policy freely, that is, without being instructed what to do and what not to do by some higher authority in a hierarchical setting, without outside agents being able to restrict the domain over which central bank instrument choice can be exercised and without this choice being influenced by rewards or punishments offered by outside parties. This, however, leaves many loose ends. Who chooses the objectives pursued by the central bank? Who determines the set of instruments the central bank has at its disposal and the range over which these instruments can be varied? Who or what determine(s) the pay-off function (institutional and personal costs and benefits attached to monetary policy actions) for the mpc and its individual members?

When it comes to central bank independence, a distinction needs to be made between ends and means. *Goal independence* is the freedom or ability of the central bank to set its own objectives. It is helpful to distinguish between ultimate goals and operational objectives. Ultimate goals are broad principles, such as price stability, full employment and financial stability. They tend to be qualitative or categorical and hard to express in terms of observable and verifiable variables.

I know of no central bank that has the freedom to set its ultimate objectives. Even the ECB has its ultimate objectives, with price stability first in a lexicographic ordering, set in the Treaty establishing the European Community and the Protocol attached to it.²⁷ The ultimate objectives of the Bank of England are laid down in the Bank of England Act 1998, those of the Fed in the Federal Reserve Act and those of the Bank of Japan in the Bank of Japan Act.

When it comes to the operational objectives of the central bank, the quantitative, observable and verifiable yardsticks by which their performance can be measured, there are considerable differences between the central banks, not only as regards what they are, but also as to who sets them. The ECB sets its own operational objective: an inflation rate for the HICP index of below but close to 2 percent per annum in the medium term. With the Bank of England, the Chancellor of the Exchequer sets the inflation objective – both the index and the number, and the Chancellor can, in principle, change it at will whenever he sees fit, although in practice there has thus far been admirable restraint.

With the end of quantitative easing and of the zero interest rate policy, the Bank of Japan now sets itself an inflation target. New Zealand's inflation target is negotiated and agreed between the Governor of the Reserve Bank of New Zealand and the Minister of Finance. Only the US has no operational targets for monetary policy, that is, no quantitative yardsticks operationalising 'maximum employment, price stability and moderate long-term interest rates. This makes it extremely difficult for participants in financial markets, labour markets or markets for goods and services to make informed guesses about the likely future conduct of monetary

²⁷ The Protocol on the Statute of the European System of Central Banks and of the European Central bank, Chapter II, Article 2 states: "Objectives. ... the primary objective of the ESCB shall be to maintain price stability. Without prejudice to the objective of price stability, it shall support the general economic policies in the Community with a view to contributing to the achievement of the objectives of the Community as laid down in Article 2 of this Treaty. The ESCB shall act in accordance with the principle of an open market economy with free competition, favouring an efficient allocation of resources, and in compliance with the principles set out in Article 4 of this Treaty."

policy, and may be one reason why ‘Fed watching’ is such a resource-intensive and well-rewarded activity. The absence of numerical targets for employment, inflation, and long-term interest rate moderation also means that even formal accountability (reporting, explaining and justifying monetary policy decisions) is bound to be weaker for the Fed than it is for central banks with numerical operational targets.

Operational independence is the freedom or ability of a central bank to pursue its objectives (regardless of who sets them) as it sees fit, without interference or pressure from third parties. It is not a binary variable. Operational independence is a matter of degree.

Operational independence for a central bank requires *political independence*: the central bank cannot seek or take instructions from any government/state body or other institution/body. It also requires *technical independence*: the central bank is given the tool(s) to do the job. It means that the central bank cannot be coerced or induced to extend financial assistance to the government or to private agents. It requires *financial independence*, that is, a separate budget and a secure capital base. It requires *security of tenure*, e.g. through a minimum term of office and removal from office only for incapacity or serious misconduct, and not for gross incompetence. Finally, it requires that there be some other independent body, e.g. a court, to settle disputes between the central bank and the government. This list suggests that true operational independence is difficult to achieve and that, if it is achieved, the central bank is, almost by definition, not substantively accountable.

There can be little doubt that the ECB is the central bank with the highest degree of operational independence. Since it also sets its own operational objectives, it can also be characterized as the most independent central bank, when operational independence and target/goal independence are taken together. The ECB’s operational independence and its

mandate are enshrined in the Treaty establishing the European Community and the associated Protocol. These can only be amended through a Treaty revision requiring the unanimous consent of the EU member states (currently 25 in number). This amounts to a degree of formal legal protection that is greater than constitutional protection in a conventional nation state, because constitutions typically do not require unanimity to be amended. *A fortiori* the ECB's mandate and privileges are therefore much better shielded than the Federal Reserve Board (created by an Act of Congress), the Bank of England (governed by the Bank of England Act 1998) or the Bank of Japan (governed by the Bank of Japan Act).

As regards formal, legal safeguards guaranteeing political independence, financial independence and security of tenure, the ECB scores as high as or higher than any other central bank. Highly unusual, there is nothing in the Treaty and Protocol governing the ESCB and the ECB that permits the political authorities (in this case the Council of the European Union) to repatriate, or take back, under extreme circumstances, the power to conduct monetary policy from the ECB.²⁸ The Bank of England Act 1998 created the Treasury Reserve Powers for this purpose; the Reserve Bank of New Zealand Act 1989 contains a similar provision. According to the Treaty and Protocol, even if financial chaos, war or revolution were to buffet the Eurozone, monetary policy will continue to be made by the ECB. Dispute resolution through the European Court of Justice provides a further safeguard for its operational independence.

²⁸ The Council of the European Union forms, along with the European Parliament, the legislative arm of the European Union, but also has some of the functions normally exercised by the executive. It contains the ministers with the relevant portfolios of the governments of each of the European Union member states. It is often referred to as the Council or the Council of Ministers.

There is just one chink in the ECB's operational independence armour. This relates to the ECB's *technical independence*. There is some question mark as to whether it has the tools to do the job of ensuring price stability.

Responsibility for exchange rate policy is divided between the ECB and the Council of Ministers. The Council of Ministers, acting unanimously, can enter into formal exchange rate arrangements with non-EU countries, on the basis of a recommendation from the ECB or, in the absence of such a recommendation, after consulting with the ECB in an endeavor to reach consensus consistent with price stability. The Council can also formulate general orientations for the exchange rate. Only a qualified majority is required for such general orientations. In the absence of such arrangements or orientations, the management of the exchange rate is the responsibility of the ECB.²⁹

The interpretation of the ECB of these paragraphs of the Treaty is that the Council can make systemic decisions about the nature of the exchange rate *regime* for the Eurozone. Once this systemic issue has been settled, however, the actual management of the exchange rate, including the absence of any active exchange rate management when a (freely) floating exchange rate regime has been adopted – as has been the case for the euro since its inception in 1999 – is a

²⁹ The relevant paragraphs in Article 109 of the Treaty are the following:

1. "..., the Council may, acting unanimously on a recommendation from the ECB or from the Commission, and after consulting the ECB in an endeavour to reach a consensus consistent with the objective of price stability, after consulting the European Parliament, in accordance with the procedure in paragraph 3 for determining the arrangements, conclude formal agreements on an exchange rate system for the ECU in relation to non-Community currencies. ...
2. In the absence of an exchange rate system in relation to one or more non-Community currencies as referred to in paragraph 1, the Council, acting by a qualified majority either on a recommendation from the Commission and after consulting the ECB, or on a recommendation from the ECB, may formulate general orientations for exchange rate policy in relation to these currencies. These general orientations shall be without prejudice to the primary objective of the ESCB to maintain price stability.
3., where agreements concerning monetary or foreign exchange regime matters need to be negotiated by the Community with one or more States or international organizations, the Council, acting by a qualified majority on a recommendation from the Commission and after consulting the ECB, shall decide the arrangements for the negotiation and for the conclusion of such agreements...."

matter solely for the ECB. In other words, the Council of Ministers could decide that the euro should have a fixed exchange rate with the US dollar and the Yen, as part of a new Bretton Woods system. Once the decision has been made to let the euro float, managing or not managing the exchange rate, including foreign exchange market intervention to influence the external value of the euro, is a matter for the ECB alone to decide.

The ECB clearly has reason on its side in the debate as to who should manage the exchange rate. In a world with unrestricted financial capital mobility, independent monetary policy is no longer possible if some other party determines present and future values of the exchange rate. If the Council of ministers had the power to choose a (contingent) path for the exchange rate of the euro, and if it could instruct the ECB to do whatever it took (through interest rates or foreign exchange market intervention) to achieve that exchange rate path, there would be no operationally independent monetary policy left.

Reason and Treaties are not always congruent, however. The camel's nose is clearly in the tent when the Council is given the power to “...*formulate general orientations for exchange rate policy in relation to these currencies. These general orientations shall be without prejudice to the primary objective of the ESCB to maintain price stability.*” Unless the ESCB is the sole arbiter of whether a given ‘general orientation’ is prejudicial to price stability, there is a risk that the Council could start giving binding exchange rate orientations. This would undermine monetary policy independence. Unfortunately, the Treaty does not state which party or parties have the power to determine whether a given exchange rate orientation is prejudicial to price stability. The ECB asserts that it cannot be given binding exchange rate orientations without its consent. Every French minister of finance since 1999 and a number of other ministers of finance have begged to disagree. The issue has not yet been put to the test.

A number other leading central banks could potentially be nobbled as much as the ECB by legislation that treats exchange rate policy as separate from monetary policy and assigns the responsibility for the exchange rate to an agency other than the central bank. Treating interest rate policy and exchange rate policy as separate and independent instruments may have made sense, albeit only in the short run, in a world with rigorous capital and foreign exchange controls, but that world died a long time ago. In the US, the exchange rate is the domain of the Treasury, not that of the Fed. The same holds true for Japan. Of the leading central banks, only the Bank of England does not have this design flaw.

It must be remembered also that strength of the formal, legal guarantees of a central bank's independence may bear little or no relationship to the likelihood that this independence will be encroached on in the real world. The politics of the moment can overwhelm even constitution-based or Treaty-based guarantees. This is likely to be particularly relevant for the ECB. Its operational independence is derived from a Treaty that is several hundred pages long and has a kitchen sink quality – it covers everything from the sublime and important to the ridiculous and trivial. Few citizens of the EU will consider themselves bound by every paragraph in it. The ECB's independence has extremely sturdy formal legal foundations, but in substance is only as strong as the pro-EU political sentiment and the EU institutions supporting it.

IIIA. The financial mechanics of central bank dependence

In this section of the paper, I argue the following. First, given the central bank's financial dependence on the rest of the state – the Treasury for short – a central bank is inherently financially vulnerable and its operational independence is very difficult to establish. Second, if against the odds, the central bank has been made financially independent of the Treasury, it cannot be *substantively* accountable to anyone or any institution; such a central bank is an *agent*

whose behaviour can only be influenced in at most a very limited way by the *principal* (the government in the first instance, and the citizenry/voters ultimately). Third, in a democratic polity, lack of substantive accountability is acceptable only if the remit/mandate of the central bank is limited/restricted. Fourth, there is a tendency for central banks to go beyond their narrow legitimate remits – the ECB is a leading example of this, but by no means the only one. Fifth, such illegitimate enhancement of the central bank’s mandate risks a political backlash that may undermine central bank operational independence even in those narrowly defined areas of its mandate where it makes sense. Finally, operational independence does not mean that you don’t answer the telephone: coordination and cooperation with the fiscal authorities is entirely consistent with central bank independence.

Regardless of the degree of *de jure* and *de facto* operational or goal independence of the central bank, the balance sheet and the profit and loss account of the central bank are not independent of those of the rest of government. They are part of the balance sheet and profit and loss account of the state, for our purposes the consolidated general government and central bank.³⁰ The fact that the balance sheet and profit and loss account of the central bank are inextricably, but asymmetrically, intertwined with those of the general government manifests itself in a number of different ways.

There is a key asymmetry in the relationship between the central bank and the general government (which I will call the treasury from now on). The treasury has the power to tax but

³⁰ From the perspective of macroeconomic management – fiscal-financial-monetary sustainability and macroeconomic stabilisation - the appropriate treatment of state-owned enterprises (SOEs) and similar publicly-owned bits of the enterprise sector is in principle clear but in practice often complicated. If and to the extent that they represent contingent general government liabilities or assets, their accounts should be consolidated with those of the general government.

the central bank does not.³¹ Not only does the treasury have the power to tax in general, it has the power to tax the central bank. Typically, the operating profits of the central bank are transferred automatically to the treasury.³²

A further common but not universal asymmetry in the relationship between the treasury and the central bank is that the treasury is typically the main and majority shareholder of the central bank. In the UK, for instance, the Bank of England is a joint stock company all of whose shares are held by the Treasury.³³ Norges Bank is a separate legal entity owned by the state. However, the fact that the central bank is, from a financial point of view, an integral part of the state, does not depend on the formal legal niceties of stock ownership.³⁴ The concept of a financially independent central bank is therefore, in substance, vacuous, whatever the formal legal status of the central bank.

For a central bank to be able to achieve an inflation target without it having the power to tax, two conditions have to be satisfied. First, the inflation target has to be financeable by the state, that is, the consolidated central bank and general government. Second, when monetary policy is institutionally delegated to the central bank, the treasury has to ‘stand behind’ the central bank. What this means is that resources of the general government, in particular its

³¹ It is unclear whether most central banks have the right/power to make explicit transfer payments to parties outside the government. Since I will consider the ability of the central bank to make an (idealised) helicopter drop of money, I will consider the case where the central bank can make transfer payments to the public.

³² The ECB distributes its profits to its shareholders, the National Central Banks (NCBs). The NCBs distribute their profits to the respective ministries of finance.

³³ The Bank of England is a body corporate incorporated by Royal Charter pursuant to the 1694 Act. The Bank was nationalised by the 1946 Act and its capital stock transferred to the Treasury.

³⁴ The Federal Reserve System is an independent entity within the US Federal government. The stock of the twelve regional Federal Reserve Banks is owned by (private) member banks. Ownership of a certain amount of stock is, by law, a condition of membership in the System. The stock may not be sold or traded or pledged as security for a loan; dividends are, by law, 6 percent per year. The ECB is owned by the national central banks (NCBs) that make up the EU’s European System of Central Banks (ESCB). The NCB’s themselves have a variety of formal ownership structures, but their balance sheets and profit and loss accounts all are effectively integral parts of the consolidated financial accounts of the nation state to which they belong. The Bank of Japan’s capital is one hundred million yen, subscribed by both the government and non-governmental legal persons, in exchange for subscription certifications (shares), with the government providing no less than 55 million yen.

capacity to tax, now and in the future, can and will be used, if required, to provide the central bank with the resources required to pursue its inflation target effectively. We consider the issue of the treasury recapitalising the central bank further in Section IIIA.3.a below.

There is a flip side to this implicit or explicit guarantee of the balance sheet of the central bank by the treasury, which manifests itself when the treasury tries to appropriate (part of) the assets of the central bank. We are familiar with this phenomenon in developing countries and emerging markets. For instance, in 2006, the Central Bank of Bolivia was required to provide the new government of Evo Morales with hard currency to complete the nationalisation of the domestic gas industry. Also in 2006, and the Reserve Bank of Zimbabwe was ‘asked’ to provide the government of Robert Mugabe with the resources to purchase additional Chinese fighter jets. The phenomenon also occurs in developed market economies, however, regardless of whether the central bank has been granted operational independence.

The central bank may be able to resist, at least in part and for a while, a claim on its assets by the treasury. The Bundesbank did this in 1997 when the German Federal Government attempted to raid (the revaluation of) the Bundesbank’s gold and official foreign exchange reserves in an attempt to improve its chances of meeting the Maastricht Criteria for EMU membership.³⁵ The National Bank of Poland successfully rebuffed an attempt, in 2003, by the Polish Ministry of Finance to appropriate a part of (the capital gains incurred on) its foreign exchange reserves. Ultimately, a determined treasury will be able to overcome such obstacles, be they conventions, laws or constitutional arrangements, provided there is popular political support for such deprecations.

In Switzerland, the distribution of the profits (strictly speaking capital gains) realised since 1997 by the Swiss National Bank from the sale of its gold reserves, has been a contentious

³⁵ See Duckenfield (1999) for a most interesting statement by the Bundesbank on this matter.

political issue. In 2005, Jean-Pierre Roth, Chairman of the Governing Board of the Swiss National Bank spoke out publicly against the "COSA initiative", which proposes allocating the first billion Swiss francs of the Bank's current profit to the cantons, with the balance going to the state Old Age and Survivors' Insurance scheme (AHV/AVS), the unfunded Swiss national security retirement scheme (Roth (2005)). As of mid-2006, it still looks likely that this initiative will be voted on and approved in a referendum. As a less serious example, during 1998, the Netherlands Bank donated 110mn Dutch guilders (about US\$ 58mn at the then-prevailing exchange rate) to a fund dedicated to the purchase of art for Dutch musea. This led to a political tempest in a teacup, because the assets of the central bank, including its non-financial assets, were deemed by many to be the property of the state, which the central bank had no right to gift to any one, without the consent of parliament, which had not been sought.³⁶

Because of the exceptional status of certain of the financial liabilities of the central bank (typically currency) as legal tender, the central bank can create any nominal amount of liquidity at negligible cost and virtually instantaneously. The central bank is therefore the agency of the state with the '*short-term deep pockets*'. Such '*short-term deep pockets*' are all that is required for a central bank to be able to confront a liquidity crisis (say a run on the commercial banks) that is not expected to turn into a solvency crisis for a significant part of the banking/financial system. It is all that is required for the central bank to be an effective lender of last resort.

However, if in the view of the central bank and the treasury, the banking/financial system requires a permanent capital injection, it may not be possible for the central bank to do this on its

³⁶ The fund immediately used 80 million guilders to purchase a single painting, Victory Boogie Woogie by Piet Mondriaan. Although the minister of finance and the prime minister had been consulted and had agreed to the gift, parliament had not been consulted.

own without recourse to monetary injections that would result in excessive inflationary pressures. In that case, provided the comprehensive balance sheet (that is, the intertemporal budget constraint, including future revenue-raising capacity and public spending obligations) of the treasury is sufficiently robust, the treasury can recapitalise the central bank and thus prevent excessive inflation resulting from a financial rescue operation by the central bank. The treasury, the agency of the state with the capacity to tax, has the ‘*long-term deep pockets*’ that complement the short-term deep pockets of the central bank.

IIIA.1 The intertemporal budget constraints of the central bank and the treasury

The argument thus far is easily formalised and made precise with a stylized set of accounts for the central bank and the treasury (see also Buitier (2004), Sims (2004), (2005) and Ize (2005)).

The central bank has the monetary base M , (currency plus commercial bank reserves with the central bank) on the liability side of its financial balance sheet; it carries a zero nominal interest rate.³⁷ On the asset side it has the stock of international foreign exchange reserves, R^f , earning a risk-free nominal interest rate i^f and the stock of domestic credit, which consists of central bank holdings of nominal, interest-bearing treasury bills, D , earning a risk-free nominal interest rate i , and central bank claims on the private sector, L , with nominal interest rate i^L .³⁸ The stock of treasury debt held outside the central bank is B ; it pays the risk-free nominal interest rate i ; τ^P is the real value of the tax payments by the domestic private sector to the

³⁷ For simplicity, all of the monetary base is treated as non-interest bearing.

³⁸ For simplicity, I consider only short maturity bonds. Generalisations to longer maturities, index-linked debt or foreign-currency denominated debt are straightforward. In many transition countries and developing countries the central bank also holds private sector debt instruments among its assets and interest-bearing, non-monetary liabilities among its liabilities.

treasury; it is a choice variable of the treasury; τ^b is the real value of taxes paid by the central bank to the treasury; it is a choice variable of the treasury and can be positive or negative; $\tau^s \equiv \tau^p + \tau^b$ is the real value of total treasury tax receipts; $h \geq 0$ is the real value of the transfer payments made by the central bank to the private sector ('helicopter drops'); I assume it to be a choice variable of the central bank; $\tau \equiv \tau^p - h$ is total real taxes net of transfer payments received by the state, that is, the consolidated treasury and central Bank; e is the value of the spot nominal exchange rate (the domestic currency price of foreign exchange); c^s is the real value of general government spending on goods and services and c^b the real value of central bank spending on goods and services; P is the general price level; the distinction between producer and consumer price levels is ignored for simplicity, and public spending on goods and services is assumed to be public consumption only.

Equation (35) is the budget identity of the treasury and equation (36) that of the central bank.³⁹

$$\frac{B_t + D_t}{P_t} \equiv c_t^s - \tau_t^p - \tau_t^b + (1 + i_{t,t-1}) \left(\frac{B_{t-1} + D_{t-1}}{P_t} \right) \quad (35)$$

$$\frac{M_t - D_t - L_t - e_t R_t^f}{P_t} \equiv c_t^b + \tau_t^b + h_t + \frac{M_{t-1} - (1 + i_{t,t-1}) D_{t-1} - (1 + i_{t,t-1}^L) L_{t-1} - (1 + i_{t,t-1}^f) e_t R_{t-1}^f}{P_t} \quad (36)$$

When there exist complete contingent claims markets, and the no-arbitrage condition is satisfied, the usual solvency constraints, ruling out Ponzi finance by both the government and the

³⁹ Note that the familiar proposition that the change in the monetary base equals domestic credit expansion plus the value of the change in the stock of foreign exchange reserves is correct if and only if the central bank makes no *after-tax* profits, that is, its before-tax profits, $i_t D_{t-1} + i_t^L L_{t-1} + e_t i_t^f R_{t-1}^f - P_t h_t$, are paid as taxes to the treasury:

$$\Delta M_t \equiv \Delta D_t + \Delta L_t + e_t \Delta R_t^f \quad \text{iff} \quad P_t \tau_t^b \equiv i_t D_{t-1} + i_t^L L_{t-1} + e_t i_t^f R_{t-1}^f - P_t h_t.$$

central bank, imply the following intertemporal budget constraints for the treasury (equation (37)) and for the central bank (equation (38)).⁴⁰

$$B_{t-1} + D_{t-1} \leq E_t \sum_{j=t}^{\infty} I_{j,t} P_j (\tau_j^p + \tau_j^b - c_j^g) \quad (37)$$

$$-(D_{t-1} + L_{t-1} + e_{t-1} R_{t-1}^f) \leq E_t \sum_{j=t}^{\infty} I_{j,t} P_j \left(-c_j^b - \tau_j^b - h_j - s_j + \frac{\Delta M_j}{P_j} \right) \quad (38)$$

$$P_t S_t \equiv (i_t - i_t^L) L_{t-1} + \left[1 + i_t - (1 + i_t^f) \frac{e_t}{e_{t-1}} \right] e_{t-1} R_{t-1}^f. \quad (39)$$

Here $I_{j,t}$ is the nominal stochastic discount factor between periods j and t defined by

$$\begin{aligned} I_{t_1, t_0} &= \prod_{k=t_0+1}^{t_1} I_{k, t-1} \quad \text{for } t_1 > t_0 \\ &= 1 \quad \text{for } t_1 = t_0 \end{aligned} \quad (40)$$

The interpretation of $I_{j,t}$ is the price in terms of period t money of one unit of money in period $j \geq t$. There will in general be many possible states in period j , and period j money has a period t (forward) price for each state. Provided earlier dated information sets do not contain more information than later dated information sets, these stochastic discount factors satisfy the recursion property

$$E_{t_0} (I_{t_1, t_0} E_{t_1} I_{t_2, t_1}) = E_{t_0} I_{t_2, t_0} \quad \text{for } t_2 \geq t_1 \geq t_0 \quad (41)$$

Finally, the risk-free nominal interest rate in period t , the money price in period t of one unit of money in every state in period $t+1$ is defined by

$$\frac{1}{1 + i_{t+1, t}} = E_t I_{t+1, t} \quad (42)$$

For future reference I also define recursively the real stochastic discount factor $R_{j,t}$ by

⁴⁰ The solvency constraint for the treasury is $\lim_{j \rightarrow \infty} E_t I_{j,t} (B_j + D_j) \leq 0$, that for the central bank is

$$\lim_{j \rightarrow \infty} E_t I_{j,t} (D_j + L_j + e_j R_j^f) \geq 0.$$

$$R_{t_1, t_0} = \prod_{k=t_0+1}^{t_1} R_{k, t-1} \quad \text{for } t_1 > t_0$$

$$= 1 \quad \text{for } t_1 = t_0$$

where

$$R_{t+1, t} = I_{t+1, t} (1 + \pi_{t+1, t})$$

and the risk-free real rate of interest between periods t and $t+1$ is defined as

$$\frac{1}{1 + r_{t+1, t}} = E_t R_{t+1, t}.$$

The expression s in (39) stands for the real value of the quasi-fiscal implicit interest subsidies made by the central bank. If the rate of return on government debt exceeds that on loans to the private sector, there is an implicit subsidy to the private sector equal in period t to $(i_t - i_t^L)L_{t-1}$. If the rate of return on foreign exchange reserves is less than what would be implied by Uncovered Interest Parity (UIP), there is an implicit subsidy to the issuers of these

reserves, given in period t by $\left[1 + i_t - (1 + i_t^f) \frac{e_t}{e_{t-1}} \right] e_{t-1} R_{t-1}^f$

Summing (35) and (36) gives the budget identity of the state (the consolidated treasury and central bank), in equation (43); summing (37) and (38) given the intertemporal budget constraint of the state in equation (44).

$$M_t + B_t - L_t - e_t R_t^f \equiv P_t (c_t^s + c_t^b - \tau_t) + M_{t-1} + (1 + i_t) B_{t-1} - (1 + i_t^L) L_{t-1} - e_t (1 + i_t^f) R_{t-1}^f \quad (43)$$

$$B_{t-1} - L_{t-1} - e_{t-1} R_{t-1}^f \leq \sum_{j=t}^{\infty} E_t I_{j,t} P_j \left(\tau_j - s_j - c_t^s - c_t^b + \frac{\Delta M_j}{P_j} \right) \quad (44)$$

Consider the conventional financial balance sheet of the central bank in Table 2, that of the treasury in Table 3, and that of the state in Table 4. Loans to the private sector and international reserves are valued at their notional or face values. If the outstanding stock of loans

to the private sector were marked-to-market, its value would be $L_t \left(\frac{1+i_{t+1}^L}{1+i_t} \right)$ and the marked-to-

market value of the international reserves would be $e_t R_t^f \left(\frac{(1+i_{t+1}^f) e_{t+1} / e_t}{1+i_{t+1}} \right)$.

Table 2	
Central Bank Financial Balance Sheet	
Assets	Liabilities
<i>D</i>	<i>M</i>
<i>L</i>	
eR^f	
	W^b

Table 3	
Treasury Financial Balance Sheet	
Assets	Liabilities
	<i>D</i>
	<i>B</i>
	W^s

Table 4	
Financial Balance Sheet of the State (consolidated Treasury and Central Bank)	
Assets	Liabilities
<i>L</i>	<i>B</i>
<i>eR^f</i>	<i>M</i>
	<i>W^s</i>

The central bank's financial net worth, $W^b \equiv D + L + eR^f - M$, is the excess of the value of its financial assets, treasury debt, D , loans to the private sector, L and foreign exchange reserves, eR^f , over its monetary liabilities, M . Note that, in principle, there is nothing to prevent W^{cb} from being negative. Financial net worth excludes the present value of anticipated or planned future non-contractual outlays and revenues (the right-hand side of equation (38)). It is therefore perfectly possible, for the central bank to survive and thrive with negative financial net worth. This might, however, require the central bank to raise so much real seigniorage, $\frac{\Delta M_j}{P_j}$, $j \geq t$, through current and future nominal base money issuance, that, given the demand function for real base money, unacceptable rates of inflation would result. The financial net worth of the treasury, $W^s \equiv -(D + B)$, is negative for most governments. The financial net worth of the state, $W^s \equiv W^s + W^b = L + eR^f - B - M$, is also likely to be negative for most countries. None of this need be a source of concern, unless the gap between the outstanding contractual non-monetary debt of the state and the present discounted value of the future primary (non-interest) surpluses of the state, $\tau_j - c_j^g - c_j^b - s_j$, $j \geq t$ is so large, that it either cannot be

filled at all at all (the maximum value of the discounted future real seigniorage stream is too low) and the state defaults, or can only be closed at high rates of inflation.

The only intertemporal budget constraint that ought to matter, that is, the only one that would matter in a well-managed economy, is that of the consolidated treasury and central bank, given in equation (44). Its breakdown into the treasury's intertemporal budget constraint (equation (37)) and the central bank's intertemporal budget constraint (equation (38)) is without macroeconomic interest, unless there is a failure of cooperation and coordination between the monetary and fiscal authorities, that is, between the central bank and the treasury.

III.A.2 Can central banks survive with ‘negative equity’?

We can rewrite the intertemporal budget constraint of the central bank in (38) as follows:

$$M_{t-1} - (D_{t-1} + L_{t-1} + e_{t-1}R_{t-1}^f) \leq E_t \sum_{j=t}^{\infty} I_{j,t} P_j (-c_j^b - \tau_j^b - h_j - s_j) + E_t \sum_{j=t}^{\infty} I_{j,t} \left(\frac{i_{j,j-1}}{1+i_{j,j-1}} \right) M_{j-1} + \lim_{j \rightarrow \infty} E_t I_{j,t} M_j \quad (45)^{41}$$

On the left-hand side of (45) we have (minus) the equity of the central bank – the excess of its monetary liabilities over its financial assets. On the right-hand side of (45) we have

$E_t \sum_{j=t}^{\infty} I_{j,t} \left(\frac{i_{j,j-1}}{1+i_{j,j-1}} \right) M_{j-1}$, the present discounted value of the future interest payments saved by

the central bank because of its ability to issue non-interest-bearing monetary liabilities. On the right-hand side of (45) we also have the present value of the terminal stock of non-interest-bearing money, $\lim_{j \rightarrow \infty} E_t I_{j,t} M_j$.

⁴¹ Add M_{t-1} to both sides of (38); note that $M_{t-1} + E_t \sum_{j=t}^{\infty} I_{j,t} \Delta M_j \equiv E_t \sum_{j=t}^{\infty} (I_{j-1,t} - I_{j,t}) M_{j-1} + \lim_{j \rightarrow \infty} E_t I_{j,t} M_j$;

finally note that $E_t I_{j,t} = E_t (I_{j-1,t} I_{j,j-1})$ and that $E_t I_{j,j-1} = \frac{1}{1+i_{j,j-1}}$.

In order to obtain the central bank's intertemporal budget constraint (38), I assumed (see footnote (39)) that $\lim_{j \rightarrow \infty} E_t I_{j,t} (D_j + L_j + e_j R_j^f) \geq 0$, that is, the present value of the terminal net non-monetary liabilities had to be non-negative. I did not impose the condition $\lim_{j \rightarrow \infty} E_t I_{j,t} (D_j + L_j + e_j R_j^f - M_j) \geq 0$, that is, that the present value of the terminal total net liabilities, monetary and non-monetary had to be non-negative. The reason is that the monetary 'liabilities' of the central bank are not in any meaningful sense liabilities of the central bank. The owner (holder) of currency notes worth X units of currency have a claim on the central bank for currency notes worth X units of currency – nothing more. The monetary liabilities of the central bank are irredeemable or inconvertible into anything other than the same amount of itself. While in most well-behaved economies, $\lim_{j \rightarrow \infty} E_t I_{j,t} M_j = 0$, this will not be the case, for instance, in a permanent liquidity trap where $\lim_{j \rightarrow \infty} E_t I_{j,t} M_j = \lim_{j \rightarrow \infty} E_t M_j \neq 0$ unless the monetary authorities adopt a policy of (asymptotically) demonetising the economy. This will be the case, for instance, in the efficient stationary liquidity trap equilibrium of the Bailey-Friedman Optimal Quantity of Money rule, where the nominal interest is kept at zero throughout and the nominal stock of base money shrinks at a proportional rate equal to the real interest rate and the rate of time preference.

Consider for simplicity the case where the present value of the terminal money stock is zero. Even if the conventionally defined net worth or equity of the central bank is negative, that is, if $M_{t-1} - (D_{t-1} + L_{t-1} + e_{t-1} R_{t-1}^f) > 0$, the central bank can be solvent provided

$$M_{t-1} - (D_{t-1} + L_{t-1} + e_{t-1} R_{t-1}^f) \leq E_t \sum_{j=t}^{\infty} I_{j,t} P_j (-c_j^b - \tau_j^b - h_j - s_j) + E_t \sum_{j=t}^{\infty} I_{j,t} \left(\frac{i_{j,j-1}}{1 + i_{j,j-1}} \right) M_{j-1}. \quad \text{Whether}$$

this is consistent with the pursuit of the externally imposed or self-imposed inflation target is something we will consider next.

IIIA.3 Is the inflation target independently financeable by the central bank?

I consider here whether and under what conditions the inflation target is consistent with the central bank's intertemporal budget constraint. Consider a simplified, closed economy macroeconomic model, tagged on to the accounting framework developed in the previous Subsection. There are no international reserves, $R_t^f = 0$, no central bank loans to the private sector, $L_t = 0$, and therefore no quasi-fiscal subsidies by the central bank, $s_t = 0$.

The intertemporal budget constraints of the central bank and of the consolidated central bank and treasury are for this simplified closed economy:

$$-D_{t-1} \leq \sum_{j=t}^{\infty} E_t I_{j,t} P_j \left(-c_j^b - \tau_j^b - h_j + \frac{\Delta M_j}{M_j} \frac{M_j}{P_j} \right) \quad (46)$$

and

$$B_{t-1} \leq \sum_{j=t}^{\infty} E_t I_{j,t} P_j \left(\tau_j - c_t^s - c_t^b + \frac{\Delta M_j}{M_j} \frac{M_j}{P_j} \right) \quad (47)$$

Let the real value of the stock of domestic credit be $d_t = \frac{D_t}{P_t}$ and the real stock of money

balances $m_t = \frac{M_t}{P_t}$.

We can re-write the central bank's intertemporal budget constraint as:

$$-d_{t-1} \leq \sum_{j=t}^{\infty} E_t R_{j,t} \left(-c_j^b - \tau_j^b - h_j + \frac{\Delta M_j}{M_j} m_j \right) \quad (48)$$

The rest of the economy is a simple non-stochastic one-commodity endowment economy with a representative infinite-lived household with a time-additive objective function and a subjective discount factor $\beta = \frac{1}{1+\rho} < 1$. Period utility is the natural logarithm of a Cobb-

Douglas function of consumption and real money balances. There is full price flexibility. Real money balances are an argument in the household's utility function. The demand for real money balances and the Euler equation for private consumption, c , are as follows:

$$m_t = \alpha \left(\frac{1+i_{t+1}}{i_{t+1}} \right) c_t; \quad 1 > \alpha > 0, i_{t+1} \geq 0 \quad (49)$$

$$c_{t+1} = \left(\frac{1+r_{t+1}}{1+\rho} \right) c_t \quad (50)$$

where the one-period real interest rate $r_{t,t-1}$ is defined by

$$1+r_{t,t-1} = \frac{1+i_{t,t-1}}{1+\pi_{t,t-1}}$$

Equilibrium is given by:

$$y_t = c_t + c_t^g + c_t^b \quad (51)$$

I consider a simple stationary benchmark with $y_t = \bar{y} > c_t^g + c_t^b$, $c_t^g = \bar{c}^g$ and $c_t^b = \bar{c}^b$. It follows that in equilibrium:

$$c_t = \bar{c} = \bar{y} - \bar{c}^g - \bar{c}^b \quad c_t = \bar{c} = \bar{y} - \bar{c}^g - \bar{c}^b \quad (52)$$

$$r_{t+1} = \rho \quad (53)$$

$$\pi_{t+1} = \frac{\Delta M_{t+1}}{M_t} \quad (54)$$

I want to consider which constant rate(s) of inflation, $\bar{\pi}$, this economy can support, with a central bank whose intertemporal budget constraint is given by equation (48). Without loss of generality for our purposes, we also assume that the real value of the taxes imposed on the central bank by the treasury is constant, $\tau_t^b = \bar{\tau}^b$ and that the real value of the payments by the

central bank to the public is constant, $h_t = \bar{h}$.⁴² It follows that the central bank's intertemporal budget constraint can be rewritten as follows:

$$-d_{t-1} + \frac{\bar{\tau}^b}{\rho} + \left(\frac{\bar{c}^b + \bar{h}}{\rho} \right) \leq \sigma(\bar{\pi}) \quad (55)$$

where

$$\sigma(\bar{\pi}) = \frac{\alpha \bar{c}(1+\rho)(1+\bar{\pi})\bar{\pi}}{\rho[\rho+(1+\rho)\bar{\pi}]}$$

with

$$\sigma'(\bar{\pi}) = \frac{\alpha \bar{c}(1+\rho)[\rho(1+2\bar{\pi})+(1+\rho)\bar{\pi}^2]}{\rho[\rho+(1+\rho)\bar{\pi}]^2} > 0 \text{ for } \bar{\pi} > \frac{-\rho}{1+\rho} \quad (56)^{43}$$

The interpretation of $\sigma(\bar{\pi})$ is the capitalised value of long-run real seigniorage revenue.

If the value of the inflation target, π^* , is less than the value of the lowest constant inflation rate that is consistent with the central bank's intertemporal budget constraint, for given values of $d_{t-1}, \bar{c}^b \geq 0, \bar{\tau}^b$ and $\bar{h} \geq 0$, the central bank cannot achieve the inflation target, because doing so would bankrupt it. The most it could do would be to set both \bar{h} and \bar{c}^b equal to zero: there would be no central bank-initiated helicopter drops of money and central bank staff would not get paid. If that is not enough to cause the weak inequality in (55) to be satisfied with

⁴² We can interpret $\bar{\tau}_t^b$ as the permanent value of treasury taxes on the central bank, that is, as that constant real tax whose present discounted value is the same as the present discounted value of the actual (not necessary constant)

sequence of taxes. So $\bar{\tau}_t^b \equiv \left[\sum_{j=t}^{\infty} \prod_{s=t}^j \left(\frac{1}{1+r_s} \right) \right]^{-1} \sum_{j=t}^{\infty} \prod_{s=t}^j \left(\frac{1}{1+r_s} \right) \tau_j^b$. We can also define the permanent or long-run real interest rate in period t , \bar{r}_t , as that constant real interest rate that satisfies

$\frac{1}{\bar{r}_t} = \sum_{j=t}^{\infty} \prod_{s=t}^j \left(\frac{1}{1+\bar{r}_t} \right) = \sum_{j=t}^{\infty} \prod_{s=t}^j \left(\frac{1}{1+r_s} \right)$, if $\bar{r}_t > 0$. Using this convention, the intertemporal budget constraint of,

say, the central bank can always be written as $-d_{t-1} + \frac{\bar{\tau}_t^b}{\bar{r}_t} + \left(\frac{\bar{c}_t^b + \bar{h}_t}{\bar{r}_t} \right) \leq \sigma(\bar{\pi})$, with (constant) permanent flows

of revenues being discounted using (constant) permanent discount rates.

⁴³ For the 'double logarithmic' money demand function there is no long-run 'seigniorage Laffer curve'. A higher inflation rate will increase steady-state real seigniorage revenue.

$\bar{\pi} = \pi^*$, I will call this a situation where the inflation target is not *independently financeable* by the central bank. The value of the central bank's holdings of treasury debt, d_{t-1} , is determined by history; the net tax paid by the central bank to the treasury, $\bar{\tau}^b$ is determined unilaterally by the treasury.

If the treasury decides to support the central bank in the pursuit of the inflation objective, the inflation target is *jointly financeable* by the central bank and the treasury, as long as the consolidated intertemporal budget constraint of the treasury and the central bank can be satisfied with the seigniorage revenue generated by the implementation of the inflation target. Let the real stock of treasury debt held outside the central bank be $b_t \equiv B_t / P_t$, remember that taxes net of transfers of the consolidated treasury and central bank are $\tau = \tau^p - h$ and assuming for simplicity that treasury spending, like central bank spending is constant, the intertemporal budget constraint of the state is given by:

$$b_{t-1} + \frac{\bar{c}^s + \bar{c}^b - \bar{\tau}}{\rho} \leq \sigma(\bar{\pi}) \quad (57)$$

If (57) is not satisfied with $\bar{\pi} = \pi^*$, the inflation target is *not financeable*, even with cooperation between treasury and central bank. The inflation target in that case is not feasible. If (57) is satisfied with $\bar{\pi} = \pi^*$, the inflation target is financeable by the consolidated treasury and central bank – that is, the inflation target is feasible with cooperation between treasury and central bank. Note that the feasibility condition for the inflation target, equation (57), is independent of $\bar{\tau}^b$ (which is a transfer payment within the consolidated treasury and central bank) and of d_{t-1} which is an internal liability/asset within the consolidated treasury and central bank. What matters is the net debt of the consolidated treasury and central bank, b_{t-1} , and the taxes net of transfers of the consolidated treasury and central bank, $\bar{\tau}$. If the feasibility

condition (57) is satisfied, the treasury can always provide the central bank with the resources it requires to implement the inflation target. All it has to do is reduce taxes on the central bank (or increase transfer payments to the central bank), in an amount sufficient to ensure that equation (55) is also satisfied.⁴⁴

If (57) is satisfied with $\bar{\pi} = \pi^*$, but (55) is satisfied with $\bar{\pi} = \pi^*$, but (55) is not, then the inflation target is only financeable by the treasury and central bank jointly, not independently by the central bank.

This discussion supports the view that the central bank should not have operational target independence (freedom to choose a quantitative inflation target) even when it has operational independence (the freedom to set the short nominal interest rate as it sees fit), simply because it does not have financial independence. Therefore, one reason the treasury (that is, the government) should set the inflation target, is that only the treasury can make sure that the central bank has enough resources, other than through seigniorage, to make the inflation target financeable by the central bank. The treasury, through its ability to tax the central bank, is effectively constrained only by the consolidated intertemporal budget constrained in (57), even though formally it faces the intertemporal budget constraint given in equation (58):

$$b_{t-1} + d_{t-1} \leq \frac{\bar{\tau}^p + \bar{\tau}^b - \bar{c}^g}{\rho} \quad (58)$$

There are, of course, other reasons for leaving the setting of the inflation target to the elected government rather than to the central bank than the fact that only the treasury can ensure that the inflation target is financeable and therefore feasible. Alan Blinder (in private communication) argues that the inflation target should be set by the elected government because it and not the central bank, is the better judge of what constitutes the people's welfare function.

⁴⁴ This could be achieved through a one-off capital transfer rather than through a sequence of current transfers.

A further reason for me is that assigning the setting of an important policy objective to appointed officials could be the beginning of a slippery slope to paternalistic government across-the-board by unelected and substantively unaccountable officials.

A problem with leaving the setting of the operational inflation target with the treasury is that it could re-create the problem of opportunistic (ab)use of monetary policy, even with the short nominal rate of interest under the formal independent control of the central bank, through the opportunistic manipulation of the operational inflation target by the treasury. The UK's monetary arrangement, where the inflation target can be set at will by the Chancellor of the Exchequer, is particularly vulnerable in this regard. The power of the Treasury to take back the power to make monetary policy, that is, interest rate setting powers, from the Bank of England under the Treasury Reserve Powers further accentuate this vulnerability.⁴⁵

In the nine years since the Bank of England's operational independence in 1997, the Treasury Reserve Powers have not been invoked, and there has been but one change in the numerical inflation target (from 2.5% per annum to 2.0% per annum), which was associated with a change from one price index (RPIX) to another (CPI). The change in the index made sense because it brought the UK in line with Eurozone practice: the UK's CPI is a harmonized

⁴⁵ The following description of the Treasury Reserve Powers is taken, with minor edits, from the House of Lords, Bank of England Bill, Memorandum by Her Majesty's Treasury, which can be found at: <http://www.publications.parliament.uk/pa/ld199798/ldselect/lddereg/066xi/dr1106.htm>. The Treasury reserve powers, are a provision in the Bank of England Act 1998, that ensures that, although Bank has statutory operational responsibility for monetary policy, the Treasury may direct the Bank with respect to monetary policy if they are satisfied that such action is required by extreme economic circumstances and is in the public interest.

The rationale is that, in extreme economic circumstances there may be a need to override the Bank's operational responsibility for monetary policy decisions. Because the action required would depend on the nature of the extreme economic circumstances, it is deemed appropriate that this is left to delegated legislation, which can then be tailored to the needs of the particular circumstances which have arisen.

The powers delegated by this provision are exercisable by statutory instrument laid before Parliament after being made. The order will cease to have effect after 28 days, unless it has by then been approved by resolution of each House of Parliament. Even if approved, an order will cease to have effect 3 months after the day it was made.

The Treasury argues that, because these reserve powers may only be exercised in extreme economic circumstances, which are likely to necessitate emergency action, it is appropriate that they should have immediate effect. This is balanced to some extent, by requiring that the continued effect of such action should require the approval of Parliament.

consumer price index, consistent with the HICP indices used to define the inflation target in Euroland.⁴⁶

One reason the problem of opportunistic changes in the inflation target or abuse of the Treasury Reserve Powers has not arisen, is that the same Chancellor who created the framework, Gordon Brown, has also been the only one in charge of the setting of the inflation target. Such self-restraint cannot be taken for granted when another incumbent (possibly a representative of another political party) occupies the position of Chancellor of the Exchequer. It would therefore be wise to make a change in the operational inflation target (including the numerical target and the price index to which it applies) subject to a strongly qualified majority vote (say a 2/3rd or 3/4th majority in both Houses of Parliament).

IIIA.4 Other aspects of necessary co-operation and co-ordination between central bank and treasury

Even if the treasury supports the central bank's inflation target and provides it with the financial resources to implement it, there are at least two other economic contingencies for which active central bank and treasury co-ordination and co-operation is desirable.

IIIA.4a Recapitalizing the central bank

The first case occurs when the (threat of) a serious banking crisis or financial crisis with systemic implications forces that central bank to act as a lender of last resort, and the problem turns out to be (or becomes), for a significant portion of the banking/financial system, a solvency crisis as well as a liquidity crisis. It could happen that recapitalising the insolvent banks or financial institutions with just the financial resources of the central bank (including a given

⁴⁶ For a number of reasons (including the fact that the RPIX is an arithmetically weighted index while the CPI is a geometrically weighted price index and that the CPI excludes any housing cost component) the inflation rate as measured by the RPIX has historically exceeded that measured by the CPI. The lowering of the inflation target from 2.5% per annum for the RPIX to 2.0% per annum for the CPI represents an attempt to make the index change neutral as regards its impact on monetary policy.

sequence of net payments to the treasury, τ^b) would require the central bank to engage in excessive base money issuance, which would result in unacceptable rates of inflation. As long as the resources of the consolidated treasury and central bank are sufficient, the treasury should either recapitalise the central bank (if the central bank recapitalised the private banking/financial system in the first instance), or the treasury should directly recapitalise the banking/financial system. In the accounts set out above, this would amount to one or more large negative realisations of τ^b .

Special problems occur when the insolvency of (part of) the financial system is due to an excess of foreign-currency liabilities over foreign-currency assets. In that case the treasury, in order to recapitalise the central bank (or some other part of the financial sector directly), has to be able to engineer both an internal fiscal transfer and an external transfer of resources of the required magnitude. If the external credit of the state is undermined, this may only be possible gradually, if and as the state can lay claim to (part of) the external primary surplus of the nation.

In the usual nation state setting, a single treasury or national fiscal authority stands behind a single central bank. Unique complications arise in the EMU, where each national fiscal authority stands financially behind its own NCB, but no fiscal authority stands directly behind the ECB. The lender of last resort function in the EMU is assigned to the NCB members of the ESCB (see Padoa-Schioppa (1999), Goodhart (1999) and Lastra (2000)). This will work fine when a troubled or failing bank or other financial institution deemed to be of systemic importance has a clear nationality, as most Eurozone-domiciled banks and other financial institutions do today. Likewise, banks that are subsidiaries of institutions domiciled outside the EMU will be the responsibility of their respective central bank (be it the Bank of England, the

Federal Reserve System or the Bank of Japan) and of the national fiscal authority that stands behind each of these central banks.

Trouble arises when Eurozone-domiciled banks emerge that do not have a clear national identity, say banks incorporated solely under European Law. As there is no fiscal authority, national or supranational, standing behind the ECB, who would organise and fund the bail-out and recapitalisation of such a 'European bank'? Whether this potential vulnerability will in due course be remedied by the creation of a serious supra-national fiscal authority at the EMU level that would stand behind the ECB, or by implicit or explicit agreements between the ECB, the NCBs (the shareholders of the ECB) and the national fiscal authorities is as yet unclear.

IIIA.4b Helicopter drops of money

The second set of circumstances when cooperation and coordination between the monetary and fiscal authorities is essential is when an economy is confronting the need to avoid unwanted deflation or, having succumbed to it, to escape from it. In principle, the potential benefits from cooperation between the monetary and fiscal authority apply to stabilisation policy in general, that is to counter-inflationary as well as to counter-deflationary policies. The issue is particularly urgent, however, when deflation is the enemy and conventional monetary policy has run out of steam.

Faced with deflation, the central bank on its own can cut the short nominal interest rate - the primary monetary policy instrument in most economies with a floating exchange rate. It can engage in sterilised foreign exchange market operations. If there are reserve requirements imposed on commercial banks or other financial institutions, these can be relaxed, as can the

collateral standards in Repos and the eligibility requirements that must be met by potential counterparties.

Once the short nominal interest rate is at the zero floor, conventional monetary policy is effectively exhausted. The central bank can then engage in generalised open market purchases, monetising the outstanding stock of non-monetary public debt, of all maturities, nominally denominated or index-linked, held outside the central bank. Once all outstanding public debt has been absorbed by the central bank, it could turn its attention to the purchase and monetisation of private securities, from foreign currency-denominated securities, to stocks and shares, land, property or contingent claims. Clearly, such socialisation of private wealth would be subject to all kinds of moral hazard, adverse selection and governance problems.

Should this too fail to boost aggregate demand and end deflation, the monetary authority on its own has one remaining exotic instrument and the combined monetary and fiscal authorities have one conventional but truly effective instrument. The unconventional instrument is to lower the zero floor on nominal interest rates (which is a result of the zero nominal interest rate paid on currency and often on all base money), by paying a negative nominal interest rate on base money. For commercial banks' reserves with the central bank, paying a negative nominal interest rate is technically and administratively trivial. Imposing a 'carry tax' on currency is administratively cumbersome and intrusive, but not impossible. Silvio Gesell (1916) recommended it many years ago, and as great an economist as Irving Fisher (1933) thought the proposal had merit (see also Goodfriend (2000) and Buitert and Panigirtzoglou (2001, 2003)).

There is, however, a very conventional policy alternative. Milton Friedman referred to it as (base) money dropped from a helicopter (Friedman (1968)). If the recipients of this largesse do not expect it to be reversed (in present discounted value terms) in the future, that is, if they do

not expect the helicopter drop of money to be followed by a vacuum cleaner sucking up the currency notes again, this would, at a given price level, represent an increase in the real net wealth of the private sector (see Buiter (2003)). Because base money does not have to be redeemed *ever*, it does not constitute an effective liability of the state. The increase in net private wealth is also in the most liquid form possible.

An example of a helicopter drop, in the UK context, would be for the Governor of the Bank of England issue a £1,000 cheque, drawn upon the Bank of England, to every man, woman and child in the country. On the balance sheet of the Bank this would show up as an increase in the stock of base money and a corresponding reduction in the financial net worth of the Bank. In its budget constraint it would be a one-off transfer payment to the private sector (h in our notation).

Would it work? If the money rain is not expected to be reversed in present value, it surely would. It does not rely on the strength of the intertemporal substitution effect in private consumption or on the interest sensitivity of private investment demand. All that it requires is that aggregate consumption today is a normal good. If the wealth effect is weak and the £1,000.00 cheque does not do the job, the Governor can add zeros in front of the decimal point on the cheque until the private consumer surrenders and goes out and spends.

Even if the economic mechanism of the helicopter drop of money is straightforward, its practical implementation cannot be done by the central bank alone. The reason is that in reality central banks do not have an instrument like h in their arsenals. Making transfer payments to the private sector is not something central banks are legally permitted to do, because they are not fiscal agents of the state. So the economically equivalent action has to be coordinated between the treasury and the central bank. The treasury will implement a tax cut or increase in transfer

payments (a cut in τ^p) and will finance this by selling debt to the central bank (increasing D). The acquisition of treasury debt by the central bank is financed through the issuance of base money, an increase in M .

Cooperation and coordination between independent agents is often welfare-enhancing. When cooperation and coordination extend to all parties (to all players in the game), and when all parties are capable of credible commitment to future actions, welfare will be higher than in any non-cooperative equilibrium. When only a subset of the players in the game cooperate, or when not all players are capable of commitment, the ‘curse of the second best’ strikes and such partial cooperation (with or without partial commitment) need not produce outcomes that dominate non-cooperative behaviour (see Rogoff (1985a)).

IV. The Political economy of limited central bank independence

Even more important than the issues of central bank resource adequacy and cooperation with the fiscal authorities, is the question of the extent to which key economic policy decisions can be delegated to appointed, that is, unelected, technocrats in a society that values democratic legitimacy and accountability.

In democratic communities with representative government, there are many functions of the state that are delegated by the state (the Proximate Principal) to operationally independent technocrats (the Agents).⁴⁷ The operationally independent regulators, such as the FSA and the Office of Fair Trading in the UK, and the Office of the Controller of the Currency and the

⁴⁷ The Ultimate Principals are the citizens of the polity.

Federal Trade Commission in the USA have authority delegated to them by the executive and legislative branches of government.⁴⁸⁴⁹

In countries like the UK, which do not have the Montesquieuan constitutional separation of powers, the administration of justice through an operationally independent judiciary is another example of state authority delegated to a collection of independent technocrats. In constitutional systems that have the Montesquieuan constitutional separation of powers, the three branches of government are assumed to be formally co-equal, which represents the highest degree of (mutual) operational independence. The ECB, whose independence is written into the Protocol on the Statute of the European System of Central Banks annexed to the Treaty establishing the European Community, has a status somewhere between that of a co-equal branch of government and a body with responsibilities delegated to it by the executive and legislative branches of government.

IVA. The operationally independent central bank as a solution to a commitment problem

The reasons why an elected government might delegate certain policy areas to institutions run by unelected technocrats differ. As regards monetary policy, a common argument for its delegation to an operationally independent central bank is that this solves a commitment problem. The optimal monetary policy is not time-consistent (see Kydland and Prescott (1977) and Barro and Gordon (1983)). The government, which values price stability but also targets a

⁴⁸ In the UK there is no separation between the executive, the legislative and the judiciary branches of government.

⁴⁹ It is not entirely clear whether the OCC can be described as operationally independent. The OCC was established in 1863 as a bureau of the U.S. Department of the Treasury. The OCC is headed by the Comptroller, who is appointed by the President, with the advice and consent of the Senate, for a five-year term. The FTC is an independent agency that reports to Congress on its actions. The Commission is headed by five Commissioners, nominated by the President and confirmed by the Senate, each serving a seven-year term. The President chooses one Commissioner to act as Chairman. No more than three Commissioners can be of the same political party.

level of output in excess of the natural level (say because of monopolistic or tax distortions in output or labour markets), is incapable of credibly committing itself to a policy of price stability. Left to its own devices, it will opportunistically try to take advantage of price and wage setters who have made long-term non-contingent price and wage decisions based on the government's promise of low future inflation. The resulting equilibrium is one where inflation is so high that the benefit to the government of inflicting another inflation surprise on the private sector no longer exceeds the cost to the government of higher inflation. Time-consistent monetary policy without commitment results in an inflation bias.

This account of the alleged inflation bias in monetary policy without an operationally independent monetary authority has never rung true to me.⁵⁰ Even the most New-Keynesian, flexible-inflation-targeting central banker I know has never knowingly targeted any output level other than the natural level, or any unemployment rate below the natural rate. Furthermore, the fondness of many economists for backward recursive optimisation has led many of them to overstate the problem of time-inconsistency of optimal plans. People, including central bankers, may find commitment easier because they don't necessarily attach only instrumental value to truth-telling. Being endowed with the George Washington ('I cannot tell a lie') gene or meme makes commitment easier. If the preferences of the monetary policy maker were lexicographic, with price stability in pole position (an example of Rogoff's 'conservative central banker' (Rogoff (1985b))), there would be no inflation bias.

Finally, there is the telling objection of McCallum (1995, 1997a,b) to solving the problem of a time-inconsistent optimal monetary policy and the inflation bias it produces by delegating it to an operationally independent central bank: why and how can a government incapable of

⁵⁰ Alan Blinder has also said that during his N years as Deputy Chairman of the Federal Reserve Board, the Kydland-Prescott time inconsistency problem had never been an issue (Blinder (1999)).

credibly committing itself to pursuing a non-inflationary optimal policy, credibly commit itself to appointing an operationally independent central bank to pursue price stability and not to interfere with its operations? The only partial answer to this conundrum is Balcerowicz's (1995) theory of periods of 'extraordinary politics'. Following epochal events, such as revolutions, defeat in war or the collapse of an economic and social system, there may be a short window of opportunity for creating institutions/constitutions that will constrain the future behaviour of governments and other political actors during the more common periods of 'mundane politics'. This is clearly an issue that remains poorly understood. For the purpose of what follows, however, the key thing is that this delegation of monetary policy to an operationally independent central bank has taken place, for whatever reason, and through whatever mechanism.

Like every delegation of authority, the delegation of monetary policy to an operationally independent central bank raises two questions. The first is how to incentivise the central bank (the Agent) to pursue the mandate assigned to it by the government or the Treaty (the Proximate Principal) and the citizens of the state or other political entity (the Ultimate Principals)? The second problem is that of the legitimacy of the institution to which authority has been delegated.

IVB. Incentives and institutions for efficient monetary policy making

While many central bankers may be motivated in their approach to the job by a sense of public service, by duty and by commitment to the central bank's mandate, one would like to see these higher motives reinforced by such primitive but reliable motives as the desire for power, prestige, wealth, comfort and leisure.

IVB.1 Monetary policy making by committee

When monetary policy is made by a committee, there are two further factors that can adversely influence the quality of the decision making. The first is the problem of free riding and shirking by individual members whose incremental contribution to the joint product (the interest rate decision) cannot be identified clearly (see Sibert (2003, 2006), Sibert and Mihov (2006)). The second concerns some well-known problems and pathologies associated with small-group decision making.

IVB.1a Shirking

A shirking problem exists when a better pay-off requires greater effort, greater effort brings greater disutility, and effort cannot be monitored with sufficient precision to design a first-best incentive scheme. In the context of mpcs, the shirking problem is likely to most severe when terms of appointment are long and non-renewable.⁵¹ The Federal Reserve Board with its 14-year, non-renewable terms of appointment (longer than almost any other central bank) would seem to be vulnerable to this problem.^{52 53} ‘Lopsided’ mpcs with a dominant Chairman and little influence over monetary policy by the other mpc members, are likely to have a higher incidence of shirking by those with only marginal influence on the monetary policy decision. The Federal Reserve Board (and the Federal Open Market Committee consisting of the seven Federal

⁵¹ In what follows, ‘MPC’ will be used to the Monetary Policy Committee of the Bank of England, whereas mpc refers to any monetary policy making committee.

⁵² In theory, a member of the Board of Governors of the Fed could serve for just under 28 years. This is because a Governor can complete the unfinished part of another Governor’s 14 - year term of office, in addition to his/her own full 14-year term. In Italy, until the resignation under a cloud of Governor Fazio, the Governor of the central bank was appointed for life. Monetary policy decisions (before Italy joined EMU in 1999) were made just by the Governor, however.

⁵³ FOMC members have other responsibilities than monetary policy. Board members have supervisory and regulatory responsibilities and regional Federal Reserve Bank Presidents have a serious management job in addition to their supervisory and regulatory responsibilities. The shirking problem I characterise applies to the effort put into the monetary policy decision.

Reserve Board Governors, the President of the Federal Reserve Bank of New York and, by rotation, four of the 11 other regional Federal Reserve Bank Presidents) is the prime example of such a ‘lopsided’ mpc, with its powerful Chairman taking all the lead roles, minor supporting roles for the Vice Chairman and the President of the Federal Reserve Bank of New York, and just occasional bit parts for all other FOMC members. Obviously, the Chairman of the Federal Reserve Board is not affected by this potential shirking problem, as he is effectively held personally responsible and accountable for the conduct of monetary policy. In addition, the Chairman’s term is only four years and renewable (subject to the 14 year total term limit for all Board members).

Mitigation of the shirking problem through better identification and assessment of an individual mpc member’s contributions to monetary policy can be achieved by having a formal vote on the monetary policy decision and publishing the individual votes promptly. Speedy publication of transcripts of mpc meetings or of minutes with individual attribution of views and opinions will also help. Parliamentary hearings in which, over a period of time, all mpc members (rather than just the Governor and the Deputy Governor) are questioned in public, would also be helpful. The problem of proving the right incentives for mpc members is addressed again from a different perspective below in Section IVC.1 on central bank accountability.

IVB.1b Groupthink and other group decision-making pathologies

More important than the shirking problem is the problem of dysfunctional decision making by the committee. As explained in Sibert (2006a), committees, especially those that are cohesive and tightly-knit, can exhibit ‘groupthink’ and related pathologies of group decision

making.⁵⁴ It is possible that the views expressed by the committee in a joint decision are more extreme than the views held by any individual committee member. Committees often share or pool information badly. These potential dysfunctional aspects of decision making by committee are well-established in a voluminous social-psychological empirical literature (see Sibert (2006) for a survey). They contradict the more optimistic view of decision-making by committee expressed, for instance, in Blinder (2005) and Blinder and Morgan (2005), which can be summarized as ‘two (or more) heads are better than one’.

In the monetary policy decision making committees of the developed market economies that I am familiar with, the dangers of groupthink and related pathologies of group decision making are not just a logical possibility. They are part of an uncomfortable reality that all these mpcs are, to a greater or lesser extent confronted with. Janis’s definition of groupthink as “*A mode of thinking that people engage in when they are deeply involved in a cohesive in-group, when the members' strivings for unanimity override their motivation to realistically appraise alternative courses of action*” (Janis (1972)), fits both the old (pre-EMU) Bundesbank and the ECB today like a glove.⁵⁵

⁵⁴ *Groupthink* was the title of an article written by William H. White for Fortune Magazine in 1952. White was an American sociologist who later wrote *The Organization Man* (White (1956)). The concept was developed by Janis (1972). Parts of his theory (especially those related to the antecedents of groupthink, that is, the necessary and sufficient conditions for it to emergence) have been contested and rejected by later researchers (see e.g. Baron (2005)), but the small-group decision-making pathologies he identifies have proven to be robust. Wikipedia (<http://en.wikipedia.org/wiki/Groupthink>) defines groupthink as follows: “**Groupthink** is a mode of thought whereby individuals intentionally conform to what they perceive to be the consensus of the group. Groupthink may cause the group (typically a committee or large organization) to make bad or irrational decisions which each member might individually consider to be unwise.”

⁵⁵ Janis lists eight symptoms indicative of groupthink and seven symptoms of a decision affected by groupthink. Taken almost verbatim from Wikipedia, (<http://en.wikipedia.org/wiki/Groupthink>) the first eight are: 1. Illusion of invulnerability; 2. Unquestioned belief in the inherent morality of the group; 3. Collective rationalization of group's decisions; 4. Shared stereotypes of outgroup, particularly opponents; 5. Self-censorship; members withhold criticisms; 6. Illusion of unanimity (or false consensus effect); 7. Direct pressure on dissenters to conform; and 8. Self-appointed "mindguards" protect the group from negative information.

Again taken virtually verbatim from Wikipedia, (<http://en.wikipedia.org/wiki/Groupthink>), Janis’s seven symptoms of a decision affected by groupthink are: 1. Incomplete survey of alternatives; 2. Incomplete survey of objectives; 3. Failure to examine risks attached to preferred choice; 4. Failure to re-appraise initially rejected alternatives; 5. Poor

The culture of monetary policy committees in central banks tends to be relentlessly homogenizing. In most cases it results in the rapid socialization of new members into the group ethos, conventional wisdom and attitudes to the outside world of the central bank. Those who do not wish to conform tend to leave early, often well before the end of their term of appointment.

The risk of groupthink and related pathologies taking hold of an mpc can be reduced by recruiting mpc members from a variety of backgrounds (and from outside the pool of (former) central bank officials), by limiting the terms of appointment of mpc members, and making such appointments non-renewable.⁵⁶ From this perspective, the 14-year (albeit non-renewable) terms of appointment of Federal Reserve Board members (14 years, non-renewable) are far too long. While a minimal duration of tenure is necessary to become an effective mpc member, everything that needs to be learned can certainly be learned in a year or so, if the mpc member has an adequate technical economics background, as (s)he ought to have. Non-renewable terms of appointment of 5 years would certainly be long enough. The ECB's six Executive Board members have eight year non-renewable terms of office, which seems too long. The NCB governors must have terms of office of at least 5 years. These terms can be renewable or non-renewable, depending on national legislation. The Bank of England's Governor and two Deputy Governors are appointed by the Chancellor for renewable five-year terms. The two other internal members are appointed for three year renewable terms by the Governor, with the consent of the Chancellor. The four external members are appointed for renewable three year terms by

information search; 6. Selective bias in processing information at hand or [confirmation bias](#); 7. Failure to work out contingency plans.

Most of these 15 symptoms can be found, to a greater or lesser degree and with higher or lower frequency in the decision-making process and decisions reached by mpcs.

⁵⁶ Making terms non-renewable would, of course, take away one incentive to reduce shirking.

the Chancellor. A single non-renewable term for external members, of between three and five years would be an improvement over the current arrangement.

It would also be helpful in preventing groupthink, if the majority of the mpc members were external members, that is, persons who are not full-time career central bankers. This is uncommon among the major central banks. In the UK, the MPC has four external members and five members that are full-time Bank of England officials with executive and managerial responsibilities (or internal members). Anne Sibert (2006b) has proposed reducing the number of internal members of the Bank of England's MPC from five to three, by rescinding the membership of the Bank's Chief Economist and the Executive Director for Markets. I too favour an MPC with three internal and four external members, but would achieve this by eliminating one of the two Deputy Governor positions (two Deputies seems excessive, particularly in a central bank with no supervisory and regulatory responsibilities) and ending the MPC membership if the Executive Director for Markets.

The ECB's Governing Council has no external members, either on the Executive Board or among the remaining Governing Council members, who are all NCB governors. In principle, non-career central bankers could be appointed to the Executive Board, but this has not (yet) happened. The Federal Reserve Board has Governors who prior to their appointment to the Board were not career central bankers. However, as soon as such external appointees become Board members, they also become full-time central bankers with executive and managerial responsibilities. The Presidents of the 12 regional Federal Reserve Banks can not really be characterized as external members. Of the leading central banks, only the Bank of Japan has a majority of external members on its mpc: its nine member Policy Board includes the Governor of the Bank of Japan and two Deputy Governors, as well as six external members.

A final potentially important bulwark against groupthink taking hold of a central bank's mpc is the existence of a number of competing, heterogeneous support units with direct access to one or more mpc members, engaged in research, forecasting and other policy-focused economic analysis. At least some of these units should be independent of the central bank. Without multiple independent centers of research to provide analytical support to mpc members, there is a serious risk that the central bank's own research and economics departments will be the only providers of policy-oriented economic analysis to the mpc members.

This, to me, is the (only) contribution of the regional Federal Reserve Banks to monetary policy. Well-resourced and outside the control of the Washington Federal Reserve Board, these regional Feds ensure that more than a single, in-house view gets serious consideration. The distinguished contributions to the theory and practice of monetary economics and monetary policy made by the Federal Reserve Bank of St. Louis and the Federal Reserve Bank of Minneapolis are reminders of the importance of letting 100 monetary economics flowers bloom. The contribution of the regional Federal Research Banks as alternative sources of policy-oriented monetary analysis to the (excellent) research staff of the Federal Reserve Board is all the more important, because of the tight control exercised by past Chairmen of the Federal Reserve Board over access to Fed research staff by the other Governors. Things may be different under Chairman Bernanke, but under his predecessors, no Governor other than the Chairman had free and unrestricted access to the Fed research staff.

The national central banks (NCBs) of the Eurosystem, which, like the regional Federal Reserve Banks in the USA, do not have any remaining meaningful role in the design and implementation of monetary policy in Euroland since the creation of the Eurosystem, should try to emulate the best of the US regional Federal Reserve Banks by setting up competing centers of

excellence in research into monetary theory and policy. Thus far this has not happened, and the monetary policy debate in the ECB has been dominated by the ECB's Research and Economics Departments. There is no doubt that the staff of the ECB is of the highest quality, but in unsettled fields of scientific enquiry such as monetary economics, it is essential that the mpc have access to more, and *more diverse*, intellectual and analytical support than the in-house orthodoxy offered by central bank staff with a near-monopoly of direct access to mpc members. As regards the creation of alternative centers of monetary policy expertise with easy access to the ECB Governing Council members, the Bundesbank is, for reasons of history and location, my first best hope.

The issue of the capacity of individual mpc members (and especially external mpc members) to pursue independent lines of inquiry, which depend neither on the consent of the Governor of the central bank (or of other internal mpc members or central bank executives), nor on resources allocated to them at the discretion of these parties, came up early in the life of the operationally independent Bank of England. The insistence of the four external MPC members that, despite the proximity of a large number of excellent and highly motivated research economists in the Bank of England, the external MPC members needed some ring-fenced resources to pursue their own research priorities, independent of Bank of England's management, led to the only significant conflict within the MPC during the first three years of its existence.⁵⁷ The issue was resolved by the creation of a dedicated MPC unit. Each external member was allocated two researchers, one at the MSc-level (research assistant) and one at the

⁵⁷ The external MPC members were Charles Goodhart, DeAnne Julius, Sushil Wadhvani and Willem Buiter.

PhD-level (research associate).⁵⁸ I believe the creation of this small dedicated unit was important both substantively and symbolically.

IV.C The legitimacy of delegated monetary policy authority

Legitimacy is the popular acceptance of a governing regime, law or institution as an authority. Without a sufficient degree of legitimacy, a regime or institution will deadlock or collapse; a law lacking legitimacy will not be enforceable. The legitimacy of a governing regime, institution or arrangement is not just a function of how well it serves its purpose. While such instrumentalist determinants of legitimacy undoubtedly play a role, certain features of the regime, institution, arrangement or law may have intrinsic value (for instance, formal and substantive accountability), or at any rate value that is not derived from the specific purpose for which it was created.

IVC.1 Operational independence precludes substantive accountability

Formal accountability is the aspect of responsibility involving giving, ex-post, a statistical or judicial explanation for events, actions and outcomes. Such formal accountability requires that those to whom account is given have enough information to be able to make an informed judgment about how well the party held to account has performed. Clear and shared objectives are necessary for formal accountability to be possible. Most modern central banks have price stability as the primary objective. This is the case for instance, for the ECB, the Bank of England and the Bank of Japan. This lexicographic preference ordering is often

⁵⁸ This was in addition to the more than adequate secretarial and administrative support that had been available all along.

operationalised through some numerical inflation objective, set either by the central bank itself (e.g. the ECB), by the government (the Chancellor of the Exchequer in the case of the Bank of England) or by a joint decision of the minister of finance and the governor of the central bank (the case of New Zealand).

The Fed is the only leading central bank whose official objectives are virtually incomprehensible and whose operational objectives can only be guessed at.⁵⁹ One can but be baffled by that is meant by “*maximum employment, stable prices, and moderate long-term interest rates*”. It is highly unusual for a central bank to have a non-lexicographic, triple mandate, with targets for real economic activity, price stability and asset prices. To observe market participants trying to determine what the Fed Chairman’s ‘comfort zone’ is for inflation of the core personal consumption expenditure deflator, and how this inflation comfort zone is weighted against real activity comfort zones or asset market comfort zones is to witness a private rational but socially wasteful use of resources to solve a signal extraction problem that would not exist in a proper monetary policy framework, like that embodied in the Bank of England Act 1998. This is, in my view, a significant weakness of the US monetary policy framework, which may account for the greater amplitude of post World War II business cycles in the US compared to other regions of comparable economic size.

Formal accountability requires openness and transparency, at least *ex-post*. Whether it is enough to know the objectives and the narrowly defined actions of the monetary authority (typically the interest rate decisions), or whether procedural transparency is also required continues to be a subject of disagreement (see e.g. Buiter (1999) and Issing (1999)). One way of

⁵⁹ The Federal Reserve Act states: “The Board of Governors of the Federal Reserve System and the Federal Open Market Committee shall maintain long run growth of the monetary and credit aggregates commensurate with the economy’s long run potential to increase production, so as to promote effectively the goals of maximum employment, stable prices, and moderate long-term interest rates.”

framing the disagreement is that some, like myself, consider the relevant actions to be not just the interest rate decision, but the individual votes that produce that interest rate decision, and the (attributed) arguments, opinions, views of the transmission mechanism and forecasts that help shape the interest rate decision and will help shape it in the future.

Substantive accountability means that, following such reporting, explanation and justification, *judgment (or other pleasant or unpleasant consequences) may follow*. There is substantive accountability if the reporting, explanation and justification is ‘payoff-relevant’ for the party doing the reporting, that is, there can be punishments, sanctions or rewards for those deemed responsible for events, actions or outcomes. It is clear from its own website, that the ECB has a minimalist, interpretation of accountability as formal accountability only: it is the (written and oral) *reporting obligations* of the ECB to the European Parliament, the EU Council, the European Commission and the European Council.⁶⁰ The same holds for the Bank of England (which also has oral reporting obligations towards the UK Parliament) and all other operationally independent central banks.

It is not surprising that operationally independent central banks have limited formal accountability and effectively no substantive accountability at all. Independence *has* to mean that those in charge of monetary policy cannot be fired except for incapacity or serious misconduct, and that financial remuneration and working conditions likewise cannot be used to

⁶⁰ See: <http://www.ecb.int/ecb/orga/accountability/html/index.en.html>. The website states “According to the Statute, the ECB is required to publish quarterly reports on the activities of the Eurosystem as well as a consolidated Weekly Financial Statement. In addition, it has to produce an Annual Report on its activities and on the monetary policy of the previous and the current year. The Annual Report has to be addressed to the European Parliament, the EU Council, the European Commission and the European Council.” Article 113.3 of the Treaty Establishing the European Community (Consolidated Version) states “*The ECB shall address an annual report on the activities of the ESCB and on the monetary policy of both the previous and current year to the European Parliament, the Council and the Commission, and also to the European Council. The President of the ECB shall present this report to the Council and to the European Parliament, which may hold a general debate on that basis. The President of the ECB and the other members of the Executive Board may, at the request of the European Parliament or on their own initiative, be heard by the competent committees of the European Parliament.*”

reward or punish them.⁶¹ Former as well as incumbent monetary policy makers from non-operationally independent central banks have been sued in civil and criminal courts for actions taken in their capacity as monetary policy makers - that is, not for personal financial misdemeanours or felonies, but for (criminal) negligence and dereliction of duty.⁶² In the advanced industrial countries we have not (yet) witnessed recourse to the law by those disgruntled with the conduct of monetary policy. The legal immunities and liabilities of central bankers in the performance of their monetary policy making tasks are, however, an uncharted area. The legislation establishing most independent central banks in most cases makes the monetary policy makers subject to real sanctions (such as being removed from office) only for incapacity or gross misconduct but not for gross incompetence. It therefore appears unlikely that the courts will be much use incentivising operationally independent central bankers.

Until now, in any case, in the OECD countries, accountability of the monetary policy makers does not mean judgment-with-consequences of individual or group actions. There are no penalties or rewards, indeed no consequences other than damage to reputations (shame and embarrassment) and loss of post-central bank term of office honours and career prospects. Employment prospects in the public sector following a stint as a central banker, or honours granted by the government following the completion of a term of appointment with the central bank would not be appropriate or even legitimate incentives for central bankers to behave

⁶¹ Governing Council members of the ECB, both Executive Board members and NCB Governors, can only be fired for incapacity and serious misconduct. This does not appear to include gross incompetence as a cause for dismissal. The Bank of England Act 1998, permits dismissal when an MPC member is *unable or unfit* to do the job. This would seem to be a weaker test than that of the ECB. In particular, 'unfit' would seem to include 'grossly incompetent'. Other causes for dismissal of MPC members include bankruptcy and a few other irrelevant odds and ends.

⁶² Brad Setser's Web Log reported on May 31, 2005, that the "*Former Thai central bank governor Rerngchai Marakanond, who oversaw the country's failed attempt to protect its fixed exchange rate regime on the eve of the 1997 Asian financial crisis, was ordered on Tuesday to pay back the Bt186bn (US\$4.57bn) spent in the futile defence of the Baht peg currency. A local court chastised Mr Rerngchai for "grave negligence" for exhausting Thai foreign exchange reserves battling currency speculators.*" <http://www.rgemonitor.com/blog/setser/91443/> .

properly. Post-central bank appointment employment prospects in the private sector would however, subject to the appropriate safeguards and purdah/cooling off periods, be a useful way of incentivising central bankers.

If we grant the assumption that the outside world's perception of one's competence is a major determinant of one's future employment prospects, it is essential that the most complete information about each monetary policy maker's contribution to the monetary policy decision is publicly available. This is always the case when monetary policy is made by one person, as is the case in New Zealand. It is not automatically the case when monetary policy is made by a committee, as it is now in the majority of central banks. Collective decision making encourages shirking. Revealing the individual votes of all members of a monetary policy committee as soon as practicable following a monetary policy decision, is an effective way of structuring incentives and represents a tiny step towards substantive accountability.

The obvious fact that operational independence is inconsistent with material substantive accountability should be recognised openly; lack of substantive accountability is a price one has to pay for operational independence. The sight of central banks describing themselves as highly accountable, fully accountable (or even as the most accountable central bank in the known universe), when all that this amounts to is a limited set of reporting duties without consequences, is not a pretty one.

IVC.2 Limiting the domain of unaccountability, or central banks should stick to their knitting⁶⁴

⁶³ See e.g. Cukierman, Webb and Neyapti (1992), Cukierman (2006), Alesina and Summers (1993), Posen (1993), McCallum (1995), Beetsma and Bovenberg (1997), Campillo and Miron (1997), Forder (1998), Blinder (1999), de Haan and Kooij (2000), Ozkan (2000), Posen (1993), Buiters (2004, 2005)

⁶⁴ See e.g. Federal Reserve Bank of Kansas City (1996), Bernanke and Woodford (2005).

The absence of substantive accountability for delegated authority can be rationalised and defended when there are clear performance gains from the delegation in question. The legitimacy of the delegation is however, undermined when the range of actions and decisions that is delegated to a substantively unaccountable authority is greater than is strictly necessary.

Operational independence and the associated inevitable lack of substantive accountability is only acceptable in a democratic society if the following conditions are satisfied: (1) the domain over which the independent technocrats exercise discretion is very well-defined and, preferably, narrow in scope; (2) the delegated authority does not concern matters of life or death for the state and for the polity that sustains it (examples include war and peace, the dissolution of a sovereign state and the transfer of substantive national sovereignty to a supranational entity); (3) the actions of the independent technocrats are observable and verifiable.⁶⁵ For central banks, setting the value of some short nominal interest rate probably fits that bill, provided the decisions (votes) of all individual members of the rate-setting committee are in the public domain. Enhancing the responsibilities and influence of the central bank beyond the narrow responsibility to set some short nominal rate of interest in the pursuit of price stability, and to act as lender of last resort in the case of systemic financial instability, would be a grave constitutional and political mistake.⁶⁶

It is here that the ECB is especially vulnerable, because since it started operations in 1999 it has made two systematic mistakes. First, it has become a vocal and highly partisan participant

⁶⁵ These considerations imply that a Fiscal Policy Council of the kind proposed by Charles Wyplosz (2002) and endorsed e.g. by Fatas et. al. (2003) could, if it were to be given the power to prescribe or proscribe certain kinds of behaviour, would have to have a very limited mandate for it to be perceived as legitimate.

⁶⁶ The phrase 'lender of last resort' or anything resembling it do not occur in the Treaty of the European Communities as it pertains to the ECB. Nor is the ECB explicitly granted a mandate to assume substantive responsibility to act as a lender of last resort during times of financial crisis. This omission is likely to reflect a misplaced fear that just mentioning the possibility of the ECB acting a lender of last resort would create unacceptable moral hazard. Instead, constructive ambiguity is deliberately created by a as to make it

in wider economic policy debates that are well beyond its mandate and competence. Second, it has tried and continues to try, to broaden the scope of its formal powers and responsibilities.

IVC.2a The ECB and Eurozone enlargement

It was a mistake for the Treaty to grant the ECB an official, public (albeit only) advisory role in the process governing the admission of new Eurozone members. The institution has neither the political legitimacy nor the analytical competence to play such an important part in a quintessentially political and broad economic-analytical decision.⁶⁷⁶⁸

⁶⁷ The procedure set out in Articles 122 and 123 of the EC Treaty for the adoption of the euro by a particular Member State provides for the following steps:

- At least once every two years, or at the request of a Member State with a derogation, the European Commission and the ECB report on the progress made in the fulfilment by the Member States of the "Maastricht" convergence criteria in accordance with the procedure established in Article 121 of the EC Treaty.
- On the basis of a proposal by the Commission, and after consulting the European Parliament, the Council decides whether or not the country will adopt the euro.
- The Council, after consulting the ECB, adopts the conversion rate at which the euro shall be substituted for the currency of the Member State concerned.

See: http://ec.europa.eu/economy_finance/euro/documents/documents_en.htm#top

⁶⁸ Article 10 of the Protocol on the Statute of the European System of Central Banks and of the European Central Bank states:

10.1. In accordance with Article 112(1) of this Treaty, the Governing Council shall comprise the members of the Executive Board of the ECB and the governors of the national central banks.

10.2. Each member of the Governing Council shall have one vote. As from the date on which the number of members of the Governing Council exceeds 21, each member of the Executive Board shall have one vote and the number of governors with a voting right shall be 15. The latter voting rights shall be assigned and shall rotate as follows:

— as from the date on which the number of governors exceeds 15, until it reaches 22, the governors shall be allocated to two groups, according to a ranking of the size of the share of their national central bank's Member State in the aggregate gross domestic product at market prices and in the total aggregated balance sheet of the monetary financial institutions of the Member States which have adopted the euro. The shares in the aggregate gross domestic product at market prices and in the total aggregated balance sheet of the monetary financial institutions shall be assigned weights of 5/6 and 1/6, respectively. The first group shall be composed of five governors and the second group of the remaining governors. The frequency of voting rights of the governors allocated to the first group shall not be lower than the frequency of voting rights of those of the second group. Subject to the previous sentence, the first group shall be assigned four voting rights and the second group eleven voting rights;

— as from the date on which the number of governors reaches 22, the governors shall be allocated to three groups according to a ranking based on the above criteria. The first group shall be composed of five governors and shall be assigned four voting rights. The second group shall be composed of half of the total number of governors, with any fraction rounded up to the nearest integer, and shall be assigned eight voting rights. The third group shall be composed of the remaining governors and shall be assigned three voting rights;

— within each group, the governors shall have their voting rights for equal amounts of time.

The issue is all the more serious because the 13 NCB Governors that are currently members of the ECB Governing Council face a potential conflict of interest when making recommendations on Eurozone enlargement. The reason is that, once the number of Eurozone member states exceeds 15, it will no longer be the case that each NCB Governor has a vote in each interest rate decision. Instead, they will rotate and thus have their voting power diluted. This potential loss of influence is largest for the smallest current Eurozone members, Luxembourg in particular, once the number of NCB governors reaches 22. If turkeys don't vote for Christmas, Eurozone NCB governors are less likely to vote for Eurozone enlargement.

Finally, on top of the substantive economic harm done to Lithuania and Estonia by the ECB's negative stance towards their early Eurozone membership, it cannot have helped the prospects for wider EU cooperation and harmony that insult was added to injury, both through some unfortunate choice of words and imagery,⁶⁹ and because of the fact that, among the Governing Council members making the negative Eurozone membership recommendation, there were a fair number who had previously been high NCB officials from countries that joined the Eurozone without meeting either the letter or the spirit of the Maastricht convergence criteria.⁷⁰

⁶⁹ One example of many: on 27 February 2006, in a speech to the Diplomatic Institute in Sofia, Jean-Claude Trichet said the following: *"Moreover, it needs to be borne in mind that enlargement, in particular euro area enlargement, could also bear some risks if a country were to rush too quickly to join the euro area. To illustrate this point let me return to sporting imagery. While it is fully understandable for a young, ambitious and talented sportsman to want to join the champion's league as soon as possible, this person might sometimes be better off taking a bit more time for training in order to further develop and strengthen his talents in a favourable environment. When he joins the Champions League team, the rules are strict and the flexibility for playing one's own strategy is limited. This might dampen his performance. Coming back to the euro area, I am convinced that the various stages of the road to the euro as stipulated by the Maastricht Treaty can offer talented aspirants excellent "training opportunities" to perform even better at a later stage."* The notion that a 12-member Eurozone containing, Greece, Italy, Germany and France could be described as a monetary Champions League betrays a serious lack of understanding either of monetary policy or of football (or both). Perhaps 'League of Deadbeats' would be more descriptively realistic.

⁷⁰ Italy, Greece and Germany joined EMU despite not meeting the debt criterion at the time of the examination. Finland, Italy and Greece also did not satisfy the exchange rate criterion at the time of the examination. Greece turned out, after having achieved EMU membership, to have fiddled, in a comprehensive manner, the government deficit data during the qualifying period. It was not expelled from the Eurozone as a result; indeed no sanction of any kind was imposed. France, Germany and Italy have regularly violated the 3% deficit norm since joining the Eurozone.

IVC.2b Central banks, fiscal sustainability and structural reform

It is also a mistake for central bankers to express, in their official capacities, views on what they consider to be necessary or desirable fiscal and structural reforms. Examples are social security reform and the minimum wage, subjects on which Alan Greenspan liked to pontificate when he was Chairman of the Board of Governors of the Federal Reserve System. There are but a few examples of central banks that do not engage in public advocacy on fiscal policy and structural reform matters. The only examples I am aware of are the Bank of England and the Reserve Bank of New Zealand.

It is not the job of any central banker to lecture, in an official capacity, the minister of finance on fiscal sustainability and budgetary restraint, or to hector the minister of the economy on the need for structural reform of factor markets, product markets and financial markets. This is not part of the mandate of central banks and it is not part of their areas of professional competence. The regrettable fact that the Treasury and the Ministry of the Economy tend to make the symmetric mistake of lecturing the operationally independent central bank on what they perceive to be its duties (which generally amounts to a plea for lower interest rates) does not justify the central bank's persistent transgressions.

My advice to central bankers: don't pontificate in your official capacities about matters outside your mandate (and *a-fortiori* about matters both outside your mandate *and* beyond your competence), would be accepted as self-evident if it were given to members of that other operationally independent group of technocrats to whom authority has been delegated: independent regulators. Some central bank laws recognise this need for cooperation and coordination. For instance, the Bank of Japan Law states, after confirming the independence of

the Bank of Japan ("*The Bank of Japan's autonomy regarding currency and monetary control shall be respected.*"), that the Bank shall "*always maintain close contact with the government and exchange views sufficiently.*"

It would be surprising to find the Chairman or CEO of the FSA, in their official capacities, lecturing the Treasury on the Golden Rule and the Sustainable Investment Rule or the Department of Trade and Industry on the minimum wage. Such behaviour would be deemed inappropriate and even illegitimate. Even for bodies that are not merely operationally independent of the government but co-equal to it, such as the judiciary in constitutional systems with the Montesquieuan separation of powers, the same lesson holds: don't encroach on the domain of the executive and the legislative branches of government. We would not expect the Chief Justice of the Supreme Court of the USA to address the US Congress or the US Administration on the case for fiscal restraint, tax reform and free trade or for him to publicly give pointers to Ben Bernanke on the case for monetary policy targeting asset prices. It would be considered highly inappropriate. I believe it would undermine the legitimacy of the Chief Justice and the institution he heads and would ultimately undermine its independence. *Mutatis mutandis*, this is precisely what ECB Governing Council members, and many other central bankers across the world, do when they hold forth, in their official capacities, on fiscal policy and structural reform.

IVC.2c Should the central bank care about fiscal sustainability because of its impact on financial stability?

Even those who are generally in support of a restricted interpretation of the central bank's mandate tend to argue that there is one important qualification to the general rule that central banks should not try to influence fiscal policy and structural reform. This exception relates to

the possibility that aspects of fiscal policy (such as its unsustainability) or of structural reform (say changes to financial supervision and regulation, including reporting obligations, prudential standards and capital requirements) could have a material impact on financial stability. Financial stability is generally viewed as the second inescapable responsibility of central banks.⁷¹

Even if one agreed with this proposition (which would imply that, through the central bank's responsibility for financial stability, the camel's nose is in the fiscal policy and structural reform tent), it is important to keep the rest of the camel out. Financial instability is as rare as it is serious. Its only clear interface with fiscal policy is through government default, or through stability-damaging tax increases motivated by a belated attempt to avoid government default.

Even when unsustainable fiscal policies (typically manifested by (the prospect of) excessive government deficits and debt) lead to a material increase in the likelihood of government debt default, it does not automatically mean that financial stability is threatened. Private default is a normal phenomenon in a dynamic market economy. It is socially costly because of the possible destruction of the going concern value of the defaulting entity, and because of the real resources expended in the default/bankruptcy/financial restructuring/corporate restructuring process. It has social benefits to the extent that it speeds up necessary resource reallocation from inefficient to efficient firms and from contracting to expanding sectors.

Default by the state is more complicated because of the absence both of relevant legislation dealing with state default and its aftermath, and of an independent third party capable of facilitating an orderly state debt default work-out, financial restructuring etc.. On the other hand, state default will not be associated with much destruction of going concern value.

⁷¹ I would like to thank Alan Blinder for pointing out that I should pay greater attention to this issue.

Default on the public debt is first and foremost a distributional conflict between the owners of the debt, the current and future tax payers of the country whose government issued the debt and the current and future beneficiaries of its public spending. The owners of the debt will typically be old (including retirees). They could be domestic residents and citizens or foreigners. Current and future tax payers are likely to be younger than the typical holder of government debt. They are also likely to be mainly domestic residents and citizens. The same holds for beneficiaries of public spending.

This distributional conflict should be settled through the normal political and legal channels. Appropriate regulation and supervision, either by the central bank or by other operationally independent agencies of the state, should ensure that ownership of the public debt is sufficiently dispersed and diversified, that there is no threat to financial markets and institutions with systemic significance. If state default threatens to create material, systemic financial instability, this is evidence of prudential failure.

If, because of regulatory and supervisory failure, the threat or reality of public debt default threatens the financial stability of systemically important institutions and the orderly working of systemically important financial markets, the central bank (the state agency with the short-term non-inflationary deep pockets), together with the appropriate regulatory and supervisory authorities and the treasury should try to design and implement a solution, ranging from the short-term lender of last resort actions with the resources of the central bank to a possible long-run recapitalisation by the Treasury and changes in the regulatory and supervisory regime by the regulator/supervisor. The problem here is, of course, that in conditions where state default threatens or has recently occurred, the Treasury is unlikely to have deep long-term non-inflationary pockets. It is important to note that in this tripartite arrangement, the only

contribution that is required of the central bank is its liquid resources. In principle, its role could therefore be entirely passive. I shall return to this in Section IVC.3d.

There is no reason why a threatened or actual state default should impair the operation of key payments, clearing and settlement systems; the functioning of these key micro-foundations of an effective system of financial markets and institutions should not be affected by the state's inability or unwillingness to meet its financial obligations. Serious re-pricing of government debt offered as collateral will be necessary, but such asset revaluations need not impair the smooth functioning of clearing and settlement systems.

Finally, there is a common tendency to characterise as 'unsustainable' anything that is not steady state, that is, anything that cannot be maintained unchanged forever. However, if the world is not in steady state it makes no sense for the public finances to be in steady state. It would be better to define 'unsustainable' fiscal policy as 'infeasible' fiscal policy. A contingent sequence of public debt to GDP ratios could be rising for many years but still be part of a feasible sequence, because there is a clear commitment, implicit or explicit, to future policies that would end or even reverse the increase in the debt burden. The ratio of the government's deficit to GDP could for many years take on a value that, if it were to be maintained indefinitely, would imply government debt default, yet be part of a feasible sequence because future corrective action is implied by rules governing the government's fiscal-financial actions.

I am not suggesting that the central bank or anyone else take governments with high debt burdens and, large prospective deficits as far as the eye can see, at their word when these governments hold out the prospect of eventual corrective action (after the next election). I would, however, like to urge greater care and caution in the use of the word 'unsustainable'. To show convincingly that a government's fiscal-financial programme is unsustainable is a difficult

task, requiring forecasts of future exogenous variables and judgments about future contingent policy actions. The significance of having a fiscal-financial policy programme characterised as ‘unsustainable’ has been devalued by having the word roll out every time a continental European central banker opens his/her mouth; too many central bankers have cried ‘wolf’ too often. There has been no sovereign default in the EU 15 since West Germany defaulted on its debt as part of the currency reform of 1948.

Finally, I would argue that the threat or reality of default on the public debt - the ultimate consequence of unsustainable public finances - should not deter the central bank from its pursuit of price stability. Using the anticipated or unanticipated inflation tax to try to fill the budgetary hole that has produced or threatens to produce public debt default, may well do more damage to efficiency and to social peace than a restructuring of the public debt through the de-facto imposition of a capital levy on government bond holders.

Government policies posing a material risk to financial stability provide a valid reason for those responsible for financial stability to raise their voices in public. The Financial Stability Squad, however, need not, include the central bank in any substantive way. Furthermore, much of the running commentary of central banks on fiscal matters has nothing to do with the possible implications for financial stability of unsustainable public debt and deficit trajectories. Central banks almost invariably press for lower deficit and lower public debt burdens even if there is no conceivable risk of public debt default.

‘Financial crowding out’ – the displacement of interest-sensitive private expenditure (especially investment) by public debt financing - is not a legitimate concern of the central bank because it does not have clear-cut or material implications for financial stability or price stability. The intertemporal choices made by households, enterprises and the government are not a concern

of the central bank. Whether a nation saves or invests too little also is not its business. Neither is the size of the public sector (as measured, say, by public spending or employment) or the disincentive effect of high marginal tax rates and marginal benefit withdrawal rates on the willingness to work, save or invest. Intergenerational distribution issues (such as the ones associated with social security (and Medicare in the USA) are none of the central bank's business, unless they have clear and material implications for financial stability.

To those who argue that central banks should give guidance and direction on fiscal policy and structural reform because unsustainable public finances and distorted, inefficient labour, product and financial markets complicate the conduct of monetary policy, the appropriate reply is that the job of the central bank is to pursue price stability and financial stability, not to pursue price stability and financial stability when the conditions are favourable and the job is easy. Furthermore, from a technical point of view, monetary policy is no more difficult in economies with pervasive inefficiencies and real and nominal rigidities than it is in economies with well-functioning product, labour and financial markets. Real rigidities and inefficiencies are irrelevant to the conduct of monetary policy. When there are persistent significant nominal rigidities, there will be output and employment costs associated with the pursuit of price stability; the job of the central bank is to minimize these costs, as long as this does not prejudice the primary target, price stability. Pressures from the media, from special interest groups or from the government are irrelevant. As long as it does not involve the taking of loved ones as hostages, such 'pressures' are an (in practice insignificant) part of the job.

Central bankers indeed have a duty to explain how their current and future interest rate decisions are contingent on economic developments that may include or may be influenced by, the actions of the fiscal authorities and the success or failure of structural reforms. The central

bank should clarify what its reaction function is, given the economic environment in which they operate, which includes the fiscal authorities and the government and ‘social partners’ engaged in structural reforms.

Independent central bankers can, and where possible should, cooperate with and coordinate their actions with those of the fiscal authorities and with those charged with structural reform. If central banks, Treasury ministers and ministers of the Economy were to act cooperatively toward each other, and with credible commitment towards the private sector, good things may well happen. The reason this does not happen in the EU, or even in the Eurozone, is not a question of principle, but of logistics. There is no coordinated fiscal policy in the EU or in the Eurozone, so the pursuit of coordination between fiscal and monetary policy in the EU or in the Eurozone is simply not possible. Mr. Jean-Claude Juncker could have private breakfasts and/or public lunches with Mr Jean-Claude Trichet every day of the week, every week of the year, it would not bring monetary and fiscal policy coordination in the Eurozone an inch closer to realisation.

IVC.2d Private sector threats to financial stability

Should central banks speak up about possible private sector behaviour that poses a material risk to financial stability? Most central banks do. The kinds of private behaviour that the central bank speak up about concern mainly high risk financial investment decisions and behaviour that sustains asset market bubbles. In open economies, and especially in small open emerging markets, private balance sheets often contain significant unhedged foreign exchange exposure.

For instance, in Bulgaria and Hungary, to name but two examples, households have taken out large euro-denominated and Swiss franc-denominated residential mortgages, without having any natural foreign exchange hedge in their human capital or synthetic foreign exchange hedge

in the rest of their financial portfolio. The commercial banks that offer these hard-currency loans may match their hard-currency assets with hard currency debt. By doing so, they will have eliminated exchange rate risk by taking on credit risk, and it is by no means clear that these banks are fully aware of the nature and extent of this credit risk.

There are many other examples of private sector financial investment decisions and market behaviour that can create problems for financial stability. Because of man-made financial distortions such as limited liability, and through the distorted incentives associated with the separation of ownership and control and other Agency problems characteristic of modern corporate governance, there are strong incentives for excessive risk taking. Imperfect and asymmetric information can create moral hazard inducing households and corporations at times take on excessive leverage, which is further encouraged by the prospect of bail-outs orchestrated by the government or, as in the case of Long-Term Capital Management, by the central bank. Bouts of unbridled greed tend to be followed by episodes of paralysing; alternating irrational exuberance and despondence are the rule rather than the exception in financial markets.

On the basis of global experience thus far, it seems unlikely that conventional monetary policy instruments – interest rate changes - are effective in discouraging excessive leverage or for preventing or mitigating asset bubbles. Alternative instruments, such as changes in margin requirements or limits on loan-to-value ratios may have some effect. As long as nominal interest rates are not at the zero lower bound, conventional monetary policy can be reasonably effective to help clean up the mess that results when asset bust follows asset boom.

There are a number of reasons monetary policy should not be used to restrain asset prices during an asset market boom. Among these reasons is not the fact that it is often difficult to be confident as to whether asset prices are driven just by fundamentals or by both fundamentals and

bubbles. It is only wild asset market excess that poses a threat to systemic financial stability. Most asset bubbles never reach that status. The last time that stock prices worldwide were completely unhinged from their fundamental moorings was during the tech/dotcom bubble of the late 1990s. By late 1998 almost everyone with an IQ in (at least) double digits recognized that tech stock behaviour was driven by a bubble. Monetary policy *could*, in principle, have been used to target the tech bubble in its last year and a half.

The reasons I believe that conventional monetary policy should not target asset are, first, that monetary policy should not try to influence asset prices that reflect fundamentals, even if these asset prices move fast and furiously. Second, monetary policy is not the appropriate tool for influencing asset price movements that are not driven by fundamentals, that is, monetary policy is not an effective tool for bursting or mitigating bubbles.

An asset price, P^E (think of it as the price of equity) is the sum of its fundamental value, F , and its bubble component, B .

$$P^E = F + B \quad (59)$$

The fundamental value of the asset is the present discounted value (using the appropriate nominal discount factors (see equations (40), (41) and (42)), of its future nominal cash flow or dividends, D .

$$F_t = \sum_{j=t}^{\infty} E_t I_{j,t} D_j \quad (60)$$

If the bubble is rational it satisfies

$$E_t I_{t+1,t} B_{t+1} = B_t \quad (61)$$

If the bubble is irrational, it is not possible to impose a-priori restrictions on its behaviour.

There are two ways to use conventional monetary policy to neutralize a bubble or to mitigate its impact: working on F and working on B . The first of these means using monetary policy to influence the fundamental solution in such a way as to bring the sum of the policy-corrected fundamental solution and the bubble component to a level close to what the fundamental solution would have been on its own, without a bubble and without corrective policy actions. The problem with this approach is that large and sustained increases in current and near-term future risk-free nominal interest rates could well be required to influence the fundamental value so as to offset the behaviour of the bubble component.⁷² This could cause economic dislocation elsewhere in the system.

The problem with using monetary policy to try to puncture or deflate the bubble is that you have no way of knowing whether it will work, achieve nothing or aggravate the problem. The recommendation: ‘don’t hunt bubbles with fundamentals’ would seem to have much to recommend it. At most, if the monetary authorities are sufficiently confident that a given observed pattern of asset price movements does indeed represent a bubble, they should use *open mouth operations* (warnings about irrational exuberance and irrational despondence) to try and prick the bubble. Using margin requirements and similar administrative measures or measures directly targeting the cost and availability of credit may also help.

I don’t believe that central banks should use the standard monetary instrument (the short-term nominal interest rate) to influence asset market bubbles. The other instruments that could be used to influence bubbles could be controlled and set by parties other than the central bank

⁷² Assume for simplicity that changes in the current and future values of the short risk-free rate affect only the stochastic discount factors, $I_{j,t}$, and not the stochastic current and future dividends D_j . If the expected future values of short nominal interest rates in the more distant future (say after 5 years) are not affected by changes in the current value of the short nominal interest rate (say because nominal rates in the long run are pinned down by a medium-to-long term inflation target and an invariant long-run real risk-free interest rate), then short nominal rates will have to change by a lot in the short run to have a significant effect on the fundamental value.

(e.g. the financial regulator or the Treasury). If such an instrument assignment were to be implemented, as I shall propose below, central bank open mouth operations to combat private sector financial instability would be ‘cheap talk’.

IVC.3 From independent central bank to minimalist independent monetary authority

The only time central banks have the right and duty to speak out on issues beyond monetary policy narrowly defined, is when the independence of the central bank is threatened. Such occasions are few and far between. Unsustainable public finances are not a matter on which the central bank should speak out, even if they threaten to confront the central bank with the dilemma: live with a sovereign debt default or bail out the improvident government through monetisation that threatens the central bank’s price stability mandate. The central bank’s mandated course of action is clear: they should let the government default on its debt rather than monetise that debt in a way that undermines price stability.

The threat of systemic financial instability may make it desirable that any or all of the following speak out: the financial supervisor and regulator, the providers of clearing and settlement services and/or the lender of last resort. However, neither the supervision and regulation of financial institutions and markets, nor the provision of clearing and settlement services, nor the active part of the lender of last resort function need be the responsibility of the central bank. Because the degree of independence of an operationally independent monetary authority is much greater than what is desirable for the financial regulator/supervisor, the provider of clearing and settlement services and the lender of last resort, there is a strong accountability argument for not bestowing any of these functions on the central bank.

An independent monetary authority need have few of the functions historically associated with the central bank. To minimize the legitimacy problems inevitably associated with the complete lack of substantive accountability of the operationally independent central bank, I would favour stripping the monetary authority of all responsibilities and competencies other than the pursuit of price stability. This minimalist objective would be supported through a minimalist assignment of instruments to the monetary authority. It would have just the power to set some short-term nominal interest rate or, in a managed exchange rate regime, to set the value of the nominal spot exchange rate. It would also be able to manage its portfolio as it sees fit. This could include portfolio operations traditionally described as sterilised or non-sterilised foreign exchange market intervention.

This implies, that I would deny the monetary authority the following functions:

1. Supervision and regulation of banks, other financial institutions and financial markets
2. Ownership, control and management of the interbank clearing and settlement systems (e.g. TARGET for the Eurozone and its proposed successor, TARGET2).
3. Ownership, control and management of the financial securities clearing and settlement systems (e.g. the proposed TARGET2-Securities for the Eurozone)
4. An active role in the prevention and mitigation of financial instability (other than what is the natural by-product of the pursuit of price stability), including an active part in the discharge of the lender of last resort function.

It is possible to strip the monetary authority of an active role in all four areas without this having any material adverse effect on financial stability or on the efficiency of the financial intermediation, clearing and settlement processes. As there would be accountability gains from removing the monetary authority from all four areas, there is no reason not to proceed.

The ECB currently has no role in financial supervision and regulation. The Treaty and Protocol do not grant the ECB supervisory or regulatory powers, but neither do they role this out. The ECB owns and runs TARGET, but is not granted a monopoly of clearing and settlement services by the Treaty. It has ambitions for being the monopoly provider of Eurozone clearing and settlement facilities for securities.

IVC.3a Taking the monetary authority out of financial supervision and regulation

The ECB has always had ambitions to become the leading supervisor/regulator of banks and other financial institutions and of key financial markets in the Eurozone (Padoa Schioppa (1999)). There is a good case for an EU-wide (note, not just a Eurozone-wide) supervisor and regulator of banks and other financial institutions, especially as and when such institutions are established under European statutes. There is no case for the ECB fulfilling this role.

The prospect of the extreme degree of substantive unaccountability of Eurozone monetary policy being extended to financial supervision and regulation is a deeply unattractive one. This important but murky area is at the same time highly technical and deeply political. It involves often intense distributional conflict and fierce fights over property rights. Expertise in monetary policy is no qualification for that job. The notion that it should be discharged by an institution without any substantive accountability is unacceptable.

IVC.3b Taking the monetary authority out of the clearing and settlement business

The provision of clearing and settlement services is another example of an area where central banks often play a role, despite there being no fundamental efficiency argument for it. Real Time Gross Settlement (RTGS) systems process a country's large-value payments.

Historically, they are the preserve of the central bank, which more often than not owns, runs and oversees it. Examples include CHAPS for the UK, Fedwire for the US, BoJ Net for Japan and TARGET for the Eurozone.

The reason why an operationally independent central bank ought to divest itself of its national (in the case of the ECB regional) RTGS system ownership, management and operation is not that the central bank is doing a particularly poor job of running the RTGS system. It is that, if it were to do a poor job, it is excessively sheltered behind the operational independence shield of the central bank. There is no reason why the owner/manager/operator of the RTGS system should not be fired for doing a poor job. When the owner of the RTGS system is also the head of the operationally independent central bank, appropriate sanctions and incentives cannot be brought to bear on him/her.

The ECB should “outsource” TARGET by spinning it off to another regulated entity (public or private) – one which has no monetary policy functions and much greater substantive accountability than the ECB. Instead the ECB’s systematic mandate and mission creep is leading it to propose that its monopoly over the provision of euro clearing and settlement services through TARGET (and its successor TARGET2) be extended to clearing and settlement of Eurozone transactions in financial securities through a proposed TARGET2 – Securities, to be owned, controlled and run by the ESCB (see Norman (2006)).

A Eurozone-wide platform for clearing and settling securities transactions is highly desirable, because it would lower transaction costs and promote further market integration. There is no efficiency argument for having the central bank provide the clearing and settlement platform, however, and it is important for the political health of the European Union that any ECB attempt to muscle in on this activity be resisted. The body running TARGET (and the

future TARGET2-Securities) needs access to the liquid liabilities of the ECB to fulfill its clearing and settlement role at least cost. It therefore needs an account with a generous balance at the ECB or an overdraft facility with the ECB. There is no logical or practical reason why the ECB should provide such clearing and settlement services itself.

IVC.3c Taking the monetary authority out of the financial stability business

Here I briefly develop the proposition that the monetary authority has no natural role in ensuring financial stability, other than what emerges naturally as the by-product of its pursuit of price stability. A three-step argument is used. The first step is that the scope and incidence of systemically important financial instability are limited. The second step is that the irreducible minimum financial stability role that does indeed exist for public sector institutions can be performed perfectly well without the active participation of the monetary authority. The third step is that if it can be done equally well without the monetary authority, it should be done without the monetary authority. The reason is that it is undesirable, from the point of view of substantive accountability and democratic legitimacy, to grant additional tasks and responsibilities to the operationally independent and therefore substantively unaccountable monetary authority.

Whatever set of institutions is charged with maintaining financial stability, a minimalist view of financial instability is essential. The public authorities should act to prevent three kinds of pathologies. First, *disorderly markets*, including failures of clearing and settlement systems. Second, extreme credit and asset market booms and busts, where market valuations and the cost and availability of credit have become clearly detached from fundamentals. Third, defaults and

bankruptcies that have material negative systemic externalities that outweigh the positive value of default and bankruptcy in the re-allocation of ownership and control rights in a market economy based on property rights and the rule of law.

Disorderly markets are rare. For instance, since the New Zealand dollar was floated in 1985, the policy of the Reserve Bank of New Zealand has been to intervene only during periods of “extreme market disorder” when the operation of the foreign exchange market itself is under threat. For this purpose, the Bank maintained foreign exchange reserves in a target range of SDR 1.45bn to 1.75bn. The Bank has never had to intervene for crisis management reasons during the past 21 years. While the event may be rare, the cost of event should it occur could well be high. The post 9/11 flooding of the world’s inter-bank markets and money markets with central bank liquidity was clearly an appropriate precautionary measure.

Unlike disorderly markets, credit booms and busts are a common and integral part of both ancient and modern financial capitalism. The monetary authority has neither an obvious mandate for preventing or mitigating credit booms and asset price bubbles, nor a comparative advantage in doing so. Unless asset market or credit developments threaten the fulfillment, sooner or later, of the primary price stability mandate, where price stability is defined, appropriately, in terms of some consumer price index or cost-of-living index, asset market and credit booms are not a first-order concern of the monetary authority. If the conventional instrument of monetary policy (a short-term nominal interest rate) can be used to address asset market bubbles and credit booms without prejudice to the price stability target, now and in the future, the monetary authorities are indeed not only entitled, but mandated to do so.

I have serious doubts, however, about the effectiveness of the use of the central bank’s policy rate in the pursuit of asset price stability and credit growth moderation, although sharp

cuts in the policy rate can help clean up the mess that results when asset bust follows asset boom and credit crunch follows credit glut. The reasons monetary policy should not target asset prices are straightforward.

First, monetary policy should not try to influence asset prices that reflect fundamentals, even if these asset prices move fast and furiously, as often they will. Second, monetary policy is not the appropriate tool for influencing asset price movements that are not driven by fundamentals, that is, monetary policy is not an effective tool for bursting or mitigating bubbles. You don't hunt bubbles with fundamentals. At most, if the monetary authorities are sufficiently confident that a given observed pattern of asset price movements does indeed represent a bubble, they should use open mouth operations (warnings about irrational exuberance or irrational despondency) to try and prick the bubble.

Credit control measures, such as tighter margin requirements, lower limits on loan-to-value ratios for housing credit, more demanding collateral requirements, higher downpayments for home purchases and durables purchases are the appropriate tools for dealing with credit growth deemed excessive. Taxing lending or borrowing (in a financially open economy, borrowing would make more sense as disintermediation tends to be harder for borrowers than for lenders) is another possible financial stabilisation tool. There is no reason, however, for the central bank to be involved in designing, implementing and administering any such measures. It is enough for the central bank to be informed, so it can make informed judgments about the implications of such credit control measures for the pursuit of its price stability mandate.

Systemically important defaults and bankruptcies in the financial sector no doubt occur, but have I trouble recalling any in the leading industrial countries since World War II. The bail-

out of LTCM (with private money but facilitated through the good offices of the New York Fed) has been justified on the grounds that its failure would have created systemic risk, through the exposure of systematically important banks to the institution and through the effect of the rapid liquidation of LTCM's positions on certain asset prices. I disagree, and had it been my call, I would have allowed it to fail. I do not believe that the failure of this highly leveraged betting facility for the extremely rich would have created systemically significant negative externalities. I find it hard to think of any single financial institution whose failure would be more systemically significant than the failure of, say, General Motors. And there is no financial stability argument for bailing out automobile manufacturers, no matter how large.

Given enough non-fundamental contagion effects, any (financial sector) default can become a systemically important issue. However, pure contagion effects can be addressed effectively by the authorities without foregoing the benefit of periodic large-scale defaults in the financial sector.

Some central banks, the ECB prominent among them, favour a definition of financial instability that encompasses just about any inefficiency in the financial intermediation process. Since financial intermediation, whether through long-term client relationships institutionalised through banks or through markets, is shot through with features that can be plausibly be interpreted as inefficiencies, it is easy, using this all-encompassing definition of financial instability, to paint a picture of pervasive financial instability and of even more comprehensive threats to financial stability. From this 'acquis', some prominent members of the ECB Executive Board have called for a greatly enhanced role of the central bank in financial supervision and regulation. This should be resisted. Financial sector inefficiency is not a financial stability issue.

It represents, at most, an issue to be addressed by the regulator/supervisor, not by the monetary authority.;

IVC.3d Taking the monetary authority out of the lender-of-last-resort business

There exists a widespread atavistic notion that the monetary authority has to have a role in underpinning financial stability, because the central bank is the natural lender of last resort (Bagehot (1866, 1873)). It is true that, through its monopoly of the issuance of legal tender, the central bank can issue effectively unlimited amounts of default-risk-free financial liabilities of the highest liquidity at little or no notice and at little if any cost. This, however, is not sufficient to conclude that the central bank has to be the lender of last resort. All it implies is that the lender of last resort, whichever institutions plays that role, has to have very large overdraft facility with the central bank.

Financial stability requires the cooperation and coordination of the actions of the Treasury and the supervisor/regulator. There is no logically necessary role for the central bank. In the UK, for instance, the Bank of England could be taken out of the current three-party Memorandum of Understanding concerning financial stability between the UK Treasury, the Financial Services Authority (FSA) and the Bank of England.

The FSA is an essential player in the Financial Stability Team (FST) because it has the deep institution-specific information and knowledge only the supervisor/regulator has. The Treasury is an essential player because, through its capacity to tax, it is the agency with the deepest long-run non-inflationary pockets. The odds on it defaulting on *de jure* or *de facto* index-linked, that is, real, obligations, are therefore lower than for any other economic actor. If a serious bail-out through a large-scale recapitalisation is deemed necessary for financial stability,

the Treasury is the only place to go for resources. Historically, the Bank of England is part of the FST because, through its legal tender monopoly, it is the agent with the short-term deep pockets. However, any agency with the appropriate degree of access to the resources of the central bank (through ample balances held with the central bank or through an (in principle) unlimited overdraft facility with the central bank, guaranteed by the Treasury, could do the job done now by the Bank. The obvious agency in the UK to play the active part of the lender of last resort role is the FSA.

So, in the UK, the Bank of England could be stripped of its financial stability role without any adverse impact on financial stability, by bestowing on the FSA an unlimited overdraft facility with the Bank of England, guaranteed by the Treasury. The Bank of England would not be responsible for the use made of this overdraft facility, so the Bank's lack of substantive accountability would not matter. Since the FSA is significantly more substantively accountable than the Bank of England, accountability would be enhanced overall.

IV.D Threats to central bank independence

If the government's desire for control over the instruments of the central bank (and/or for seigniorage) is such as to induce it to undermine the operational independence of the central bank, there is nothing much the central bank can do, if the repatriation of monetary policy-making powers to the government is legal and constitutional. The central bank can, and indeed *should*, speak out against such re-politicisation of its functions and instruments, but the action itself is, despite being unfortunate and harmful (and perhaps even against the *enlightened* self-interest of the government), part of the rules of the game. If the government's actions break the

law and/or the constitution, there is, effectively, a coup, and the formerly operationally independent central bankers can join the rest of the freedom-loving citizens on the barricades.

Setting the short nominal interest rate is a modest, but not unimportant task that can be fulfilled by humble, competent monetary technicians – the dentists Keynes hoped all economists would eventually emulate. If central banks wish to act in a wider political capacity and choose to operate in a wider political arena than is implied by the pursuit of price stability and financial stability, they cannot expect, as regards these broader issues, the same protection (operational independence) against interference, that they currently enjoy as regards their setting of the short-term nominal interest rate. Indeed, when central banks exceed their narrow price stability and financial stability mandates, they may find that the political backlash against such usurpation could well be the loss of operational independence in the pursuit of price stability and financial stability itself.

I still believe that the loss of central bank operational independence in the pursuit of the politically mandated objective of price stability would be a serious loss to the cause of price stability, and of macroeconomic stability generally. However, what we are seeing to an increasing extent in the ECB, and to varying degrees also in many other operationally independent central banks, is the unacceptable face of central bank independence: haughty and patronising, and prone to damaging incursions into areas well outside the central bank's core mandates of price stability and financial stability, and well outside the central bank's areas of competence; and all this unchecked by any substantive accountability. The fact that, in the case of the ECB, the extension of their mandate into the decision-making process for Eurozone enlargement is written into the Treaty only shifts and redistributes the ultimate responsibility and blame for this unwise enhancement of ECB's role; it does not make it right.

The European central bank is especially vulnerable to a political backlash against central bank independence. This may seem surprising in view of the unprecedented and unparalleled scope and degree of independence granted the ECB by the Treaty and its Protocol – well in excess of that which characterised the old Bundesbank and other operationally independent central banks today. The vulnerability of the ECB reflects the weakness of the supranational political foundations on which its existence and its capacity to exercise its mandate ultimately depend. EU-wide supranational institutions are weak and remote from EU citizens; the political consensus and support for European integration have weakened as memories of internecine European warfare and the Cold War fade; alternative historically rooted sources of legitimacy that make sense for the 21st century have not (yet) taken their place.

Going ahead with the single currency in 1999, without the prior strengthening of key EU political institutions, was a calculated risk. The failure in 2005 to ratify the Treaty establishing a Constitution for Europe has extended the window of existential vulnerability of the ECB

I would urge central banks to return to and stick to their core tasks of maintaining price stability and financial stability. Either the operationally central bank, including the ECB, will limit itself or it will not survive as an operationally independent central bank.

Conclusions

There are no minimally robust conventional welfare economics foundations for making price stability (operationalised as a zero or low rate of inflation going forward) the overriding objective of monetary policy. Welfare effects due to the association of higher inflation with a higher pecuniary opportunity cost of holding cash, and associated shoe-leather costs and distortions in the relative price of cash goods and credit goods, call for a negative rate of

inflation, unless interest can be paid on currency. Menu costs are likely to be most significant for wage negotiations and would therefore call for stabilising the nominal wage, not the price level. Inflation-non-neutralities in the tax and transfer system are best addressed by index-linking the relevant parameters of the budget. Undesirable redistribution due to unexpected inflation or deflation is also most readily addressed by expanding the menu of index-linked financial instruments.

The optimal approach to addressing relative price distortions due to nominal wage and price rigidities calls for full accommodation or validation of the inflation heuristic, whatever the inflation heuristic happens to be, not for price stability, unless the inflation heuristic happens to be zero.

The purpose of the first half of this paper was not to argue that central banks should forget about price stability and inflation targeting. It is merely to point out that these arrangements that appear to work so well in practice have nothing much to recommend themselves from a theoretical point of view. Monetary theory is indeed well behind monetary policy practice, and the profession should not pretend it is otherwise. It is back to the salt mines for the theory of monetary policy and monetary economics generally.

As regards central bank independence, it is clear that, because of the central bank's inability to tax and because of the ability of the treasury to tax everyone and everything, including the central bank, there can be no guarantee that the inflation target is financeable independently by the central bank, even if it is in principle financeable by the consolidated central bank and treasury. In general, only the treasury can ensure that the central bank has the budgetary resources to implement the inflation target.

The fact that the central bank has only *short-term* deep pockets (unless it is willing to give up on its inflation target) while only the treasury has long-run deep pockets is also a key issue when the central bank is asked to fulfil its key function of lender of last resort. Unless the central bank is backed up with the resources of the treasury, it will not be able to act effectively when a liquidity crisis shows signs of becoming a solvency crisis for financial institutions characterised by important systemic externalities.

Effective policy in a liquidity trap requires money-financed tax cuts or transfer payments (helicopter drops of money). Without cooperation between the treasury and the central bank, such policies cannot be implemented.

On balance, central bank operational independence, in the sense that the Treasury cannot instruct the central bank how to set its instrument(s) (or even put material pressure on the monetary policy makers) is probably a good thing. It is not an easy task to provide the right incentives for monetary policy makers operating in a committee setting or to minimise the risk and severity of common group decision-making pathologies (such as ‘group think’). The appointment procedures, rules governing tenure, goal transparency and procedural transparency are all important contributors to the central bank’s *formal accountability* (reporting obligations). *Substantive accountability* (making the monetary policy makers’ performance in the design and implementation of monetary policy pay-off relevant for each policy maker individually (and possibly also collectively)), other than through reputation effects, is, however almost by definition incompatible with operational independence. Both formal accountability and substantive accountability (if any) for an operationally independent central bank, require individual accountability, lest each individual monetary policy maker hide behind the monetary policy making committee as a collective. The ECB, which does not permit the identification of

the contribution of individual Governing Council members to the monetary policy decision, therefore effectively has zero substantive accountability and very limited formal accountability.

Central bank operational independence should not mean that the central bank either can or should try to fulfil its mandate without close cooperation and coordination with the fiscal authorities. The governor or president of a central bank can answer the phone when a minister of finance calls without undermining the central bank's independence.

Attempts by the central banks to increase the scope of their influence beyond the narrow remit of price stability and financial stability, create the risk of a political backlash that could endanger the operational independence of the central banks where it is helpful – in the single-minded pursuit of price stability.

Granting a high degree of operational independence for monetary policy to the central bank should have as a corollary that the central bank is stripped of all non-monetary policy functions and responsibilities. The minimalist central bank has responsibility for monetary policy but for nothing else. Specifically, it plays no role in the supervision and regulation of financial institutions and markets or in the operation of settlement and clearing systems. It should even be denied an active role in the performance of the lender of last resort function.

References

- Alesina, A., Summers, L.H. (1993), Central bank independence and macroeconomic performance: some comparative evidence, *Journal of Money, Credit and Banking* 25, 151-162.
- Allais, Maurice (1947), *Economie et Intérêt*, Paris, Imprimerie Nationale.
- Bailey, Martin J. (1956), "The Welfare Costs of Inflationary Finance," *Journal of Political Economy*, vol. 64, no. 2, April, pp. 93-110.
- Balcerowicz, L. (1995), "The political economy of economic reform: Poland, 1989-92", in *Socialism, Capitalism, Transformation*, Budapest, Central European University Press.
- Bank of England (2006), *The Framework for the Bank of England's Operations in the Sterling Money Markets*, May; <http://www.bankofengland.co.uk/markets/money>
- Baron, R. S. (2005). "So Right It's Wrong: Groupthink and the Ubiquitous Nature of Polarized Group Decision Making." In Zanna, Mark P (Ed.) *Advances in experimental social psychology*, Vol. 37. (pp. 219-253). San Diego, CA: Elsevier Academic Press.
- Barro, R. J. and D. B. Gordon (1983), "A positive theory of monetary policy in a natural-rate model", *Journal of Political Economy*, 91, 4, pp. 589-610.
- Batini, Nicoletta, Kenneth Kuttner, and Douglas Laxton (2005), "Does Inflation Targeting Work in Emerging Markets", Chapter IV, *World Economic Outlook*, September, International Monetary Fund, Washington D.C.
- Baumol, William J. [1952], "The Transactions Demand for Cash: an Inventory Theoretic Approach", *Quarterly Journal of Economics*, 56, November, pp. 545-56.
- Beetsma, R., Bovenberg L.(1997), Central bank independence and public debt policy, *Journal of Economic Dynamics and Control* 21, 873-94.
- Benigno, Pierpaolo and Michael Woodford (2005), "Inflation Stabilization and Welfare: The Case of a Distorted Steady State", *Journal of the European Economic Association*, Volume 3, Issue 6, pp. 1185-1236
- Bernanke, Ben S. and Michael Woodford eds. (2005), *The Inflation-Targeting Debate*, National Bureau of Economic Research Studies in Business Cycles, Volume 32, The University of Chicago Press, Chicago and London.
- Blanchard, Olivier and Jordi Gali (2005), "Real Wage Rigidities and the New Keynesian Model", NBER Working Paper 11806, November.
- Blinder, Alan S. (1999), *Central Banking in Theory and Practice*, Cambridge, MA: MIT Press.

Blinder, Alan (2005), "Monetary Policy by Committee: Why and How?," prepared for workshop at De Nederlandsche Bank, November 28.

Blinder, Alan S. (2006), "Monetary Policy Today: Sixteen Questions and about Twelve Answers," paper prepared for Bank of Spain conference, Madrid, June 2006, forthcoming in conference volume.

Blinder, Alan S. and John Morgan (2005), "Are Two Heads Better than One? Monetary Policy by Committee," *Journal of Money, Credit, and Banking*, October, pp. 789-812.

Blinder, Alan S. and Ricardo Reis (2005), "Understanding the Greenspan Standard," in Federal Reserve Bank of Kansas City, *The Greenspan Era: Lessons for the Future*, Proceedings of the 2005 Jackson Hole Symposium, pp., 11-96.

Buiter, Willem H. (1985), "International Monetary Policy to Promote Economic Recovery", in *Monetary Conditions for Economic Recovery*, C. van Ewijk and J.J. Klant (eds.), Financial and Monetary Policy Studies 11, Martinus Nijhoff Publishers, Dordrecht, 1985, Reprinted in Willem H. Buiter, *International Macroeconomics*, Clarendon Press, Oxford, 1990, pp. 171-194.

Buiter, Willem H. (1986), "Policy Evaluation and Design for Continuous Time Linear Rational Expectations Models: Some Recent Developments", in *Prices, Competition and Equilibrium*, M.H. Peston and R.E. Quandt (eds.), 1986, Barnes & Noble Books, 84-108. Reprinted in Willem H. Buiter, *Macroeconomic Theory and Stabilisation Policy*, Michigan University Press, pp. 228-252.

Buiter, Willem H. (1999), "Alice in Euroland." *Journal of common market studies* 37, no. 2, pp. 181-209.

Buiter, Willem H. (2003), "Helicopter Money: Irredeemable Fiat Money and the Liquidity Trap" , NBER Working Paper No. W10163, December .

Buiter, Willem H. (2004), "Two naked emperors? Concerns about the Stability and Growth pact and second thoughts about Central Bank independence", *Fiscal Studies*, Vol. 25(3), pp. 249-77.

Buiter, Willem H. (2005a), "New Developments in Monetary Economics: two ghosts, two eccentricities, a fallacy, a mirage and a mythos", Royal Economic Society 2004 Hahn Lecture, *The Economic Journal*, Conference Papers, Vol. 115, No. 502, March 2005, pp. C1-C31.

Buiter, Willem H. (2005b) "Overcoming the Zero Bound: Gesell vs. Eisler; Discussion of Mitsuhiro Fukao's "The Effects of 'Gesell' (Currency) Taxes in Promoting Japan's Economic Recovery" *International Economics and Economic Policy*, Volume 2, Numbers 2-3, November 2005, pp. 189-200.

Buiter, Willem H. and Ian Jewitt (1981), "Staggered Wage Setting with Real Wage Relativities: Variations on a Theme of Taylor," with I. Jewitt, *Manchester School*, September 1981, 211-228. At URL: <http://www.nber.org/~wbuiter/buijew.pdf> .

Buiter, Willem H. and Marcus H. Miller (1985), "Costs and benefits of an anti-inflationary policy: questions and issues", in A. Argy and J. Nevile (eds.), *Inflation and Unemployment: Theory, Experience and Policy Making*, London, George Allen & Unwin, pp. 11-38. Reprinted in Willem H. Buiter, *Macroeconomic Theory and Stabilisation Policy*, Michigan University Press, pp. 200-227..

Buiter, Willem H. and Nikolaos Panigirtzoglou (2001), "Liquidity Traps: How to Avoid Them and How to Escape Them", with Nikolaos Panigirtzoglou, in *Reflections on Economics and Econometrics, Essays in Honour of Martin Fase*, edited by Wim F.V. Vanthoor and Joke Mooij, 2001, pp. 13-58, De Nederlandsche Bank NV, Amsterdam.

Buiter, Willem H. and Nikolaos Panigirtzoglou (2003), "Overcoming the Zero Bound on Nominal Interest Rates with Negative Interest on Currency: Gesell's Solution", *Economic Journal*, Volume 113, Issue 490, October 2003, pp. 723-746.

Buiter, Willem H. and Anne C. Sibert (2006), "The Elusive Welfare Economics of Price Stability as a Monetary Policy Objective: Why New Keynesian Central Bankers Should Validate Core Inflation", mimeo, London School of Economics and Political Science.:

Calvo, Guillermo (1983), "Staggered Contracts in a Utility-Maximizing Framework", *Journal of Monetary Economics*, September.

Calvo, Guillermo, Oya Celasun and Michael Kumhof (2003), "Inflation inertia and credible disinflation: the open economy case", NBER, Working Paper 9557, March.

Campillo, M., Miron, J. (1997), Why does inflation differ across countries?, in Romer C.D., Romer D.H. (Eds.), *Reducing Inflation: Motivation and Strategy*, University of Chicago Press, Chicago.

Caplin, Andrew S. and Daniel F. Spulber (1987), "Menu Costs and the Neutrality of Money", *Quarterly Journal of Economics*, 102, November, pp. 703-725.

Christiano, L. J., M. Eichenbaum and C. Evans, "Nominal Rigidities and the Dynamic Effects of a Shock to Monetary Policy", NBER Working Paper, No. 8403 (July 2001).

Cukierman, A., Webb, S.B., Neyapti, B. (1992), Measuring the independence of Central Banks and its effects on policy outcomes, *World Bank Economic Review* 6, 353-398.

Duckenfield, Mark (1999), "Bundesbank-government relations in Germany in the 1990s: from GEMU to EMU." *West European Politics* 22, no. 3 (1999), pp. 87-108. ..

Eijffinger, Sylvester (2005), *The European Central Bank: Credibility, Transparency, and Centralization*, The MIT Press, Cambridge, Massachusetts, 2005.

Eisler, Robert (1932), "Stable Money: the remedy for the economic world crisis: a programme of financial reconstruction for the international conference 1933"; with a preface by Vincent C. Vickers. London: The Search Publishing Co.

Fatas, Antonio, Jurgen von Hagen, Andrew Hughes Hallett, Ann Sibert, and Rolf Strauch (2003), "Stability and Growth in Europe: Towards a Better Pact", *Monitoring European Integration* 13, London: Centre for Economic Policy Research, London.

Federal Reserve Bank of Kansas City (1996), *Achieving Price Stability; A Symposium Sponsored by The Federal Reserve Bank of Kansas City, Jackson Hole, Wyoming, August 29-31, 1996*.

Feldstein, Martin S (1979), "The Welfare Cost of Permanent Inflation and Optimal Short-Run Economic Policy," *Journal of Political Economy*, vol. 87(4), pages 749-68.

Feldstein, Martin S. (1997). "The Costs and Benefits of Going from Low Inflation to Price Stability," NBER Working Papers 5469.

Fischer, Stanley (1981), "Towards an Understanding of the Costs of Inflation: II", *Carnegie-Rochester Conference Series on Public Policy* 15, pp. 5-42.

Fisher, Irving (1933), *Stamp Scrip*, Adelphi Company, New York.

Forder, J. (1998), Central bank independence: conceptual clarifications and interim assessments, *Oxford Economic Papers* 50, 307-334.

Friedman, Milton (1968), "The Role of Monetary Policy." *American Economic Review* 58, no. 1, pp. 1-17.

Friedman, M. and A.J. Schwartz, 1963, *A Monetary History of the United States: 1867-1960*, Princeton: Princeton University Press.

Friedman, M. and D. Meiselman, 1963, "The Relative Stability of Monetary Velocity and the Investment Multiplier in the United States, 1897-1958," in *Stabilization Policies*, Englewood Cliffs NJ: Prentice-Hall.

Gali, Jordi, Mark Gertler and J. David Lopez-Salido (2001), "European Inflation Dynamics", *European Economic Review*, 45 pp. 1237 - 1270

Gesell, Silvio (1916, 1949), *Die Natuerliche Wirtschaftsordnung*, Rudolf Zitzman Verlag, available in English as *The Natural Economic Order*, Peter Owen Ltd, London, 1958.

Giannoni, Marc P. and Michael Woodford (2003). "Optimal Inflation Targeting Rules," NBER Working Papers 9939, National Bureau of Economic Research, Inc.

Goodfriend, Marvin (2000), "Overcoming the Zero Bound on Interest Rate Policy, *Journal of Money, Credit and Banking*, Vol. 32, No. 4, Pt. 2, November, pp. 1007-1035.

Goodhart, Charles (1999), "Recent Developments in Central Banking: Some Special Features of the Monetary Policy Committee and of the European System of Central Banks", Monnet Lecture, 14 October.

Lastra, Rosa (2000), "The Division of Responsibilities Between the European Central Bank and the National Central Banks Within the European System of Central Banks," *The Columbia Journal of European Law*, Volume 6, No. 2, Spring, pp. 167-180.

Haan Jacob de, and W. Kooij, "Does Central Bank Independence Really Matter? New Evidence for Developing Countries Using a New Indicator", *Journal of Banking and Finance*, 24, 2000, 643-664.

IMF (2006), "Inflation Targeting and the IMF", Prepared by Monetary and Financial Systems Department, Policy and Development Review, Department, and Research Department, Mimeo, March 16, 2006;
<http://www.imf.org/external/np/pp/eng/2006/031606.pdf>

Issing Otmar (1999), "The Eurosystem is Transparent and Accountable, or Willem in Wonderland," *Journal of Common Market Studies*, 37, 3 pp.503-519 ...

Ize, Alain (2005), "Capitalising Central Banks: A Net Worth Approach", IMF Working Paper, WP/05/15, January 2005

Janis, I. (1972). *Victims of Groupthink: A Psychological Study of Foreign-Policy Decisions and Fiascoes*. Boston: Houghton Mifflin.

Keynes, John Maynard (1931), "Economic Possibilities for our Grandchildren", in John Maynard Keynes, *Essays in Persuasion*, Macmillan Press Ltd. London, pp. 321-332.

King, Mervyn (1997), "The inflation target five years on", Lecture delivered at the London School of Economics, Wednesday 29 October, Bank of England.

King, Mervyn (2005), "Monetary Policy: Practice Ahead of Theory", Mais Lecture, Bank of England.

Kydland, F. E. and E. C. Prescott (1977), "Rules rather than discretion: the inconsistency of optimal plans", *Journal of Political Economy*, 85, 3, June, pp. 473-491.

Larkin, William J. Jr. (1982), "The Ethics of Inflation: A Biblical Critique of the Causes and Consequences", *Grace Theological Journal*, 3:1, Spring, 1982,
<http://www.apuritansmind.com/Stewardship/LarkinWilliamEthicsInflation.htm> .

Lenin, Vladimir Ilyich http://en.thinkexist.com/quotes/vladimir_lenin/3.html .

- Lindsey, Lawrence B. (1995) "The Two-Handed Role of Money", *Contemporary Issues Series* 74, August 1995, Center for the Study of American Business Washington University, St. Louis.
- Lucas, Robert E. Jr. (1972a), "Expectations and the Neutrality of Money", *Journal of Economic Theory*, 4, pp. 103-124
- Lucas, Robert E., Jr. (1972b), "Econometric Testing of the Natural Rate Hypothesis." In *The Econometrics of Price Determination*, edited by Otto Eckstein. Reprinted in Lucas, Robert E., Jr. *Studies in Business Cycle Theory*. 1981.
- Lucas, Robert E. Jr and Nancy Stokey (1987), "Money and interest in a cash-in-advance economy", *Econometrica*, 55, Pp. 491-513.
- Lucas, Robert E. Jr. (2000), "Inflation and Welfare", *Econometrica* 68, pp. 247-274.
- Mankiw, N. Gregory and Ricardo Reis (2006), "Pervasive Stickiness (Expanded Version)", NBER Working Paper No. 12024, February.
- McCallum, B. T. (1995), "Two fallacies concerning central bank independence", *American Economic Review*, Papers and Proceedings, vol. 85 (May), pp. 207-211.
- McCallum, Bennett T. (1997a), "The Credibility of the European Central Bank: Comments," in *European Monetary Policy*, ed. by Stefan Collignon, London: London: Pinter.
- McCallum, Bennett T. (1997b), "Crucial Issues Concerning Central Bank Independence," *Journal of Monetary Economics*, 39, February, pp. 99-112.
- Ozkan, F.G. (2000), Who wants an independent Central Bank: monetary policy making and politics, *The Scandinavian Journal of Economics* 102, pp. 621-643.
- Padoa-Schioppa, Tommaso (1999), "EMU and Banking Supervision", Lecture given at the London School of Economics, 24 February.
- Phelps, Edmund S. (1967), "Phillips Curves, Expectations of Inflation and Optimal Employment over Time." *Economica NS* 34, no. 3, pp. 254-81.
- Phillips, A. W. H. (1958), "The Relation between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom, 1861-1957." *Economica NS* 25, no. 2 (1958): 283-99.
- Posen, A. (1993), Why Central Bank independence does not cause low inflation: there is no institutional fix for politics' in R O'Brien (ed.), *Finance and the International Economy*, 7, Oxford University Press, Oxford.
- Rasche, Robert H. and Marcela M. Williams (2005). "The Effectiveness of Monetary Policy", The Federal Reserve Bank of St. Louis Working Paper 2005-048B, June, revised July.

- Rogoff, Kenneth (1985a), "Can International Monetary Cooperation be Counterproductive?" *Journal of International Economics* 18, May, pp 199-217.
- Rogoff, Kenneth (1985b), "The Optimal Degree of Commitment to an Intermediate Monetary Target," *Quarterly Journal of Economics* 100, November, pp. 1169-1189.
- Rogoff, Kenneth (1998) "Foreign and Underground Demand for Euro Notes: Blessing or Curse?" *Economic Policy* 26, April, 263-303.
- Roth, Jean-Pierre (2005), "Review of the Swiss economy", speech given at the Bank's Annual General Meeting, Berne, 29 April 2005. <http://www.bis.org/review/r050503b.pdf>
- Samuelson, Paul A., and Robert M. Solow (1960), "Analytical Aspects of Anti-Inflation Policy." *American Economic Review* 50, no. 2, pp. 177-94.
- Shiller, Robert J. (1997), "Why do people dislike inflation?" in *Reducing Inflation: Motivation and Strategy*, edited by Christina D. Romer and David H. Romer, University of Chicago Press, pp.
- Sibert, Anne (2003), "Monetary Policy Committees: Individual and Collective Reputations," *Review of Economic Studies* 70, Jul. 2003, 649-666.
- Sibert, Anne (2006a) "Central Banking by Committee," *International Finance*, forthcoming, online version De Nederlandsche Bank Working Paper no. 91, Feb.
- Sibert, Anne (2006b), "Deconstructing the Bank of England Act 1998", Birkbeck College mimeo, August.
- Sibert, Anne and Ilian Mihov (2006), "Credibility and Flexibility with Monetary Policy Committees," *Journal of Money, Credit and Banking* 38, Feb. 2006, 23 – 46.
- Sims, C. A. (2004): "Fiscal Aspects of Central Bank Independence," Chapter 4, p.103-116, in *European Monetary Integration*, Hans-Werner Sinn, Mika Widgrén, and Marko Köthenbürger, editors, MIT Press.
- Sims, C. A. (2005), "Limits to Inflation Targeting", Chapter 7 in *The Inflation-Targeting Debate*, Ben S. Bernanke and Michael Woodford, editors, NBER Studies in Business Cycles Volume 32, p. 283-310.
- Smets, Frank and Raf Wouters (2003), "An estimated stochastic dynamic general equilibrium model of the euro area," *Journal of the European Economic Association*, September, Vol 1 (5), pp. 1123-1175
- Solans, Eugenio Domingo (1999), "Should the ECB have broader objectives beyond price stability? A speech given at the Wilton Park conference on "Emu: Economic and Political

Implications for the “Ins” “Outs” and European Business”, at Wiston House, West Sussex, on 24 May 1999;

<http://www.ecb.int/press/key/date/1999/html/sp990524.en.html> .

Svensson, Lars E. O. (1997). “Inflation Forecast Targeting: Implementing and Monitoring Inflation Targets,” *European Economic Review* 41(6, June): 1111-1146.

Svensson, Lars E. O. (1999). “Inflation Targeting as a Monetary Policy Rule,” *Journal of Monetary Economics* 43(3, June): 607-654.

Svensson, Lars E. O. (2001). “Independent Review of Monetary Policy in New Zealand: Report to the Minister of Finance,” Institute for International Economic Studies working paper, Stockholm University.

Svensson, Lars E. O. (2005). “Optimal Inflation Targeting: Further Developments of Inflation Targeting,” paper presented at Sveriges Riksbank conference, “Inflation Targeting: Implementation, Communication, and Effectiveness,” Stockholm, June.

Svensson, Lars E. O. (2006). “The Instrument-Rate Projection under Inflation Targeting: The Norwegian Example,” in Bank of Canada, *Inflation Targeting: Problems and Opportunities*.

Tobin, J. (1956), “The interest elasticity of transactions demand for cash”, *Review of Economics and Statistics*, Vol. 38, August.

Tobin, James (1968), “Phillips Curve Algebra”, in James Tobin, *Essays in Economics, Volume 2, Consumption and Econometrics*, pp. 11-15, MIT Press, 1987, 77, Cambridge Mass; adapted from Tobin’s “Discussion” of papers at a *Symposium on Inflation: Its Causes, Consequences and Control*, 1968, Stephen W. Rousseas ed. pp. 48-54 and from Tobin’s “Comment”, *Brookings Papers on Economic Activity*, 1971:2, pp. 512-14.

Tognato, Carlo (2004), “In the name of money: Central banking as a secular religion”, Manuel Ancizar Lecture, Universidad Nacional, Bogotá, October 30;
http://research.yale.edu/ccs/research/working-papers/tognato_banking.pdf .

Trichet, Jean-Claude (2006), “Looking at EU and euro area enlargement from a central banker’s angle: the views of the ECB”, speech given at the Diplomatic Institute, Sofia, 27 February.

Voorhis, J. H. (1973), “The Federal Reserve”, in *The Strange Case of Richard Milhouse Nixon*. New York: P. S. Eriksson, 1972;
<http://www.sonic.net/~doret/ArchiveARCHIVE/ECONOMICSPOLITICS/FEDERAL%20RESERVE/Jerry%20VoorhisFedReserve.html> .

White, William H. Jr. (1956), *The Organisation Man*.

Wallich, Henry C. (1978) “Honest Money”, commencement address delivered to the Fordham Graduate School of Business on June 28, *Economic Insights* Volume 1, Number 1, Federal Reserve Bank of Dallas, <http://www.dallasfed.org/research/ei/ei9601.html#2>

Woodford, Michael (2003), *Interest & Prices; Foundations of a Theory of Monetary Policy*, Princeton University Press, Princeton and Oxford.

Wright, Randall, Guillaume Rochetau, Peter Rupert and Karl Shell (2005), “General Equilibrium with Nonconvexities, Sunspots and Money; Or, There is a Long-Run Exploitable Trade off Between Inflation and Unemployment After All”, Mimeo, Department of Economics, University of Pennsylvania.

Wyplosz, Charles (2002), “Fiscal Policy: Institutions versus Rules”, Centre for Economic Policy Research Discussion Paper 3238, February.

Yun, T. (1996), “Nominal price rigidity, money supply endogeneity, and business cycles”, *Journal of Monetary Economics*, 37, pp. 345-370.