The New Monetary Policy

Implications and Relevance

EDITED BY

Philip Arestis
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John McCombie

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Philip Arestis

University Director of Research, Centre for Economic and Public Policy, University of Cambridge, UK and Institute Professor, Levy Institute, USA

Michelle Baddeley

Deputy Director, Centre for Economic and Public Policy, Director of Studies and Fellow in Economics, Gonville and Caius College, and at the Faculty of Economics, University of Cambridge, UK

John McCombie

Director, Centre for Economic and Public Policy and Fellow in Economics, Downing College, Cambridge, UK

Edward Elgar
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Contributors

Nigel Allington, University of Cambridge, Cambridge, UK

Philip Arestis, University of Cambridge, Cambridge, UK and Levy Economics Institute, USA

Michelle Baddeley, University of Cambridge, Cambridge, UK

Rex Ballinger, American University, Washington, DC, USA

Stephanie Bell-Kelton, University of Missouri–Kansas City and Center for Full Employment and Price Stability, USA

Georgios Chortareas, University of Essex, Colchester, UK

Valpy FitzGerald, University of Oxford, Oxford, UK

Giuseppe Fontana, University of Leeds, Leeds, UK

Charles Freedman, Carleton University, Ottawa, Canada

Charles Goodhart, London School of Economics and Political Science, London, UK

Elias Karakitsos, Global Economic Research, London, UK

John McCombie, University of Cambridge, Cambridge, UK

Mark Roberts, University of Cambridge, Cambridge, UK

Malcolm Sawyer, University of Leeds, Leeds, UK

Mark Setterfield, Trinity College, Hartford, CT, USA

A.P. Thirlwall, University of Kent, Canterbury, UK

L. Randall Wray, University of Missouri–Kansas City, USA

1. Introduction

In January 2004 the Cambridge Centre for Economic and Public Policy, based in the Department of Land Economy, University of Cambridge, UK, was inaugurated. To celebrate the event a conference took place in March 2004 at Downing College. Most appropriately, the theme of the conference was the 'New Consensus Monetary Policy'. The papers included in this volume are a collection of those presented to that conference.

Recent developments in macroeconomic and monetary thinking have given a new impetus to the management of the economy. The use of monetary policy by way of manipulating the rate of interest to affect inflation is now well accepted by both academic economists and central bank practitioners (the works of Bernanke et al., 1999; Clarida et al., 1999, 2000; Issing, 2004; King, 1997; Svensson, 1999, are good examples). The explicit control of the money supply, which was fashionable in the 1970s and 1980s in the UK, the USA, Europe and elsewhere, was abandoned in favour of monetary policy rules that focus on interest rate manipulation by the central bank. The objective is to achieve an inflation target, either specific or within a range.

This volume begins with an assessment of this new thinking in macroeconomics and monetary theory. In Chapter 2, 'New Consensus Monetary Policy: an appraisal', Philip Arestis and Malcolm Sawyer suggest that many countries have adopted the New Consensus Monetary Policy (NCMP) since the early 1990s in an attempt to reduce inflation to low levels. Since then, this policy has been praised in most of the literature as a superior framework for monetary policy. This chapter concentrates on the theoretical foundations of this policy, where a number of aspects are discussed. It then turns its attention to an assessment of the empirical work on this new policy, where the distinction between the work that has been done utilizing structural macroeconomic models, and work based in single-equation techniques, is made. The theoretical framework and the available empirical evidence do not appear to support the views of the proponents of the New Consensus Monetary Policy.

Mark Setterfield in Chapter 3, 'Central bank behaviour and the stability of macroeconomic equilibrium: a critical examination of the "New Consensus"', argues that the New Consensus model was born of a desire to introduce interest rate operating procedures into New Keynesian macroeconomics, in order to make the latter more realistic at a time when central banks made no

pretence to be targeting the stock of money in circulation. This chapter demonstrates that any increased realism purchased by the New Consensus model comes at a cost: the stability of macroeconomic equilibrium in the New Consensus model is not analytically robust. This result has important implications for monetary policy because it raises questions about why central banks adopt interest rate operating procedures and whether or not they should. The New Consensus model provides no definitive answers.

An important issue in the New Consensus Monetary Policy is the type of monetary rule the central bank in question may adopt. Georgios Chortareas in Chapter 4, 'Monetary policy divergences in the euro area: the early record of the European Central Bank', deals with the so-called Taylor rules used by the European Central Bank (ECB), in an attempt to contribute to our understanding and monitoring of cyclical divergences within the euro area. In particular, Chapter 4 provides some simple analytical tools for assessing the degree of convergence in the monetary policy needs of the Economic and Monetary Union (EMU) member countries. The progress towards EMU is examined to determine whether it enhanced convergence in the monetary policy needs of the participating countries or imposed a straitjacket on them. Taylor rules are utilized as a consistent benchmark that approximates the optimal monetary policy rule in each EMU member country and the aggregate euro area. A set of monetary policy divergence indicators is provided, which is applied to observed interest rates and to the measures of 'warranted' interest rates. The simplicity of the imposed Taylor rules renders them a manageable tool for obtaining an indication as to whether the 'one-size-fits-all' aspect of monetary policy works. The chapter also examines whether the actual interest rate convergence (or divergence) process corresponds to the convergence (or divergence) process in the warranted interest rates.

Chapter 5 turns to 'Stock market prices and the conduct of monetary policy under the New Consensus Monetary Policy'. Nigel Allington and John McCombie assess whether or not central banks should take stock market prices into account when determining interest rates in the context of the New Monetary Consensus. They consider whether the collapse of stock prices has an adverse effect on the economy, the causes of stock bubbles and their role in the transmission mechanism. The empirical studies of the relationship between asset prices, the inflation rate and real output are examined, as well as the simulation models that assess whether there is a case for including asset prices in the inflation target. Given that the evidence on these questions is mixed, they report the results of their research on how central bankers actually respond to stock prices using the heteroskedasticity of stock market returns to estimate the monetary policy response. The authors find that a 5 per cent increase (decrease) in the FTSE 100 index increases (reduces) the UK's three-month interest rate by 12.39 basis points. This translates into a 25-

basis-point change in the interest rate in the same direction as the stock market with a probability of 99 per cent. They report briefly the, mainly critical, response of researchers to this and similar findings for the USA on the reaction of monetary policy to stock prices and the converse.

Chapter 6 remains within the asset pricing area. Philip Arestis and Elias Karakitsos concentrate 'On the US post-"new economy" bubble: should asset prices be controlled?', and deal with the US experience of the boom-and-bust asset bubbles. They focus on the 2000 bubble in this economy, and the related issue of the 'new economy' paradigm. They analyse the aftermath of the bubble before dealing with the issue of how it might be tackled. Asset price inflation targeting may be both desirable and feasible and in no way conflicts with other policy objectives of the central bank, as for example in the case of inflation targeting. The process of asset price inflation targeting involves monitoring and targeting the impacts of asset prices on the spending patterns of consumers and companies, rather than asset prices themselves. The variable that lends itself as a primary candidate for monitoring and control of asset price inflation is the net wealth of the personal sector as a percentage of disposable income, as it is at the heart of the transmission mechanism from asset prices and debt to consumption.

Michelle Baddeley and Giuseppe Fontana in Chapter 7 are concerned with 'Monetary policy in the information economy: old problems and new challenges'. They discuss the creation and circulation of money in both the old economy and the new economy. The analysis begins with a theoretical survey of electronic money (e-money) in a world of endogenous money. The survey incorporates a critical analysis of the Mengerian view that money emerges only as a consequence of economizing on transactions costs. Instead the authors argue that it is important to recognize the Chartalist view of money as a social convention reflecting social relations. They argue that the effects of e-money are limited by the fact that there is always going to be a demand for hard currency/high-powered money for taxation purposes. The implications for monetary policy are deduced and assessed. Following from the theoretical analysis, an empirical analysis is then presented, analysing data on conventional monetary aggregates and e-money in both the USA and the EU, focusing in particular on the international differences in social conventions and institutions when using e-monies. Data limitations and issues are also explored.

Stephanie Bell-Kelton and Rex Ballinger in Chapter 8 look at the question of 'The monetary policy outcomes curve: can the size and structure of public debt undermine policy objectives?' This chapter examines the relationship between public debt and monetary policy outcomes as follows. When high-debt countries pursue expansionary monetary policy, the outcome may be contractionary because the lowering of interest rates cuts fiscal expenditures, perhaps by a substantial amount (e.g. Italy a decade ago). Similarly,

contractionary policy may have stimulative effects when the country has a high debt-to-GDP ratio, especially if a large portion of the debt is short-term. In contrast, monetary policy should have the predicted effects in countries with low debt-to-GDP ratios. The hypothesis is tested using data from 20 OECD countries.

Mark Roberts in Chapter 9 turns attention to the case of the Bank of England, and reviews monetary policy in a chapter entitled 'The Old Lady in new clothes: uncertainty and the UK monetary policy framework'. This chapter provides an introductory overview of current UK monetary policy, which was introduced in 1997. It involves an instrument-independent but goal-dependent central bank operating according to procedures that emphasize transparency and accountability in the conduct of monetary policy. In providing this overview, the rationale underlying the design of the framework will be explicitly considered in the context of the theoretical literature on the optimal design of monetary policy dating back to Friedman (1968). The chapter concludes with a brief consideration of both the empirical evidence concerning the introduction of the framework on inflation expectations and the challenges that continue to face policymakers operating within the framework.

Charles Goodhart also focuses on the Bank of England case in Chapter 10, which deals with specific questions relating to the UK monetary policy. This chapter is entitled 'The experience of inflation targeting since 1993', and asks four questions about the UK's recent experience with inflation targeting: (1) why has the economy during this period been so successful and stable? (2) how much has been due to good policy? (3) why is the Bank of England's forecast made on a constant interest rate path assumption? and (4) why have interest rate changes remained so autocorrelated? If the interest rate is set each time so as to drive forecast inflation into line with the desired target at a horizon date, should not interest rate changes then respond to unforeseen shocks, and be random walk? But they are not. The reasons are explored in this chapter.

Chapter 11 also deals with a specific case, this time Canadian monetary policy. Charles Freedman's chapter is entitled 'Reflections on the Bank of Canada monetary policy', and discusses the developments underlying the changes in the monetary policy framework in Canada over the past 30 years. Since the mid-1970s, monetary policy in Canada can be characterized as using or searching for a nominal anchor in a flexible exchange rate environment. In the 1975–82 period, the anchor was the narrow monetary aggregate M1. With the withdrawal of M1 as the target in 1982, the Bank of Canada searched for an alternative anchor for the rest of the decade. In 1991, it introduced inflation targeting, which has subsequently served as the basis for policy. This particular policy framework is the focus of the chapter.

The next two chapters deal with emerging and developing countries. In Chapter 12 A.P. Thirlwall addresses 'The determinants of saving in developing countries, and the impact of financial liberalization'. The chapter argues that there can be no question that saving and investment are important for economic growth, both directly and indirectly. The question is: what are the major determinants of saving and investment in developing countries, and to what extent can financial liberalization improve saving and investment performance? The conclusion is that traditional theories of savings behaviour are robust, but the impact of financial liberalization is weak. The chapter ends with the question: what is the optimal rate of interest?

Valpy FitzGerald in Chapter 13, 'Monetary models and inflation targeting in emerging market economies', extends and modifies the Keynesian critique of inflation targeting with reference to stabilization policy in emerging market economies. The IMF's 'basic monetary programming framework' for developing countries uses government borrowing and the exchange rate as policy instruments in order to achieve specific inflation and balance of payments targets. This chapter first adapts this standard model in order to include short-term capital flows and the floating exchange rate arising from financial liberalization. In this way, the macroeconomic consequences of the current Fund focus on inflation targeting and the use of a single monetary policy instrument (the interest rate, combined with rigid fiscal and reserve 'rules') in emerging market economies can be demonstrated. Second, the chapter encompasses the structuralist critique of the negative effect of inflation targeting on capacity utilization and trade competitiveness, leading to an argument for counter-cyclical monetary policy in response to external shocks. An alternative model is constructed within a comparable macroeconomic framework to that of the IMF in order to permit the shortcomings of inflation targeting to be rigorously demonstrated. A macroeconomic stabilization policy based on real exchange rate targeting, bank credit regulation and an active fiscal stance is shown to be more effective in supporting growth and investment.

Finally, in Chapter 14 L. Randall Wray deals with 'International aspects of current monetary policy'. This chapter examines the monetary policy appropriate for an open economy operating with a floating exchange rate. It is shown that most of the conventional wisdom is flawed. Briefly, the central bank sets the overnight interest rate target and then supplies or drains reserves to ensure that banks have the quantity desired and/or required. The treasury spends by crediting bank accounts and taxes by debiting them; deficits simply mean that bank accounts have been net-credited, hence reserves have increased. If this has created a position of excess reserves, then the central bank or treasury must sell bonds or the overnight rate will fall. Central bank operations are always defensive, and if international payments cause actual reserves to deviate from desired/required reserve positions, the

central bank has no choice but to 'sterilize' by supplying or draining reserves if it has a non-zero overnight rate target. The chapter questions whether there is any strong reason for the central bank to target a positive overnight interest rate in a nation operating with a floating exchange rate.

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2. New Consensus Monetary Policy: an appraisal

Philip Arestis and Malcolm Sawyer

1. INTRODUCTION

A number of countries have adopted an approach to monetary policy that is firmly based on the idea of an independent central bank using the key interest rate as the policy instrument to achieve the objective of an inflation target. The intellectual framework underpinning this approach is that of the New Consensus Macroeconomics (NCM). It is widely viewed as 'best practice' in monetary policy. Pioneered in New Zealand and Canada in the early 1990s, it has since spread to a number of countries, which have explicitly adopted inflation targeting (Sweden and the UK are two good examples). In other cases (most notably the European Central Bank) countries have adopted a policy close to inflation targeting, while in the USA it may be described as 'stealth inflation targeting'. This framework has been praised by most literature as a superior framework of monetary policy. We address the theoretical foundations of the NCM, and provide an assessment of its theoretical foundations. The combination of inflation targeting and the NCM we refer to as New Consensus Monetary Policy (NCMP). A final section summarizes and draws some conclusions.

2. NEW CONSENSUS MACROECONOMICS, MONETARY POLICY AND ITS MAIN FEATURES

NCMP is taken to include the following: (i) the setting by government (normally) of a numerical target range for the rate of (price) inflation; (ii) the use of monetary policy as the key policy instrument to achieve the target, with monetary policy taking the form of interest rate adjustments; (iii) the operation of monetary policy in the hands of an 'independent' central bank; (iv) monetary policy is only concerned with the rate of inflation, and the possible effects of monetary policy on other policy objectives are ignored, or assumed to be non-existent, with the exception of short-term effects. We suggest that

NCMP is a major policy prescription closely associated with the New Consensus Macroeconomics (NCM), and can be described succinctly in the following three equations (see, for example, McCallum, 2001; Arestis and Sawyer, 2004a; Arestis and Sawyer, 2005b):

$$Y_t^g = a_0 + a_1 Y_{t-1}^g + a_2 E_t(Y_{t+1}^g) - a_3[R_t - E_t(p_{t+1})] + s_1 \quad (2.1)$$

$$p_t = b_1 Y_t^g + b_2 p_{t-1} + b_3 E_t(p_{t+1}) + s_2 \quad (\text{with } b_2 + b_3 = 1) \quad (2.2)$$

$$R_t = (1 - c_3)[RR^* + E_t(p_{t+1}) + c_1 Y_{t-1}^g + c_2(p_{t-1} - p^T)] + c_3 R_{t-1} + s_3 \quad (2.3)$$

where Y^g is the output gap, R is nominal rate of interest, p is rate of inflation,[1] p^T is inflation rate target,[2] RR^* is the 'equilibrium' real rate of interest, that is the rate of interest consistent with zero output gap which implies, from equation (2.2), a constant rate of inflation, s_i (with i = 1, 2, 3) represents stochastic shocks, and E_t refers to expectations held at time t. Equation (2.1) is the aggregate demand equation with the current output gap determined by past and expected future output gap and the real rate of interest. Equation (2.2) is a Phillips curve with inflation based on current output gap and past and future inflation. Equation (2.3) is a monetary-policy rule, defined in the literature as a 'prescribed guide for monetary-policy conduct', which replaces the old LM curve. In this equation, the nominal interest rate is based on expected inflation, output gap, deviation of inflation from target (or 'inflation gap'), and the 'equilibrium' real rate of interest. The lagged interest rate represents interest rate 'smoothing' undertaken by the monetary authorities, which is thought of as improving performance by introducing 'history dependence' (see, for example, Rotemberg and Woodford, 1997; Woodford, 1999). Variations on this theme could be used; for example, interest rate 'smoothing' in equation (2.3) is often ignored, as is the lagged output gap variable in equation (2.1) so that the focus is on the influence of expected future output gap in this equation. It is also possible to add a fourth equation to (2.1)–(2.3). This would relate the stock of money to 'demand-for-money variables' such as income, prices and the rate of interest, which would reinforce the endogenous money nature of this approach with the stock of money being demand-determined. Clearly, though, such an equation would be superfluous in that the stock of money thereby determined is akin to a residual and does not feed back to affect other variables in the model. We have explored this issue and others related to whether the stock of money retains any causal significance at some length in Arestis and Sawyer (2003). There are three equations and three unknowns: output, interest rate and inflation.

We suggest that the economics of NCMP are firmly embedded in equations (2.1) to (2.3), especially equation (2.3). The first two equations are a skeleton

outline of the view of the working of the economy, and equation (2.3) specifies the approach to the monetary policy in the form of the setting of the interest rate. The third equation entails two important aspects of inflation targeting (henceforth IT). The first is the role of 'expected inflation'. The target and forecasts of inflation add an element of transparency seen as a paramount ingredient of IT. Inflation forecasting is a key element of IT. Inflation forecasts rest on an assessment of a number of relevant components. Although the variables used in this assessment differ among central banks, three may be particularly relevant: development of aggregate demand relative to output gap; inflation expectations; and trends in the exchange rate in a flexible exchange rate regime. Administrative price developments are also assessed, which are normally formed outside the market.[3] The emphasis on inflation forecasts entails a grave danger. There are the difficulties of assessing the relevant components of inflation forecasts. One clear implication of these difficulties is that there are normally large margins of error in forecasting inflation itself. This can, of course, seriously damage the reputation and credibility of central banks. The centrality of inflation forecasts in the conduct of this type of monetary policy represents a major challenge to countries that pursue IT.[4]

The second important aspect of equation (2.3) we wish to highlight is the variables included in this relationship. It is not merely the gap between current inflation and targeted inflation, but also the output gap. The underlying assumption here is that there is a trade-off between variations in inflation and in real economic activity. If no deviation between actual inflation and targeted inflation is tolerated, we can then have what one might describe as the 'inflation nutter' case.[5] It follows that the smaller the degree of tolerance over a given time horizon, the larger the variation that would have to be accepted in output gap. This trade-off is embedded in equation (2.3), where both the output-gap variable and that of the deviation of current inflation from targeted inflation are included.[6]

Inflation targeting is preferred to money supply targeting. This is due to the instability of the LM relationship, because of the unstable demand-for-money relationship (see, for example, HM Treasury, 2003). It can also be seen to target a final rather than intermediate objective. See also King (1997a, 1997b), who argues for the superiority of IT over a money-supply rule, in that it results in an optimal short-run response to shocks in a way that money-growth targeting does not (see also Svensson and Woodford, 2003). There are certain features that form the key aspects of the NCM monetary policy, which are embedded in equations (2.1) to (2.3) above. We discuss these features in this section, based on our more extensive study in Arestis and Sawyer (2005a).

(i) IT is a monetary policy framework that improves communication between the public, business and markets on the one hand, and policymakers on the other hand, and provides discipline, accountability, transparency, legitimacy and flexibility in monetary policy. However, credibility is recognized as paramount in the conduct of monetary policy to avoid problems associated with time-inconsistency.[7] It is argued that a policy which lacks credibility because of time-inconsistency is neither optimal nor feasible (Kydland and Prescott, 1977; Calvo, 1978; Barro and Gordon, 1983). Even if aggregate demand policies have an impact on output in the short run, a policy of non-intervention is preferable on grounds of addressing the time-inconsistency problem.

(ii) Monetary policy is the determinant of the rate of inflation through the effect of the interest rate on demand and on expectations, and in the long run the inflation rate is the only macroeconomic variable that monetary policy can affect. Monetary policy cannot affect economic activity, for example output, employment and so on, in the long run. The achievement of the long-run objective of price stability should take place at a minimum cost in terms of the output gap (deviation of actual from potential output) and deviations of inflation from its target (HM Treasury, 2003).

(iii) Fiscal policy is no longer viewed as a powerful macroeconomic instrument. It has a passive role to play in that the budget deficit position varies over the business cycle in the well-known manner. The budget can and should be balanced over the course of the business cycle, implying that an economy can achieve full employment with no growth in net financial assets. A clear statement of this view is made by Mishkin (2000) when he argues that 'Restraining the fiscal authorities from engaging in excessive deficits financing thus aligns fiscal policy with monetary policy and makes it easier for the monetary authorities to keep inflation under control' (p. 2). It is thereby suggested that within this framework, 'monetary policy moves first and dominates, forcing fiscal policy to align with monetary policy' (ibid., p. 4).

(iv) Monetary policy has, thus, been upgraded and fiscal policy has been downgraded. However, monetary policy should not be operated by politicians but by experts (whether banks, economists or others) in the form of an 'independent' central bank. There is, however, a difference between goal independence and instrument independence (Debelle and Fischer, 1994; Fischer, 1994). The argument is usually couched by the proponents in terms of goal dependence: it is more democratic for the elected government to set the goal of price stability, and for the central bank to pursue that goal by independently setting the instrument(s) of monetary policy (see, for example,

Bernanke et al., 1999).[8] Instrument independence is justified on two grounds: it resolves the problem of time-inconsistency and enables the central bank to be forward looking in view of the long and variable lags in monetary policy.

(v) Monetary policy should be used to meet the objective of low rates of inflation (which are always desirable in this view, since low, and stable, rates of inflation are conducive to healthy growth rates). This objective should be achieved through the principle of 'constrained discretion' (Bernanke and Mishkin, 1997, p. 104), rather than 'unfettered discretion' (King, 1997b). 'Constrained discretion' is actually viewed as 'middle ground' between 'rules' and 'discretion'. It is 'an approach that allows monetary policymakers considerable leeway in responding to economic shocks, financial disturbances, and other unforeseen developments. Importantly, however, this discretion of policymakers is constrained by a strong commitment to keeping inflation low and stable' (Bernanke, 2003a, p. 2; see also Bernanke, 2003b). This principle constrains monetary policy to achieve clear long-term and sustainable goals, but discretion is allowed to respond sensibly to unanticipated shocks. In this way, IT serves as a nominal anchor for monetary policy, thereby pinning down precisely what the commitment to price stability means.[9] As such, monetary policy imposes discipline on the central bank and the government within a flexible policy framework.

(vi) The source of domestic inflation (relative to the expected rate of inflation) is seen to arise from the output gap being positive, that is, output being above some 'normal' level. Inflation is postulated to rise if the output gap is positive. However, in the long run there is a relationship between output and inflation (and by implication no trade-off between unemployment and inflation). In the long run, inflation is viewed as a monetary (policy) phenomenon in that the rate of inflation is aligned with the rate of increase of the money supply (though that is implicit in the model outlined above). The essence of Say's Law holds, namely that the level of demand does not play an independent role in the determination of output in the long run.

3. AN ASSESSMENT OF THE THEORETICAL AND EMPIRICAL FOUNDATIONS OF INflATION TARGETING

In Arestis and Sawyer (2004b) we argued there that while monetary policy may very well be a flexible instrument in terms of stabilization objectives, whether it is the most significant determinant of inflation is a moot point. A related critical argument is that IT is an insufficient guide for monetary

policy in view of balance-sheet disorders (Palley, 2003). These imbalances are more likely to occur in today's environment of deregulated financial markets, essentially due to their ability to innovate and to generate credit and asset price bubbles. The imbalances thereby created are not expected to have immediate effects on inflation, but can have significant employment and output costs, especially as a result of the bursting of the bubble. These disorders are asset price and debt bubbles, which IT cannot cure. The implication is that additional policy measures are required; IT by itself cannot achieve the objectives assigned to it. Furthermore, IT can create moral hazard in asset markets (Palley, 2003). Monetary authorities pay little attention during the upturn, but are compelled to protect asset values during the downturn. This reinforces the argument about asset price bubbles to which we have just referred.

The asset price bubble aspect leads to a related problematic dimension of inflation targeting. It is the case that besides achieving a consumer price inflation target, central banks are required to maintain stability in the financial system. This entails providing sufficient liquidity so that the financial system can function uninterruptedly and be able to allocate resources and manage risks. More importantly for the purposes of this chapter, it also entails an ability to absorb shocks, thereby preventing asset bubbles and 'boom–bust' cycles (for alternative definitions of financial stability, see Houben et al., 2004, Appendix II). In fact,

> Over the past decade, safeguarding financial stability has become an increasingly dominant objective in economic policymaking. This is illustrated by the periodic Financial Stability Reports that have been launched by more than a dozen central banks and several international financial institutions (including the IMF, the Bank for International Settlements (BIS), and the World Bank, as well as by the more prominent place given to financial stability in many of these institutions' organizational structures and mandates. (Houben et al., 2004, p. 28)[10]

However, recent experience in the USA and Japan, and currently in the UK and Australia, suggests that the enormous emphasis on inflation targeting in the NCM monetary policy has been accompanied by insufficient attention paid to the equally important aspect of monetary policy – that of stability in the financial system. This indictment emerges from the fact that central banks over the last decade or so tend to react to asset bubbles when it is too late instead of attempting to prevent their occurrence. This has been justified under the pretext that central banks can never establish when an asset bubble is imminent, and that the size of the change in the rate of interest required to prick a bubble might be substantial and harmful to the real economy (Greenspan, 2002). Indeed, it could very well be that the IT approach could not tackle it either, as the study by Bordo and Jeanne (2002) has shown.

Using a stylized model they examine the possibility of pre-emptive monetary policy to conclude that 'optimal policy depends on the economic conditions in a complex, non-linear way and cannot be summarized by a simple policy rule of the type considered in the inflation-targeting literature' (p. 1). There is also the argument that, under IT, it is only inflation which is meant to be the objective of monetary policy, the arguments put forward above on the 'inflation nutter' aspect notwithstanding.

Another important critique is that of the practice of undertaking monetary policy within the IT framework by committees. This critique has been taken up by Blinder (1998), who argues that committees 'laboriously aggregate individual preferences … need to be led … tend to adopt compromise positions on difficult questions … tend to be inertial' (p. 20). Committee inertial behaviour, in particular, may induce the awkward problem of 'inducing the central bank to maintain its policy stance too long', thereby causing central banks 'to overstay their stance' (ibid.). This problem may be alleviated whenever there is a strong and powerful chairman of the monetary policy committee, but even then 'a chairman who needs to build consensus may have to move more slowly than if he were acting alone' (ibid., p. 21).

It is evident from the model above that expectations on inflation are postulated to have a major influence on actual inflation (equation 2.2), and that interest rates will continue to be raised while inflation is above the target rate (equation 2.3). Inflation targeting (and indeed any policy towards inflation) can on this view bring down inflation more quickly (and maintain low inflation) if it can influence inflation expectations accordingly. It could be noted that the control of the money supply policies of the early 1980s was based on a similar premise. In other words, announcing tough money supply growth targets (below current rate of inflation) would lower inflation expectations, and actual inflation would then be tamed with little short-run effect on unemployment (and no long-run effect). On those occasions when that experiment was attempted (for example, the UK, the USA and even Germany), money supply targets were often missed, but more relevant to the argument here, inflation did not come down rapidly. Money supply targets did not seem to have had the intended consequences. IT may have been more successful on this score (for a recent support of this view, see Mishkin, 2002). The transparency and accountability aspects of IT that are thought to enhance credibility may have been helpful on this score (see, for example, Arestis et al., 2002). However, the problem with this argument is that even non-IT central banks have been equally successful in taming inflation; and these central banks have not attempted conspicuously to become more transparent and accountable (Arestis and Sawyer, 2005a).

The most interesting aspect of the IT model for the purposes of this chapter is the mechanism whereby inflation is targeted. This is assumed to take place

through equation (2.1) where interest rates, themselves determined by the operating policy rule as in equation (2.3), affect aggregate demand and via equation (2.2) changes in the rate of inflation depend on aggregate demand. Then the strength, timing and predictability of the effects of changes in the rate of interest on aggregate demand become important questions. Higher (lower) interest rates tend to reduce (increase) aggregate demand, and lower (higher) aggregate demand is assumed to reduce (increase) the rate of inflation. The possibility that interest rates are regarded as a cost (by firms), thereby leading to higher prices, is not mentioned. This simple model refers to a single interest rate, and the feed-through of the central bank interest rate onto long-term interest rates is an issue. In this context, market assessments of the future direction of monetary policy play an important role. If a change in the short-term rate of interest were perceived as the first of a series of increases, its impact on long-term interest rates would be greater than if the markets expected no further changes. And yet, it would appear to be the case that it is long-term interest rates that are more important in terms of their impact on GDP and inflation.[11] Furthermore, and as one of the former chairmen of the Board of Governors of the Federal Reserve System has recently argued, since the early 1980s this 'new' approach to monetary policy 'relies upon direct influence on the short-term interest rate and a much more fluid market situation that allows policy to be transmitted through the markets by some mysterious or maybe not so mysterious process' (Volcker, 2002, p. 9). This mysterious, and not so mysterious, process we have dealt with in a separate study (Arestis and Sawyer, 2004a), and here we can only summarize the argument.[12]

There are, to begin with, the channels traditionally identified in the literature: the interest rate channel; the wealth effect channel; the exchange rate channel (although this particular channel may not be as traditional as claimed); and what has been termed the monetarist channel (but which is not the direct impact of the stock of money). Two further channels have been identified more recently: essentially a credit channel normally discussed as comprising two channels – the narrow credit channel (sometimes referred to as the balance sheet channel) and the broad credit channel.

We discuss the six channels briefly. The two credit channels, the narrow credit channel and the broad credit channel, are distinct but complementary ways whereby imperfections in financial markets might affect real magnitudes in the economy. They are concerned with how changes in the financial positions of lenders and borrowers can affect aggregate demand in the economy, on the assumption of credit market frictions. The narrow credit channel (also labelled the bank lending channel; see Hall, 2001) concentrates on the role of banks as lenders (Roosa, 1951; Bernanke and Blinder, 1988). Banks rely heavily on demand deposits subjected to reserve requirements as an impor-

tant source of funding economic activity. When there is a change in total reserves as a result of changes in monetary policy, bank reserves would be affected, thereby affecting their supply of loans to the private sector. Given that a significant number of firms and households depend on bank lending, ultimately aggregate demand and inflation would be affected.

The broad credit channel (also labelled the balance sheet channel; see Hall, 2001) describes how the financial health of borrowers can affect the supply of finance and ultimately aggregate demand (Bernanke and Gertler, 1989; 1999; Bernanke et al., 1999a). This channel relies heavily on an imperfect information assumption in terms of the supply of external finance to firms. This is that lenders charge borrowers a premium to cover monitoring costs; and it is the firm's financial position that determines their external finance premium. Thus low (high) gearing, that is, high (low) internal finance, implies small (large) external finance premium. Two important implications follow: the first is that there is a role for corporate cash flows. A policy-induced increase (decrease) in the rate of interest raises (lowers) the firm's gearing ratio, that is, the proportion of a given investment that must be financed from external funds, thereby increasing (reducing) the required premium to cover monitoring costs. The second implication is that asset prices play an important role as they determine the value of collateral that bank customers (firms and consumers) can use to support loan applications. In the presence of information asymmetries, agency costs and other credit market frictions, collateral values are paramount. As the value of the collateral declines, say because of falling asset prices, due to higher policy-induced interest rates, the borrower premium increases. Consequently, the impact on investment and consumption can be significant as a result of this 'financial accelerator' effect. *Mutatis mutandis* in the case where the value of collateral increases. Changes in asset prices are important in the case of the wealth effect channel too. The mechanism in this case works via consumer expenditure where the consumption function is hypothesized to depend on consumer wealth. Policy-induced changes in interest rates affect the value of asset prices and thereby the real value of consumer wealth. This in its turn leads to changes in consumer expenditure.

We may take next the interest rate channel and the monetarist channel together. These two channels depend heavily on the assumption made about the degree of substitutability between money and other assets. If this degree is very high between money and financial assets, particularly short-term liquid assets, then changes in the money supply will have significant effects on interest rates. Given some degree of price stickiness, real interest rates and the user cost of capital would also be affected. To the extent that the components of aggregate demand are interest rate sensitive, then policy-induced changes in interest rates would have a significant impact on the level and

pace of economic activity. This channel may also include 'availability' effects. Financial institutions may decide not to adjust their interest rates in response to a change in the central bank interest rate, but rather to apply some form of credit rationing (Stiglitz and Weiss, 1981). In this channel, therefore, interest rates provide more information than money supply changes. Monetary policy can be undertaken with greater certainty by acting directly to influence and control interest rates than by seeking to control the money supply. Monetary authorities have to provide, however, as much monetary base as it takes to achieve their target interest rate. If, by contrast, the degree of substitutability between money and a wide range of assets, including real assets, is high, then the impact of money supply changes would crucially depend on relative price changes. This monetarist channel, therefore, works through relative asset price changes. Interest rate changes do not play a special role other than as one of many relative price changes. Since the effect of monetary policy is on relative 'real' rates, it is pointless looking at the rate of interest to represent the thrust of monetary policy. Monetary policy should, thus, set the money supply and let interest rates become the endogenous magnitude. It is relative asset prices that can have an impact on aggregate demand.

The sixth channel of the impact of monetary policy is the exchange rate channel. It links monetary policy to inflation via two routes. The first is via total demand and works through the uncovered interest rate parity condition. The second relates interest rate differentials to expected exchange rate movements. Policy-induced changes in domestic interest rates relative to foreign interest rates would affect the exchange rate and this would lead to balance-of-payments changes. The overall level of aggregate demand would thereby be affected, influencing the inflation rate. The second route works through import prices. Changes in the exchange rate affect import prices directly, and these influence the inflation rate.[13]

It would appear from this discussion to be the case that monetary policy can affect both GDP and the path of inflation. The transmission mechanism, though, is by no means fully understood, nor is it easy to quantify it precisely.[14] For it is the case that however interesting it may be to identify and discuss the channels of the transmission mechanism of monetary policy, the problem is that there is considerable uncertainty both in terms of which channels monetary policy measure(s) affects the inflation target and its likely time profile. No wonder that there are important and influential central banks around the globe, and the US Federal Reserve System is an excellent example in this case, that reject policy rules, or even 'constrained discretion' and argue very strongly for pure discretion (for example Greenspan, 2002).

In Arestis and Sawyer (2005a) we examined further problematic aspects of IT, which we can summarize here. One is the nominal anchor aspect; it

relates to the adoption of a nominal anchor such as an inflation target, which does not leave much room for manoeuvre for output stabilization.

Another is the separation of real and monetary factors, namely, the assignment of monetary policy to the nominal side of the economy, and specifically to inflation, and supply-side policies to address the real side of the economy. It can first be noted that the estimates of the non-accelerating inflation rate of unemployment (NAIRU) (or equivalent) do often vary over time. Gordon (1997) has, for example, provided estimates of a time-varying 'natural rate of unemployment' drawn from evidence on the relationship between price inflation and the rate of unemployment. The OECD produces estimates of the non-accelerating wage rate of unemployment (NAWRU) on a bi-annual basis (see OECD *Economic Outlook* database). The component of aggregate demand, which is likely to be the most interest sensitive, is investment expenditure. This is supported by the results of the simulations of the effects of interest rate policy, to which reference is made below, in which the effect of interest rate change on investment is larger than the effects on other components of demand. The IT framework is concerned with the effects of interest rate on aggregate demand, and thereby on the rate of inflation. But it is, of course, the case that investment impacts on the time path of the capital stock, and hence on the future supply-side position. For monetary policy to have no lasting supply-side effects, it would have to be assumed that the real rate of interest averaged out at the equilibrium rate, and that the effects of interest rates (relative to the equilibrium rate) were symmetrical. Even then there would be effects on investment, which would last for some time (perhaps 20 years, depending on the life of the capital stock). But this would imply that the reduction of inflation through deflationary monetary policy and higher interest rates would have a long-lasting effect on the capital stock.[15]

A further problematic aspect relates to the causes of inflation. In the context of the working of monetary policy, this view of inflation, namely that it is caused by demand factors, raises three issues. The first is the question of how effective monetary policy is in influencing aggregate demand and thereby inflation. The evidence, surveyed in Arestis and Sawyer (2004a), suggests that it is rather ineffectual. Second, if inflation is a 'demand phenomenon', and not a cost phenomenon, as reflected in the Phillips curve of equation (2.2), then the question arises as to whether monetary policy is the most effective (or least ineffective) way of influencing aggregate demand. In Arestis and Sawyer (2004a), we concluded that it is not, and suggested that fiscal policy is a clear alternative policy instrument. Third, there is the question of whether the possibility of sustained cost-push and other non-demand-related inflation can be as lightly dismissed as the 'New Consensus' appears to do. The version of the Phillips curve which appears as equation (2.2) is a (heav-

ily) reduced form that does not explicitly consider wages, material costs and imported prices. A sustained money wage push makes no appearance in equation (2.2) and it would appear that there is no explicit representation of such pressures. An increase in, for example, wage aspirations on the part of workers or pressure for higher profit margins is not incorporated, though it could be argued that they would be reflected in the stochastic term.

4. SUMMARY AND CONCLUSIONS

We have argued in this chapter that IT is closely associated with the NCM. We have located the theoretical foundations of IT and identified a number of weaknesses and reservations with it. In a separate paper (Arestis and Sawyer, 2005a) we assessed critically the empirical work undertaken on IT. We relied on two types of evidence in that assessment: empirical evidence based on macroeconometric models, and evidence that emanates from the application of single-equation techniques. We conclude that changes in the rate of interest are not expected to have the impact assigned to them by the theoretical propositions of the IT model. In terms of the empirical work that uses single-equation econometric techniques, we conclude that there is no evidence that IT improves economic performance as measured by the behaviour of inflation, output and interest rates. Not that better performance was not evident for the IT countries: inflation fell in these countries and became more stable; and output growth stabilized during the IT period as compared to the pre-IT period. But then the same experience was evident for countries that did not adopt IT (see also Ball and Sheridan, 2003). Consequently, better performance must have been due to something other than IT. We may also add that in post-1998 South East Asia inflationary pressures were avoided in the absence of IT.

It would appear that Mishkin's (1999) premature statement that the reduction of inflation in IT countries 'beyond that which would likely have occurred in the absence of inflation targets' (p. 595) is not supported by any theoretical reasoning or empirical evidence. We would, therefore, conclude overall along with Ball and Sheridan (2003) that the recent 'low-inflation' era is not different for IT and non-IT countries. Consequently, IT has been a great deal of fuss about really very little!

NOTES

1. The target variable is normally the consumer price index (CPI). It is well accepted that CPI provides a good approximation of the general price level in an economy. CPI normally excludes house mortgage payments, indirect taxes and subsidies. These items are

thought to have only a transitory impact on inflation, and therefore should not influence monetary policy.

2. The inflation target is normally 2 per cent, for two main reasons. CPI does not properly mirror changes in the quality of the goods and services included in CPI; such changes should not be treated as worrisome. The second reason is the possibility of deflation, and that an inflation target below 2 per cent could potentially produce such an outcome, especially if expectations of falling prices set in. Monetary policy becomes impotent then since the rate of interest cannot fall below zero.
3. When the assessment of all the components referred to in the text is complete, a forecast of future inflation is published in an Inflation Report. This forecast is in the form of a numerical identification of the 'most probable' path in the future. Uncertainty intervals of the forecast point estimates of inflation are ascertained from alternative scenarios along with the probability of their occurrence. This is accompanied by 'fan charts' that indicate the degree of uncertainty in the inflation forecasts. They also show how this degree of uncertainty grows as the forecasting horizon lengthens.
4. For a recent critique and further elaboration, as well as a discussion of rules of monetary policy and a suggestion for describing IT as a 'forecast-targeting rule', or 'forecast targeting' (with the Reserve Bank of New Zealand being cited as an example of this procedure), see Svensson (2003).
5. In practice central banks have resolved the problem of 'inflation nutter' in the following way. The implicit stance adopted by central banks is to have a steering horizon of normally one to two years. This reflects the belief that in the space of one year forecast inflationary pressures may be transitory and should fade away over the steering horizon, if the forecast points to inflation being close to target near to the end of the steering period. Indeed, there may be occasions when steering horizons should be extended (shortened). Supply shocks, for example oil price changes, that push inflation above (below) the inflation target over the steering horizon, may require extending (shortening) the latter rather than increasing (reducing) the rate of interest. Also, if a supply shock requires an excessively large interest rate adjustment, a longer steering horizon would be needed to avoid dramatic and unduly drastic economic effects. Still, central banks may deviate from the IT rules if the banking system is either going through, or indeed threatened by, a financial crisis.
6. In Taylor (1993) the original monetary-policy rule formulation was: $R_t = RR^* + d_1 Y_t^g + d_2 (p_t - p^*)$, where the symbols are as above, with the exception of p^*, which stands for the desired inflation rate; the coefficients are $d_1 = 0.5$ and $d_2 = 1.5$, p^* is 2 per cent and the average short-term real interest rate is 2 per cent, so that RR^* is 4 per cent. d_2 is required to be greater than one, the 'Taylor Principle', for unique equilibrium in sticky-price models (Taylor, 1999; Woodford, 2001).
7. The time-inconsistency problem may be briefly summarized. Central banks that pursue discretionary monetary policies with the specific objective of improving real economic activity (output or unemployment) in the short run may very well cause inflation without any gains in economic activity in the long run (see, for example, Barro and Gordon, 1983).
8. See, however, Forder (2003) for a critique of the democratic view of goal dependence.
9. The evidence in Levin at al. (2004) gives some credence to this argument. IT affects the public's expectations about inflation, particularly at large horizons. IT is thought to 'anchor' expectations, so that changes in actual inflation affect inflation expectations much less than otherwise. The 'steering' time length required for this effect is found to be five to ten years, much longer than the 'steering' period utilized by most central banks round the globe.
10. Houben et al. (2004) relate the renewed emphasis on financial stability to four major trends: '(1) the financial system has expanded more rapidly than the real economy; (2) the composition of the financial system has changed, with non-monetary assets becoming more important; (3) the financial system has become more integrated, both cross-sector and cross-border; and (4) the financial system has become more complex' (p. 28).
11. It is very difficult to explain why central banks operate on the short-term rate rather than

on the long-term rate. However, one explanation is that central banks may be in a better position to control directly the short-term, rather than the long-term, rate of interest.

12. We may note in passing that IT is concerned with the rate of interest that supports rentiers. This is a serious worry in that this class does not produce. A monetary policy that helps to redistribute income and wealth towards labour, which matters in production, should be preferred.
13. It is important to examine the quantitative impact of changes in the rate of interest on both the level of economic activity and the rate of inflation, in an attempt to verify or otherwise the channels through which monetary policy works. This has been dealt with in Arestis and Sawyer (2004a), where we concluded that interest rate variations could have long-lasting effects, in that the effects on investment will lead to changes in the size of the capital stock. The effects of interest rate changes on the rate of inflation are rather modest. A 1 percentage point change in interest rates is predicted to lead to a cumulative fall in the price level of 0.41 per cent in one case and 0.76 per cent in the other, after five years. The rate of inflation declines by a maximum of 0.21 percentage points.
14. A recent study by Altavilla and Landolfo (2005) studies cross-country asymmetries in ten EMU countries of the monetary policy transmission, and concludes that output gap and inflation respond to identical monetary shocks with a similar speed and movement, but with a different degree of effect. Monetary policy exerts its maximum effect after more than two years in almost all countries, with the largest effects being present in the cases of Germany, Austria and Finland.
15. An interesting recent study by Bodkin and Neder (2003) examines IT in the case of Canada for the period 1980–89 and 1990–99 (the IT period). Their results, based on graphical analysis, clearly indicate that inflation over the IT period did fall, but at a significant cost of unemployment and output. This leads the authors to the conclusion that a great deal of doubt is cast 'on the theoretical notion of the supposed long-run neutrality of money', an important, if not the most important, ingredient of the theoretical IT framework. They also suggest that the 'deleterious real effects (higher unemployment and … lower growth) during the decade under study suggests that some small amount of inflation (say in the range of 3 to 5 per cent) may well be beneficial for a modern economy' (p. 355).

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3. Central bank behaviour and the stability of macroeconomic equilibrium: a critical examination of the 'New Consensus'

Mark Setterfield*

1. INTRODUCTION

It has become commonplace to refer to the existence of a 'New Consensus' in monetary macroeconomics. According to Taylor (2000, p. 91), variants of this model are already characteristic of most macroeconomic policy research and the policy models of several prominent central banks, including the Federal Reserve and the European Central Bank.

Macroeconomics is, of course, no stranger to 'consensus', having been dominated for several decades by the Neoclassical Synthesis.[1] But the problem with consensus – especially when it is more apparent than real – is that it can serve to narrow and stifle debate, something that can only fetter scientific progress. As Mehrling remarks with respect to the Neoclassical Synthesis:

> in the beginning, the neoClassical Synthesis was more of a way of talking than a way of thinking, a common language that allowed diverse groups interested in economic issues to converse with one another … [But] as more and more economists came to speak the new language, it became not just a way of talking but a way of thinking. What could not be said in the new language could not be understood, and hence must be nonsense. The price paid for the unification of economics discourse was therefore a certain flattening of that discourse. (Mehrling, 1996, p. 72)

This chapter asserts the importance of continued debate in macroeconomics, based on a critical examination and comparative evaluation of 'baseline' New Keynesian and New Consensus macroeconomics. Particular emphasis is placed on the treatment of monetary policy and the stability of equilibrium in these models. In the next section, a baseline New Keynesian model is developed, in which the instrument of monetary policy is the quantity of money in circulation and the economy is rendered stable by the Pigou effect. In section 3, a

New Consensus model is developed. The New Consensus builds on the baseline New Keynesian model, but the central bank is assumed to use the interest rate rather than the money supply as its monetary policy instrument. This change in the description of the conduct of monetary policy is designed to increase the realism of New Keynesian macroeconomics. It is demonstrated, however, that any such increase in realism is purchased at a cost: the stability of equilibrium in the New Consensus model is not analytically robust. Ultimately, it is shown that this feature of the New Consensus model means that both the descriptive and prescriptive value of the model rests on an untested empirical claim about relative speeds of disequilibrium adjustment. Finally, section 5 ends with some conclusions.

2. A 'BASELINE' NEW KEYNESIAN MODEL OF THE ECONOMY

Consider the following four equations, which together make up a simplified 'baseline' New Keynesian (BNK) model of the economy:[2]

$$d = m \tag{3.1}$$

$$y = d - p \tag{3.2}$$

$$p = p_{-1} + \alpha(y - y_n)_{-1} \tag{3.3}$$

$$m = \overline{m} \tag{3.4}$$

where d denotes nominal demand growth, m is the rate of growth of the money supply, p is the rate of inflation and y and y_n are the actual and natural rates of growth of real output, respectively.[3] Equation (3.1) describes the growth of nominal demand as being uniquely determined by the rate of growth of the money supply, and is derived from the equation $D = M\overline{V}$, where upper-case characters denote the levels of variables and V is the income velocity of circulation of money (assumed constant). Equation (3.2), meanwhile, suggests that real output growth varies with the difference between nominal demand growth and inflation, and follows from the accounting identity $D \equiv PY$.

Equation (3.3) is essentially a Phillips curve that describes the determination of inflation in a manner that is consistent with the emphasis of New Keynesianism on natural rate theory and on nominal inertia. Hence according to this equation, any change in the rate of inflation depends on the discrepancy between the actual and natural rates of growth in the previous period.

The presumption in equation (3.3) is that it takes time for an output gap to affect nominal variables, because the optimizing behaviour of workers and firms renders nominal wages and prices sticky and therefore slow to adjust to the pressures of excess demand.

Finally, equation (3.4) describes the conduct of monetary policy. The central bank is assumed to manipulate the money supply in accordance with a constant money supply growth rule.

Equilibrium is achieved when the rate of inflation is steady, from which it follows (from (3.3)) that the equilibrium rate of growth, y^*, is given by $y^* = y_n$. This information, in turn, can be used in combination with (3.1), (3.2) and (3.4) to determine the equilibrium rate of inflation, p^*, which is $p^* = \overline{m} - y_n$. The structural relations in equations (3.1)–(3.4) together with the equilibrium configuration described above are illustrated in Figure 3.1 below.

Suppose that we now consider the implications of a demand shock in this model. Because the central bank has complete control over the rate of growth

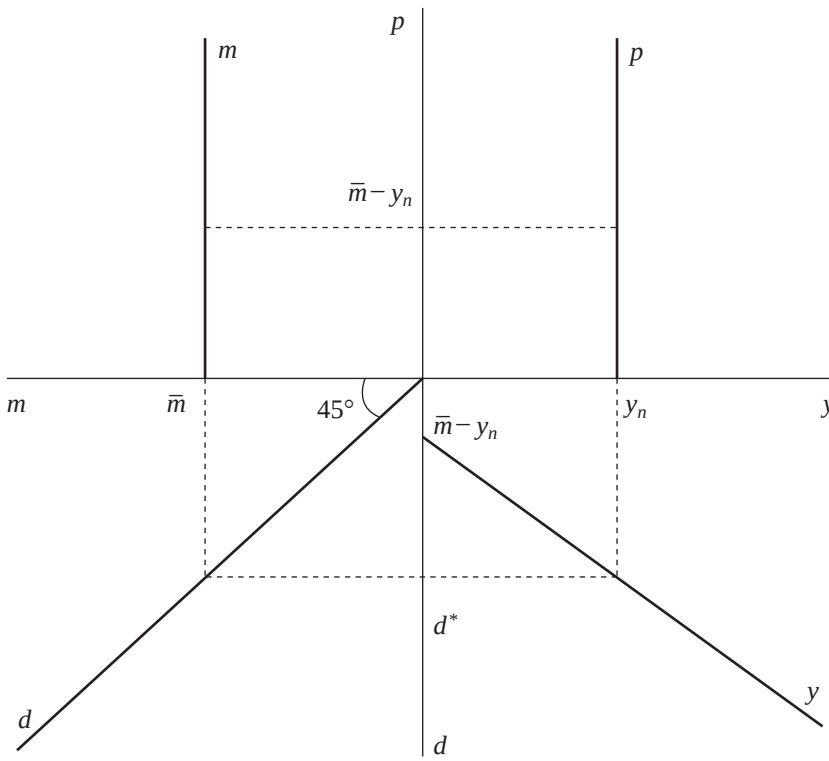
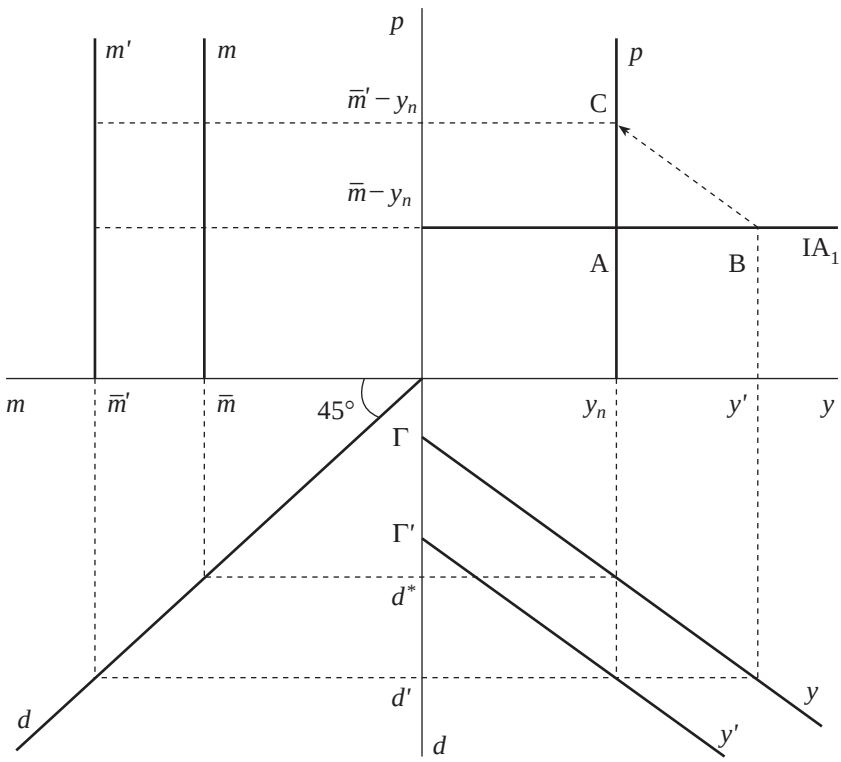


Figure 3.1 The baseline New Keynesian model

of nominal demand (equations (3.1) and (3.4)), the only way in which we can do this is by contemplating a change in the rate of growth of the money supply. Suppose, then, that m increases from $\bar{m}$ to $\bar{m}'$. This will cause an increase in d of equal magnitude (to d' in Figure 3.2) in equation (3.1), an event that will, in turn, have the same effect on y (which increases from y_n to y' in Figure 3.2) in equation (3.2). This latter result follows from the nominal inertia in equation (3.3). The value of p is initially invariant with respect to the change in d since $(y - y_n)_{-1} = y_n - y_n = 0$ in the period during which the shock first takes effect, so we have $p = p_{-1} = \bar{m} - y_n$. These events are summarized by the movement of the economy from point A to point B in the



Notes:
$\Gamma = \bar{m} - y_n$
$\Gamma' = \bar{m}' - y_n$

Figure 3.2 Response of the baseline New Keynesian model to a demand shock

north-east quadrant of Figure 3.2 along the horizontal short-run inflation-adjustment schedule IA_1.

The economy will not, however, remain at point B. In the next period, we will have $(y - y_n)_{-1} = y' - y_n > 0$ in (3.3), as a result of which the rate of inflation will increase. As p rises, the intercept of the $y = d - p$ schedule in the south-east quadrant of Figure 3.2 also increases, reducing the value of y associated with $d' = \overline{m}'$. This process of increasing inflation and falling output growth will be repeated in each successive period for which $y > y_n$ so that, over time, the economy will follow the trajectory depicted in the north-east quadrant of Figure 3.2 from point B to point C. Equilibrium is regained at point C where $y = y_n$ and $p = p_{-1}$, with the equilibrium rate of inflation now given by $p' = \overline{m}' - y_n$.

This simple model captures several important properties of New Keynesian macroeconomics. Hence the long-run neutrality of money and concomitant irrelevance of aggregate demand are both evident. Real outcomes are determined by the supply-constrained equilibrium rate of growth y_n, save for transitory departures from this equilibrium (in which demand *does* play a role) caused by nominal rigidities. New Keynesians have, of course, expended considerable resources developing the precise microfoundations of nominal rigidities, but far more important for the purposes of this chapter are two other features of the BNK model developed above. The first is its treatment of monetary policy, which involves the central bank controlling and conducting monetary policy through manipulation of the quantity of money in circulation. This is evident in equation (3.4). The second is its use of the real balance or Pigou effect to force the quantity of goods demanded to adjust to aggregate supply and thus render the supply-determined equilibrium rate of growth of real output (y_n) stable. Hence note that in the preceding description of how the BNK model responds to a demand shock, it is the lagged response of p to an increase in m and the resultant increase in the rate of growth of real balances $(m - p)$ that causes y to rise initially (since, from (3.1) and (3.2), $y = d - p = m - p$). Subsequently, increases in p (resulting from $y > y_n$) with $m = \overline{m}'$ constant erode the rate of growth of real balances and hence reduce the value of y. Ultimately, with stable inflation regained at point C (where the equilibrium rate of inflation is $p' = \overline{m}' - y_n$), the rate of growth of real balances is restored to $m - p = \overline{m}' - \overline{m}' + y_n = y_n$, which is exactly the same value observed at the initial equilibrium position ($m - p = \overline{m} - \overline{m} + y_n = y_n$) and is, of course, consistent with the unique, supply-determined equilibrium rate of growth of real output y_n.

As will become clear in what follows, the New Consensus has placed much emphasis on the first of these features of the BNK model (money supply targeting by the central bank) but has had far less to say about the second (the importance of the Pigou effect for the stability of y_n). As we shall

see, this has important implications for the extent to which the New Consensus can be regarded as having successfully reconciled contemporary central bank behaviour with the core of macroeconomic theory that it inherits from the BNK model.

3. THE NEW CONSENSUS MODEL

The Model

The New Consensus (NC) model was born of a desire to incorporate an interest rate operating procedure (IROP) into New Keynesian macroeconomics, in order to make the latter's description of monetary policy more realistic at a time when central banks make no pretence to be setting targets for the quantity of money in circulation.[4] The NC model can be summarized by the following four equations:

$$d = y_0 + p - \delta r \tag{3.5}$$

$$y = d - p \tag{3.6}$$

$$p = p_{-1} + \alpha(y - y_n)_{-1} \tag{3.7}$$

$$r = r_{-1} + \beta(y - y_n)_{-1} + \gamma(p - p^T) \tag{3.8}$$

where y_0 denotes the autonomous component of real output growth, r is the real interest rate and p^T represents the central bank's inflation target. All other variables are as previously defined.

Equations (3.6) and (3.7) are immediately recognizable as being identical to equations (3.2) and (3.3) in the BNK model. Hence the key differences between the BNK and NC models are: a change in the relationship between monetary policy and nominal demand growth (equation (3.5)); and the way in which central bank behaviour is modelled (equation (3.8)).

Equation (3.1) simply decomposes nominal demand growth into two components – inflation and the rate of growth of demand for real output. The latter is, in turn, decomposed into an endogenous component that depends on the real interest rate and an autonomous component that is assumed to vary with, for example, fiscal policy or the balance of trade. The inclusion of the autonomous component y_0 in equation (3.5) means that monetary policy does not completely determine the rate of growth of nominal demand, as in (3.1). Moreover, monetary policy impacts nominal demand growth via the interest rate – there is no causal role for the quantity of money in the NC model.

Equation (3.8) is a Taylor rule that describes monetary policy as acting on the real interest rate in response to events within the economy (specifically, the difference between the actual and natural rates of growth and/or any departure of the actual rate of inflation from the central bank's target rate).[5] Again, the quantity of money is conspicuous by its absence from equation (3.8), which assumes that the conduct of monetary policy is characterized by an IROP.

There are several noteworthy features of the IROP in equation (3.8) that merit further discussion. First, it describes the central bank as acting on *real* interest rates. As such, for any $\gamma > 0$, equation (3.8) automatically satisfies the 'Taylor principle' (Clarida et al., 1999, p. 1701; Woodford, 2001; Mankiw, 2001, pp. 37–40; Smithin, 2004, p. 4). As originally advocated by Taylor (1993), this states that in response to a change in the rate of inflation, the central bank should adjust *nominal* interest rates by a magnitude greater than that of the initial change in inflation – thus ensuring an inverse relationship between *real* interest rates and the rate of inflation, as in equation (3.8).[6] The Taylor principle is a necessary (but not sufficient) condition for the stability of equilibrium in the NC model.[7]

A second important feature of the IROP in equation (3.8) is that it allows for automatic revision over time of the interest rate that prevails when $y = y_n$ and $p = p^T$ (i.e., the first term on the right-hand side of (3.8)). This avoids the possibility that the central bank will miss its inflation target – a problem that can rise in the NC model if the interest rate that prevails when $y = y_n$ and $p = p^T$ is treated as a constant (Woodford, 2001, pp. 235–6; Lavoie, 2004, pp. 7–8).[8]

In short, the specification of equation (3.8) is designed to avoid commonly understood problems with the equilibrium and stability properties of the NC model and thus contributes to a formulation of this model that presents the New Consensus in a favourable light. It is important to emphasize this point here because of the scrutiny to which the stability properties of the NC model will subsequently be subjected.

Equilibrium is achieved in the NC model when steady inflation consistent with the central bank's inflation target is achieved (i.e., $p = p_{-1} = p^T$). Under these conditions, we have $y = y_n$ from (3.7) and hence $r = r_{-1} = r^*$ from (3.8), where r^* denotes the equilibrium real interest rate. Note that substituting (3.5) into (3.6) yields $y = y_0 - \delta r$.[9] Hence in equilibrium, we can write:

$$y_n = y_0 - \delta r^*$$

$$\Rightarrow \quad r^* = \frac{y_0 - y_n}{\delta}$$

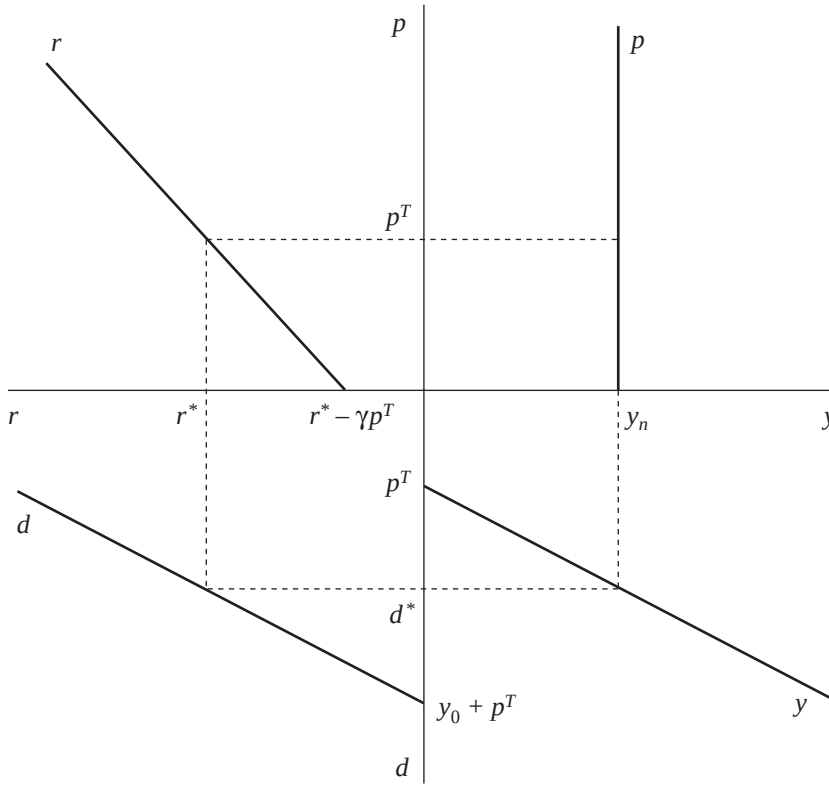
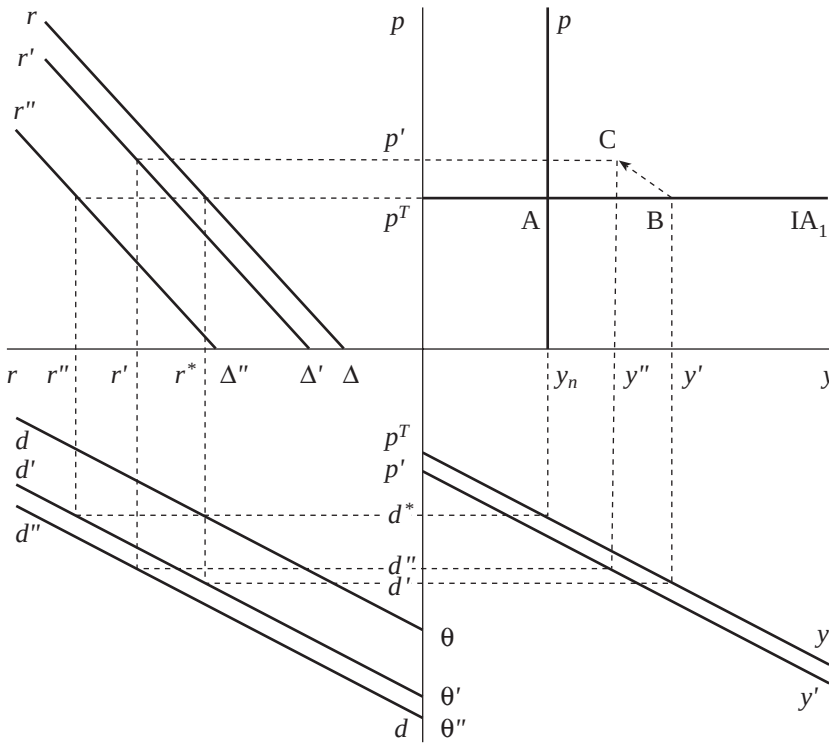


Figure 3.3 The New Consensus model

The equilibrium real interest rate is thus determined independently of monetary policy by the exogenous givens y_0, y_n and δ, and has the same characteristics as the Wicksellian natural rate of interest, with which it is usually identified (see, for example, Michl, 2002, p. 61; Lavoie, 2004, p. 8). Figure 3.3 illustrates the NC model in an initial position of equilibrium.[10]

We can now consider the implications of a demand shock for the NC model. First, note that because monetary policy does not completely determine the rate of growth of nominal demand, this demand shock need not emanate from monetary policy (as it must in the BNK model developed previously). Suppose, then, that we begin with a change in fiscal policy that increases y_0 to y_0'.[11] In the first instance, the only effect of this demand shock will be to increase the rate of growth of nominal demand associated with the current real interest rate (as depicted by the shift in the *d* schedule in the southwest quadrant of Figure 3.4 below) which will, in turn, cause an increase in *y*



Notes:
$\Delta = r^* - \gamma p^T$
$\Delta' = r^* + \beta(y' - y_n) - \gamma p^T$
$\Delta'' = r'' - \gamma p^T$
$\Theta = y_0 + p^T$
$\Theta' = y_0' + p^T$
$\Theta'' = y_0' + p'$

Figure 3.4 Response of the New Consensus model to a demand shock

(to y' in Figure 3.4) of equal magnitude. This latter result follows from the lagged response of r to departures of y from its natural rate in (3.8), coupled with the nominal inertia embodied in (3.7). The latter ensures that there will be no initial change in p and hence no initial difference between the actual and target rates of inflation that would otherwise result in a change in r in equation (3.8). As in the BNK model, then, the immediate impact of a demand shock in the NC model is simply to raise y, an adjustment that is summarized by the movement of the economy from point A to point B in the north-east quadrant of Figure 3.4, along the short-run inflation adjustment schedule IA_1.

Once again, however, the economy will not remain at point B. At the start of the second period, we will have $(y - y_n)_{-1} = y' - y_n > 0$ which will increase p (to p' in Figure 3.4) in equation (3.7). With both $(y - y_n)_{-1} = y' - y_n > 0$ and $p - p^T = p' - p^T > 0$, there will also be an increase in r (to r' in Figure 3.4) in equation (3.8) that will, in turn, reduce d and y (to d'' and y'' respectively in Figure 3.4) in equations (3.5) and (3.6).[12] The economy will thus move from point B to a point such as C in the north-east quadrant of Figure 3.4 as a result of these adjustments. Subsequent adjustments will ensure that equilibrium is regained when we once again observe steady inflation consistent with the central bank's inflation target (i.e., $p = p_{-1} = p^T$).[13] At this point, we will observe $y = y_n$ (from equation (3.8)) – so the economy will be back at point A in the north-east quadrant of Figure 3.4. We will also observe $r = r_{-1} = r''$ from equation (3.8) (as depicted in the north-west quadrant of Figure 3.4). Note that, using (3.5) and (3.6), we can determine that the equilibrium real interest rate r'' is now given by:

$$r'' = \frac{y_0' - y_n}{\delta}$$

In other words, the equilibrium value of the real interest rate has increased to match the new, higher value of the natural rate of interest – something that itself results from the increase in y_0 to y_0' associated with the initial fiscal stimulus.[14] Ultimately, then, inflation and the rate of growth of real output will return to their original equilibrium values (p^T and y_n respectively) prior to the demand shock and the only lasting result of the fiscal stimulus that we began with will be a higher equilibrium real interest rate.

Stability of Equilibrium in the NC Model

Both the BNK and NC models are clearly predicated on the same basic macroeconomic principles (the long-run neutrality of money and the automatic reversion of the real economy towards a unique, supply-determined equilibrium). But as intimated earlier, a key feature of the NC model is its adoption of an IROP to describe the conduct of monetary policy, in place of the manipulation of the money supply that is characteristic of the BNK model. This change in the characterization of monetary policy as between the BNK and NC models is not the result of any new body of monetary theory. Rather, its source is pragmatism: a desire to reconcile New Keynesian macroeconomics with the overwhelming evidence that contemporary central bank practice involves the use of IROPs, not money supply targeting (Romer, 2000, pp. 154–5; Taylor, 2000, p. 92).[15] Replacing money supply targeting with an IROP thus increases the realism of the NC model relative to its BNK

counterpart. But this increased realism comes at a cost: it renders the stability of equilibrium in the NC model analytically fragile.

As discussed in section 2, a key feature of the BNK model is its use of the Pigou effect to make y_n stable. But an important feature of the NC model is that the Pigou effect is conspicuous by its absence. This can be verified as follows. We begin with the identity $D \equiv MV$, from which it follows that:

$$d \equiv m + v$$

If we now assume that $v = 0$ (as in the BNK model), we get:

$$d = m$$

which is, of course, identical to equation (3.1) in the BNK model. But in the NC model, d is determined independently of m by equation (3.5), so the correct *causal* interpretation of the relationship derived above is now:

$$m = d$$

or (given (3.5)):

$$m = y_0 + p - \delta r \tag{3.9}$$

Explicit introduction of the quantity of money in circulation into the NC model reveals that m is an endogenous variable (or 'residual') which, under standard assumptions about the behaviour of v, depends on y_0, p and r. This much is well known. But note that an important corollary of (3.9) is that, *ceteris paribus*, any increase in p will result in an increase in m of equal magnitude. To put it differently, the rate of growth of real balances in the NC model is invariant with respect to the rate of inflation: it is, instead, given by $m - p = y_0 - \delta r$. As such, an increase in p in response to $y > y_n$ in equation (3.7) will not in and of itself lead to a decrease in $m - p$ and hence the reduction of y towards y_n as in the BNK model. There is no Pigou effect.[16]

The NC model is, therefore, absent of any intrinsic (to the private sector) stability mechanism. The reason is, quite simply, that in the NC model, the central bank effectively supplants any such stability mechanism – specifically, it replaces the Pigou effect with its own, administered adjustment of the real interest rate – in the course of changing the conduct of monetary policy from manipulation of the money supply to an IROP (see also Michl, 2002, p. 159 and especially Palacio-Vera, 2002, pp. 19–26, who develops this point at length). It should be noted that the NC model described earlier 'survives' this transformation, in the sense that the system of equations (3.5)–(3.8) is

stable. As noted above, an increase in p in response to $y > y_n$ in equation (3.7) will be accommodated by an increase in m of equal magnitude, so that, *ceteris paribus*, $m - p$ and y are unchanged – there is no Pigou effect. But because of equation (3.8), other things are not equal: both a positive output gap and the rise in p above its target rate to which this output gap gives rise will cause an increase in the real interest rate. Thanks to equations (3.5) and (3.6), this *will* reduce y. The central-bank-administered adjustment mechanism described here suffices to ensure the stability of equilibrium in equations (3.5)–(3.8), a result that is easily verified as follows. First, substituting (3.5) into (3.6) we arrive at:

$$y = y_0 - \delta r$$

$$\Rightarrow \quad \dot{y} = -\delta \dot{r}$$

Now note that rearranging (3.8) (and dropping time subscripts) yields:

$$\dot{r} = \beta(y - y_n) + \gamma(p - p^T)$$

Combining the information derived so far, we have:

$$\dot{y} = -\delta\beta(y - y_n) + \delta\gamma(p - p^T) \tag{3.10}$$

which, in conjunction with equation (3.7), gives us a system of two differential equations in two unknowns (y and p) that can be summarized as:

$$\begin{bmatrix} \dot{y} \\ \dot{p} \end{bmatrix} = \begin{bmatrix} -\delta\beta & -\delta\gamma \\ \alpha & 0 \end{bmatrix} \begin{bmatrix} y \\ p \end{bmatrix} + \begin{bmatrix} \delta(\beta y_n + \gamma p^T) \\ -\alpha y_n \end{bmatrix}$$

Since $|\mathbf{J}| = \alpha\delta\gamma > 0$ and $\mathrm{Tr}\,(\mathbf{J}) = -\delta\beta < 0$, the equilibrium of the NC model in equations (3.5)–(3.8) (in which $p^* = p^T$ and $y^* = y_n$) is stable, as illustrated in Figure 3.5.[17]

However, the displacement of the Pigou effect by the central bank is not quite as innocuous as the stability analysis above suggests. This is because the precise form of the central bank's IROP is a matter of policy choice, and the stability of equilibrium in the NC model is sensitive to the precise specification of the IROP. Hence suppose, for example, that $\gamma = 0$, so that the IROP in (3.8) becomes

$$r = r_{-1} + \beta(y - y_n)_{-1} \tag{3.8a}$$

This, in turn, transforms (3.10) into

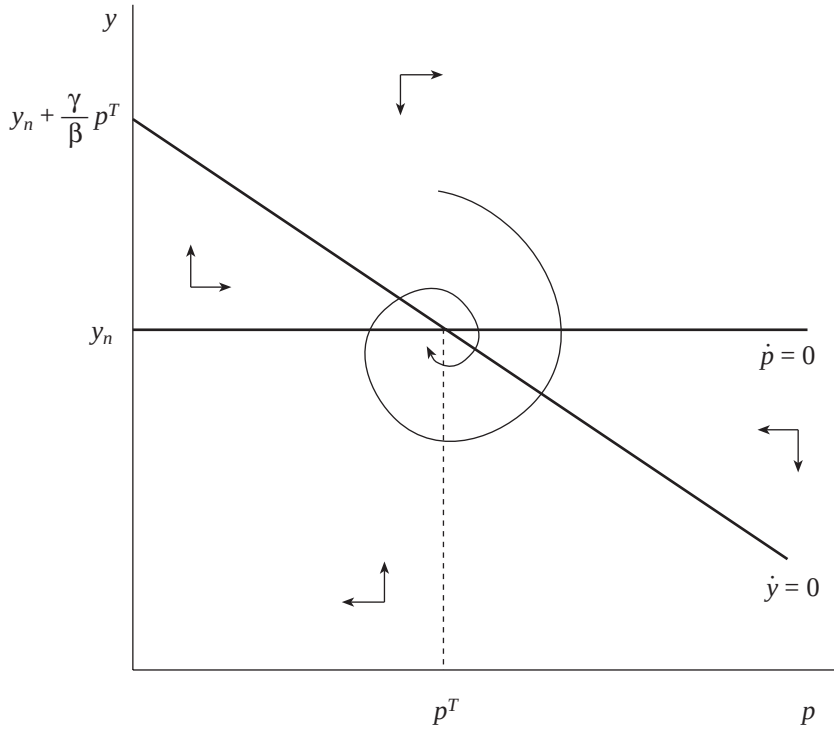


Figure 3.5 Stability of equilibrium in the NC model when the IROP is given by $r = r_{-1} + \beta(y - y_n)_{-1} + \gamma(p - p^T)$

$$\dot{y} = -\delta\beta(y - y_n) \tag{3.10a}$$

and combining (3.7) and (3.10a), we now have:

$$\begin{bmatrix} \dot{y} \\ \dot{p} \end{bmatrix} = \begin{bmatrix} -\delta\beta & 0 \\ \alpha & 0 \end{bmatrix} \begin{bmatrix} y \\ p \end{bmatrix} + \begin{bmatrix} \delta\beta y_n \\ -\alpha y_n \end{bmatrix}$$

In this case, $|\mathbf{J}| = 0$ and $\text{Tr}(\mathbf{J}) = -\delta\beta < 0$ – the system is stable, but there is a continuum of potential equilibrium positions. This is illustrated in Figure 3.6, in which the $\dot{y} = 0$ and $\dot{p} = 0$ isoclines overlap. More specifically, there remains a unique real equilibrium (y_n), but any rate of inflation can now be the equilibrium rate depending on the initial configuration of the economy.[18] This case is recognized by proponents of the NC model, who note that the central bank *must* adjust the real interest rate in response to an inflation target

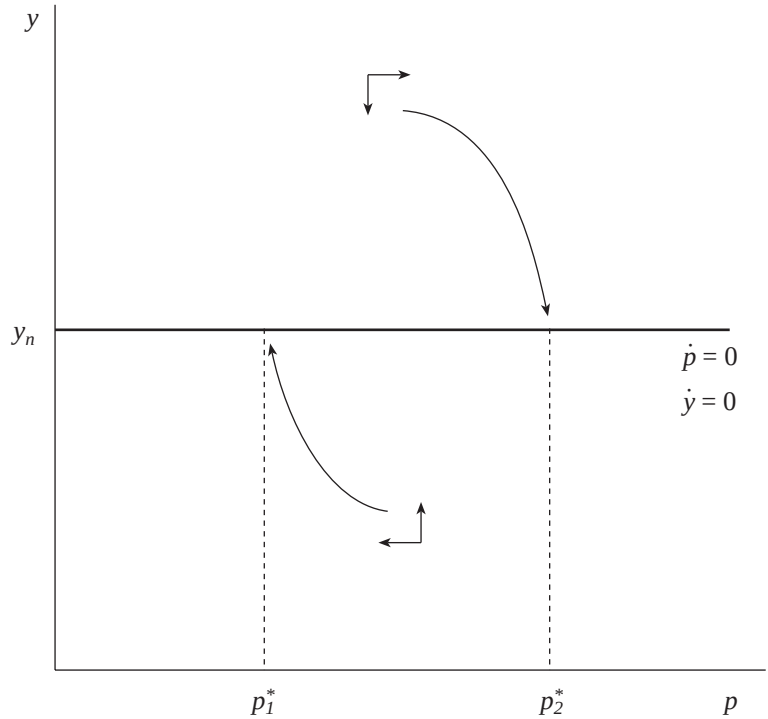


Figure 3.6 Stability of equilibrium in the NC model when the IROP is given by $r = r_{-1} + \beta(y - y_n)_{-1}$

(as in (3.8)) in order to provide the economy with a 'nominal anchor' (see, for example, Romer, 2000, p. 156).

Now suppose that $\gamma \neq 0$ but that $\beta = 0$. In this case, the IROP becomes:

$$r = r_{-1} + \gamma(p - p^T) \tag{3.8b}$$

and r is clearly set with reference to a target rate of inflation. With the IROP given by (3.8b), equation (3.10) becomes:

$$\dot{y} = -\delta\gamma(p - p^T) \tag{3.10b}$$

and combining (3.7) and (3.10b), we arrive at:

$$\begin{bmatrix} \dot{y} \\ \dot{p} \end{bmatrix} = \begin{bmatrix} 0 & -\delta\gamma \\ \alpha & 0 \end{bmatrix} \begin{bmatrix} y \\ p \end{bmatrix} + \begin{bmatrix} \delta\gamma p^T \\ -\alpha y_n \end{bmatrix}$$

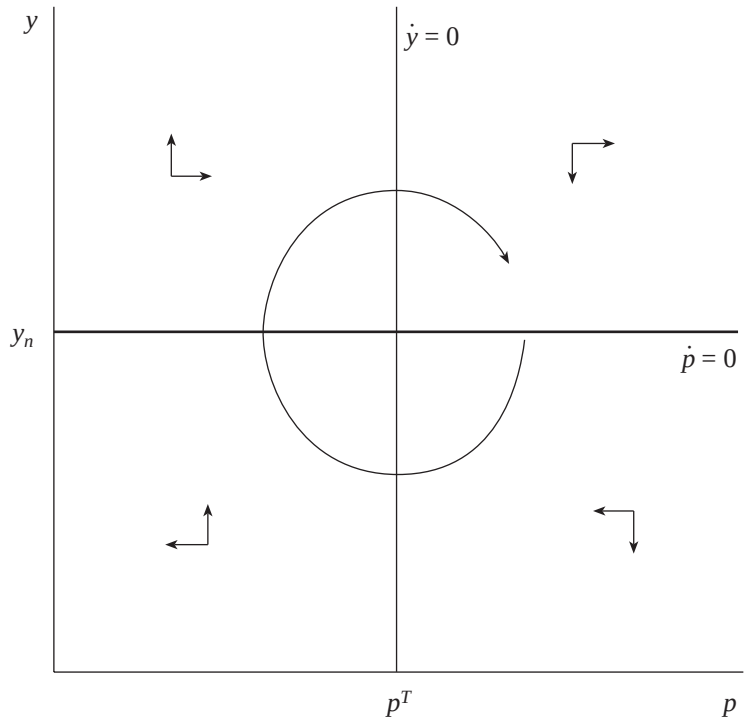


Figure 3.7 Instability of equilibrium in the NC model when the IROP is given by $r = r_{-1} + \gamma(p - p^T)$

In this case, the system has a unique equilibrium ($p^* = p^T$, $y^* = y_n$), but since $Tr(\mathbf{J})^2 - 4|\mathbf{J}| = -4\alpha\delta\gamma < 0$ and $Tr(\mathbf{J}) = 0$, this equilibrium is a centre (Gandolfo, 1996, p. 358): unless the economy is in equilibrium initially, it will continually orbit its equilibrium without ever moving closer towards it.[19] This is illustrated in Figure 3.7. Clearly, the IROP in (3.8b) fails to provide the economy with the stability furnished by the Pigou effect in the BNK model – the mechanism that, as described earlier, it displaces when the central bank switches from manipulation of the money supply to an IROP.

Finally, consider the situation where $\beta = \gamma = 0$. The IROP now becomes

$$r = r_{-1} = \bar{r} \tag{3.8c}$$

and equation (3.10) is reduced to

$$\dot{y} = 0 \tag{3.10c}$$

so that there is no change in y regardless of the value of either p or y. Combining (3.7) and (3.10c) yields:

$$\begin{bmatrix} \dot{y} \\ \dot{p} \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ \alpha & 0 \end{bmatrix} \begin{bmatrix} y \\ p \end{bmatrix} + \begin{bmatrix} 0 \\ -\alpha y_n \end{bmatrix}$$

We now have $|\mathbf{J}| = 0$ and $\text{Tr}(\mathbf{J}) = 0$ – there is a continuum of potential equilibrium positions (y_n coupled with any rate of inflation), but the system is not stable.[20] More specifically, as illustrated in Figure 3.8, if $y \neq y_n$ initially, the real rate of growth will remain permanently above/below its natural rate and inflation will increase/decrease without limit.

Once again, this case has been recognized by proponents of the NC model. Romer (2000, p. 156) identifies it as a 'difficulty [that] is a specific instance of the general result that monetary policy must have a nominal anchor if it is to keep nominal variables from rising or falling without bound'. Whilst this

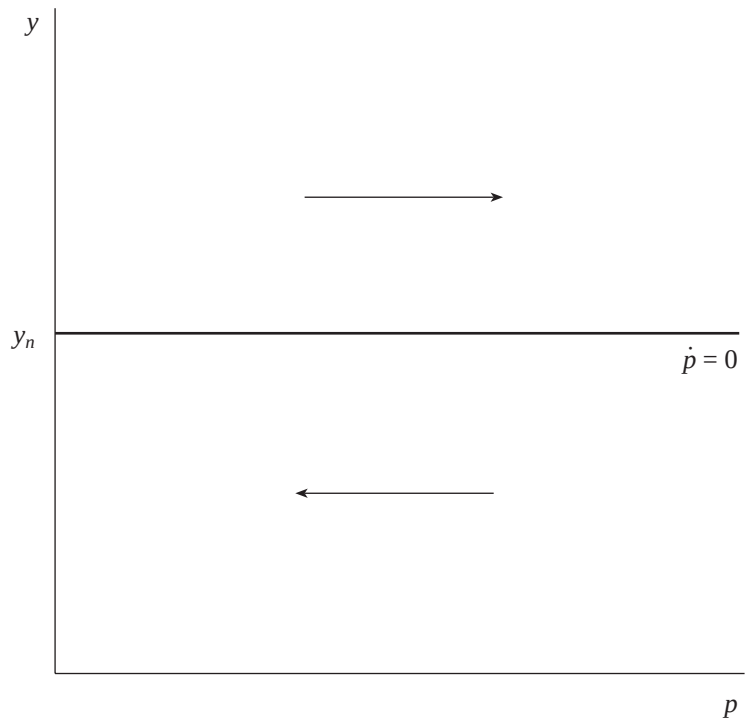


Figure 3.8 *Instability of equilibrium in the NC model when the IROP is given by* $r = r_{-1} = \bar{r}$

claim is literally true, it should not distract attention from the real substance of the preceding stability analysis which, taken as a whole, demonstrates that the stability of equilibrium in the NC model is not analytically robust. In two of the four cases examined above (those associated with the IROPs in (3.8b) and (3.8c)), neither steady output growth consistent with y_n nor steady inflation (at any rate) can be regained following a disequilibrating disturbance. This is a poor record by comparison with the BNK model, in which the Pigou effect ensures a return to stable inflation and growth in line with the natural rate following the event of a shock. In sum, the introduction of an IROP into what is otherwise a standard New Keynesian macroeconomic model (as in the NC model) both (a) supplants a stability mechanism that would otherwise be operative in the private economy and (b) replaces it with a stability mechanism based on public policy that may or may not render the economy stable, depending on the precise form of the central bank's reaction function.

These considerations raise two obvious questions. First, in light of the problems that it can create for the stability of the economy, why would central banks actually act in the way described by the NC model? This calls into question the descriptive value of the model. Second, and again in light of the problems that IROPs can create for the stability of the economy, should economists encourage central banks to engage in interest rate targeting? This calls into question the prescriptive value of the NC model.

One possible response to these questions is to dismiss them as trivial because the analysis from which they emanate amounts to little more than 'logic chopping'. The argument here is disarmingly simple. As long as the central bank gets monetary policy right – that is, adopts an IROP similar to (3.8) or at least avoids the pitfalls of (3.8b) and (3.8c) – then all will be well: its actions will render the economy stable. But this argument does not suffice. In the first place, by emphasizing the need to 'get monetary policy right', it concedes Palacio-Vera's (2002, p. 20) argument that the workings of the NC model are heavily reliant on the 'competence, vision and ability of central bankers'. This is something that cannot always be taken for granted.

Alternatively, consider the fact that substantial emphasis is placed on the importance of central bank discretion in the contemporary literature on the conduct of monetary policy, as opposed to mechanical rule-following behaviour in accordance with a strict and literal interpretation of any of the IROPs discussed above (see, for example, Taylor, 1993; Bernanke et al., 1999). Hence even if the central bank is fully competent, reasonable use of discretion may result in periodic departures from (3.8) in favour of an IROP such as (3.8c) – behaviour that will adversely affect the stability of macroeconomic equilibrium. Empirical evidence certainly suggests that, whether as the result of incompetence or reasonable use of discretion, there have, in fact, been periods when central banks have failed to adjust the real interest rate in a

manner consistent with the stability of equilibrium in the NC model (Judd and Rudebusch, 1998; Taylor, 1999; Fair, 2001).

Finally, even if the central bank is fully competent and acts as a mechanical rule-follower in line with equation (3.8), another problem exists – that of 'natural rate uncertainty'. In order to use (3.8) to guarantee a return to stable inflation and growth consistent with p^T and y_n, the central bank must know the value of y_n. But this natural rate of growth is an unobservable variable, the value of which must ultimately be constructed by the central bank itself (McCallum, 2001, pp. 260–61; Smithin, 2004, pp. 3–4). As empirical research into the related concept of the natural rate of unemployment in a variety of different economies demonstrates, estimates of the natural rate are notoriously imprecise and subject to large standard errors (Setterfield et al., 1992; Staiger et al., 1997a, 1997b; Franz, 2003; Greenslade et al., 2003). Building the 'wrong' estimate of the natural rate into its IROP as a result of this natural rate uncertainty is, therefore, another way in which a competent central bank could still get monetary policy wrong and adversely affect the stability of macroeconomic equilibrium (McCallum, 2001). Indeed, McCallum (2001) concludes on this basis that it is undesirable for the central bank to respond strongly to the output gap in the process of targeting interest rates. The dilemma for the NC model, of course, is that the central bank cannot afford to ignore the output gap altogether because this, too, jeopardizes the stability of equilibrium, as demonstrated above.[21] Note that none of these problems confront the BNK model described earlier, in which the central bank targets the quantity of money in circulation. Relying on the Pigou effect, the central bank in the BNK model need know nothing of the value of the natural rate, and the economy will still automatically gravitate towards an equilibrium characterized by steady inflation and steady growth consistent with y_n.

But could it be that we have exaggerated the stability properties of the BNK model and that this exaggeration is chiefly responsible for making the stability properties of the NC model seem unfavourable by comparison? For instance, the central bank in the BNK model behaves autonomously by adhering to a fixed money supply growth rule, whereas in the NC model, the central bank is described as actively responding to events within the economy. Does this 'passive versus active central bank' dichotomy bear some responsibility for the different stability properties of the BNK and NC models?

The short answer to this question is no. The first clue that this is so derives from the fact that when the central bank behaves passively in the NC model (autonomously fixing the real interest rate regardless of events elsewhere in the economy in conjunction with the IROP in (3.8c)), the model becomes unstable. Hence it is not simply the activism of the central bank in the NC model that is responsible for the instability of some variants of this model.

Furthermore, it can be shown that an active central bank that adjusts money supply growth in response to deviations of inflation from its target rate and/or the output gap does not render the BNK model unstable. More specifically, the stability of the BNK model is robust to changes in the specification of the central bank's money supply growth rule that mirror the various specifications of the IROP in the NC model considered above.[22] The intuition behind this result is quite straightforward. Recall that the stability mechanism in the BNK model is the Pigou effect. By reducing m in response to $p > p^T$ and/or $y > y_n$, the central bank enhances the rate of change of the growth of real balances, thus reinforcing the operation of the Pigou effect. Rather than supplanting the economy's intrinsic stability mechanism, then, a central bank engaged in manipulation of the money supply complements the operation of this stability mechanism whenever it adjusts the rate of growth of the money supply in response to signals emanating from the goods market. In short, the 'passive versus active central bank' dichotomy has no bearing on the comparative stability properties of the BNK and NC models. These comparative stability properties are, instead, a product of the choice of monetary policy instrument, the resulting effects of the conduct of monetary policy on the operation of the Pigou effect and (in the case of the NC model) the potential inadequacy of public policy as a replacement for the Pigou effect.

It could be argued, however, that the BNK model over-simplifies the operation of the Pigou effect, because factors such as the instability of money demand and the process of disintermediation have rendered the money supply targeting necessary for the smooth operation of this stability mechanism difficult to achieve in practice.[23] This argument undoubtedly has merit. Hence note that if the income velocity of circulation of money is not constant, the rate of growth of nominal demand in the BNK model becomes

$$d \equiv m + v$$

from which it follows that:

$$d - p \equiv m - p + v$$

Now suppose that the central bank adheres to a rigid monetary growth rule so that $m = \overline{m}$ (which is consistent with the BNK model developed earlier and has traditionally been the preferred strategy of those who advocate money supply targeting), so that we have

$$d - p = \overline{m} - p + v$$

or, using (3.2),

$$y = \overline{m} - p + v$$

It is now evident that the strict inverse relationship between the rate of inflation and the growth of demand for real output that results from the inverse relationship between inflation and the rate of growth of real balances in the BNK model will be weakened and may break down altogether if increases (decreases) in p are accompanied by increases (decreases) in v.

But even so, there remains a problem for proponents of the NC model. Even if the Pigou effect is not such a 'sure thing' because of the contemporary realities of the monetary environment, both the descriptive and prescriptive value of the NC model must still be said to rest on an untested empirical claim regarding relative speeds of disequilibrium adjustment. Specifically, whatever the contemporary realities of the monetary environment, implicit in the NC model is the unverified claim that, using an IROP, the central bank is capable of adjusting the economy towards equilibrium (stable inflation consistent with $y = y_n$) faster than the Pigou effect – a mechanism that, according to New Keynesian macroeconomics, is intrinsic to the private sector and is ordinarily operative in the economy unless the central bank chooses to endogenize the money supply by conducting monetary policy by means of manipulating the interest rate. Proponents of the New Consensus find themselves in the position of a person who has decided to exchange their car for a second vehicle because the car they currently own suffers from mechanical problems, but without first checking to make sure that the new vehicle does not suffer even greater mechanical failings of its own.

In sum, the notion that money supply targeting is difficult in practice does not, in and of itself, justify the adoption of an IROP by the central bank. This change in the instrument of monetary policy involves supplanting a stability mechanism that (according to New Keynesians) is intrinsic to and would otherwise be operative within the private economy, and replacing it with a stability mechanism based on public policy. As has been demonstrated, the stability of equilibrium in the resulting NC economy is not analytically robust. Ultimately, then, whether or not money supply targeting is difficult in practice, both the descriptive and prescriptive value of the NC model rest on an untested empirical claim: that monetary policy authorities can provide a macroeconomic stability mechanism that is superior to the stability mechanism otherwise believed by New Keynesians to be operative within the private economy.

4. CONCLUSIONS

This chapter has developed two models of macroeconomic activity in which monetary policy plays an integral role. Special attention has been paid to the stability properties of these models. In particular, it has been shown that the introduction of an interest rate operating procedure (IROP) into an otherwise conventional New Keynesian macroeconomic model – as in the New Consensus – can jeopardize the stability of macroeconomic equilibrium. By choosing the interest rate as its monetary policy instrument, the central bank supplants the Pigou effect, replacing this stability mechanism with its own administered adjustment of the real interest rate. But the capacity of this latter mechanism to render macroeconomic equilibrium stable depends crucially on the precise functional form of the central bank's IROP. Even when we consider problems with the operation of the Pigou effect emanating from the instability of the demand for money, the case for adopting an IROP remains incomplete. Ultimately, then, we are left with questions about why central banks use IROPs and whether or not they should, to which the New Consensus model provides no definitive answers.

NOTES

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1. Comparison of the New Consensus with the Neoclassical Synthesis is especially apt because, as is evident from Romer (2000), part of the purpose of the New Consensus is to create something akin to a new Neoclassical Synthesis. See Mehrling (1996, p. 77) for the claim that this is part of the *raison d'être* of New Keynesian macroeconomics writ large.
2. As elsewhere in the literature on the New Consensus, the preference in what follows is for simple models that capture key structural relations and their macroeconomic implications. See, for example, Krugman (2000), Romer (2000, p. 152) and Woodford (2001, p. 232) for further discussion of this modelling strategy. As noted by McCallum (2001, pp. 258–9), models of the type discussed here can be grounded in an explicit dynamic optimization framework.
3. The models developed in this chapter are formulated in terms of the rates of growth of nominal demand and real output, but could easily be reformulated in terms of the levels of these variables.

   Note that in the BNK model developed here (and the New Consensus model developed in the following section) the natural rate of growth is analogous to the Friedmanite natural rate of unemployment – i.e., it is a unique, supply-determined equilibrium position consistent with steady inflation. This differs from Harrod's original concept of a natural rate of growth, which is simply the maximum rate of growth that the economy can achieve in the long run, and may or may not coincide with the economy's equilibrium rate of growth.
4. Romer (2000, p. 155) lists this as the very first of 11 advantages of the NC model.

5. The lag structure in equation (3.8) – specifically, the lagged response of r to $y - y_n$ – is contrived, but is designed to avoid the simultaneity between y and r that would otherwise arise from the interaction of equations (3.5), (3.6) and (3.8). Utilizing this lag structure allows us to decompose equations (3.5), (3.6) and (3.8) which, in turn, simplifies comparative static analysis of how the NC model responds to a demand shock.
6. Essentially, we are assuming in equation (3.8) that the central bank sets nominal interest rates in accordance with the Taylor rule:

$$i = r_{-1} + \theta p^e + \beta(y - y_n)_{-1} + \gamma(p - p^T)$$

where i is the nominal interest rate, p^e is the expected rate of inflation and the central bank sets $\theta = 1$. Under these conditions, subtracting p^e from either side of the expression for i above yields equation (3.8).
7. See, however, King (2000, pp. 74–81) for discussion of caveats to the Taylor principle that arise if the central bank adjusts interest rates in response to expected future inflation as well as current inflation.
8. Specifically, this problem arises if the constant in question is not equal to the natural rate of interest. As will become clear in what follows, the specification of (3.8) allows for automatic revision of r in response to changes in the natural rate of interest without the central bank having to explicitly estimate and keep track of changes in this natural rate.
9. This is a dynamic version of the type of IS equation (expressed in real terms) that is typical of static, three-equation versions of the NC model.
10. Note that in Figure 3.3, the central bank reaction function has been drawn on the assumption that $r^* - \gamma p^T > 0$.
11. It may strike the reader as odd that, having considered a monetary shock in the BNK model, we are now appealing to a change in *fiscal* policy to demonstrate the comparative statics of the NC model. There are two reasons for this change in focus. First, as will become clear in what follows, a fiscal shock enables us to demonstrate the full repertoire of possible responses of the NC model to a demand shock, including changes in the natural rate of interest. The latter are not observed in the event of a monetary shock because, as previously noted, the natural rate of interest is determined independently of monetary variables. The second reason is entirely pragmatic. The sequence of disequilibrium adjustments in equations (3.5)–(3.8) that arise in response to an initial change in, say, p^T is very difficult to trace out in the context of the four-quadrant diagram used to summarize this model in Figure 3.3. The interested reader is, instead, referred to the phase diagram in Figure 3.5 below, in which the consequences for equations (3.5)–(3.8) of a monetary shock are easily fathomed.
12. Note that, as depicted in Figure 3.4, the d, y and r schedules all shift during the second period, in response to the fact that we now have $p - p^T = p' - p^T > 0$ (which affects the positions of the d and y schedules) and $(y - y_n)_{-1} = y' - y_n > 0$ (which affects the position of the r schedule).
13. Equilibrium will always be regained because, as demonstrated below, the system in equations (3.5)–(3.8) is stable.
14. This result confirms the claim made earlier that the specification of equation (3.8) allows the value of r to adjust automatically to any change in the value of the natural rate of interest.
15. Indeed, the reasons for central banks adopting IROPs in the first place appear to be similarly rooted in empiricism and pragmatism. Interest rate targeting is simply believed to be the most practical method of conducting monetary policy in the prevailing monetary environment. See, for example, Clarida et al. (1999, pp. 1686–7) and Palley (2002, pp. 3–9) for further discussion.
16. By the same token there is, of course, no prospect of a 'hidden' Keynes effect in the NC model, because the Keynes effect also depends on variations in $m - p$ in response to changes in p. And in any case, the interest rate in the NC model has an equilibrium ('natural') value that is determined independently of monetary variables, as demonstrated earlier.

17. Figure 3.5 depicts the equilibrium of equations (3.5)–(3.8) as a stable focus, although it may also be a stable node depending on the size of β (the central bank's reaction to the output gap in equation (3.8)) relative to the size of γ (the central bank's reaction to any disparity between the actual and target rates of inflation in (3.8)), α (the response of inflation to the output gap in (3.7)) and δ (the response of real output growth to the real interest rate in equations (3.5) and (3.6)). Hence defining $\Psi = \text{Tr}(\mathbf{J})^2 - 4|\mathbf{J}|$, we have $\Psi = (\delta\beta)^2 - 4\alpha\delta\gamma$ for equations (3.5)–(3.8). We will therefore observe $\Psi < 0$ and hence the focus depicted in Figure 3.5 whenever $\beta^2 < 4\alpha\gamma/\delta$. However, if $\beta^2 \geq 4\alpha\gamma/\delta$ so that $\Psi \geq 0$, the equilibrium of equations (3.5)–(3.8) becomes a node. This distinction is meaningful since it suggests that if β is 'too small' given the values of α, γ and δ, or alternatively if γ is 'too large' given the values of α, β and δ, central bank behaviour will cause the economy to overshoot the equilibrium outcomes $y^* = y_n$ and $p^* = p^T$ in the process of guiding the economy back to equilibrium.
18. The potential for IROPs to give rise to nominal indeterminacy in this fashion was first recognized by Sargent and Wallace (1975).
19. This result is anticipated in the Wicksellian model developed by Humphrey (1990, pp. 7–8, 9–10). Humphrey shows that adding the derivative control term $\gamma_2 \dot{p}$ to the right-hand side of (3.8b) is sufficient to restore the stability of equilibrium. Of course, this result only reinforces the point being made here – that the stability of equilibrium in the NC model depends crucially on the central bank's reaction function and is sensitive to changes in the precise functional form of this IROP.
20. This result is not surprising, since the IROP in (3.8c) clearly violates the Taylor principle discussed earlier.
21. It can be shown that if the central bank adopts an IROP of the form:

$$r = r_0 + \beta(y - y_n) + \gamma(p - p^T)$$

where:

$$r_0 = \frac{y_0 - y_n}{\delta} = r_n$$

and r_n denotes the natural rate of interest, the NC model will be stable even if $\beta = 0$: the $\dot{y} = 0$ isocline will be identical to the $\dot{p} = 0$ isocline currently shown in Figure 3.7 and this will give rise to a continuum of stable equilibrium positions consistent with steady inflation and $y^* = y_n$, the central bank's choice of p^T determining the steady state rate of inflation that is ultimately established. In other words, if the real interest rate is adjusted in response to the *natural* rate of interest (as in the IROP above) rather than the *lagged value* of the real interest rate (as in (3.8)), the NC model is stable even if the central bank makes no effort to adjust r in response to the output gap. But of course this just replaces one problem with another – rather than needing to know the natural rate of growth, the central bank now needs to know the natural rate of interest. Indeed, these problems are essentially one and the same thing since, as is evident from the expression for r_n above, the natural rates of growth and interest are functionally related. (Intuitively, this is why the IROP above renders the NC model stable even with $\beta = 0$.) In short, the problem of natural rate uncertainty is pervasive in the NC model.

    It should also be noted that the effects of $\beta = 0$ on the stability of the NC model depend not just on the precise formulation of the central bank's IROP, but also on the specification of the economy's IS curve (which, as previously noted, results from combination of equations (3.5) and (3.6) in the NC model developed earlier). As Alonso-González and Palacio-Vera (2002) show, if the rate of growth of output is sensitive to both the real interest rate and the rate of profit, it is necessary for *both* of the 'response coefficients' in the central bank's IROP (β and γ in equation (3.8)) to be strictly positive in order for the resulting model to be stable – even if this IROP involves adjusting interest rates in response to the natural rate of interest (as in the expression immediately above) rather than the lagged value of the real interest rate (as in (3.8)).

22. This result is formally demonstrated in the Appendix.
23. Indeed, as intimated earlier, these essentially empirical arguments are the traditional reasons given by NC macroeconomists for the adoption of IROPs by central banks: effective money supply targeting is judged to have become too difficult in practice (Clarida et al., 1999, pp. 1686–7). The theoretical grounds for choosing the interest rate as the instrument of monetary policy in a macroeconomic environment characterized by nominal disturbances can be traced back to Poole (1970). See Fontana and Palacio-Vera (2004, pp. 29–32) for further discussion.

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APPENDIX

Equation (3.3) of the BNK model implies that

$$\dot{p} = \alpha(y - y_n) \tag{3A.1}$$

Meanwhile, it follows from equations (3.1) and (3.2) of the model that

$$\dot{y} = \dot{m} - \dot{p}$$

which, using (3A.1), means that:

$$\dot{y} = \dot{m} - \alpha(y - y_n) \tag{3A.2}$$

Now suppose that instead of equation (3.4) we have

$$m = m_{-1} - \gamma(p - p^T)$$

$$\Rightarrow \quad \dot{m} = -\gamma(p - p^T)$$

$$\Rightarrow \quad \dot{y} = -\gamma(p - p^T) - \alpha(y - y_n) \tag{3A.2a}$$

Combining (3A.2) and (3A.1) we have:

$$\begin{bmatrix} \dot{y} \\ \dot{p} \end{bmatrix} = \begin{bmatrix} -\alpha & -\gamma \\ \alpha & 0 \end{bmatrix} \begin{bmatrix} y \\ p \end{bmatrix} + \begin{bmatrix} \gamma p^T + \alpha y_n \\ -\alpha y_n \end{bmatrix}$$

In this case, $|\mathbf{J}| = \alpha\gamma > 0$ and $\text{Tr}(\mathbf{J}) = -\alpha < 0$. The equilibrium of the model ($y^* = y_n$ and $p^* = p^T$) is a stable focus if $\alpha < 4\gamma$, and a stable node if $\alpha \geq 4\gamma$.

Alternatively, consider the case where, instead of equation (3.4), we have

$$m = m_{-1} - \beta(y - y_n)$$

$$\Rightarrow \quad \dot{m} = -\beta(y - y_n)$$

$$\Rightarrow \quad \dot{y} = -(\beta + \alpha)(y - y_n) \tag{3A.2b}$$

Combining (3A.2b) and (3A.1), we arrive at

$$\begin{bmatrix} \dot{y} \\ \dot{p} \end{bmatrix} = \begin{bmatrix} -(\beta + \alpha) & 0 \\ \alpha & 0 \end{bmatrix} \begin{bmatrix} y \\ p \end{bmatrix} + \begin{bmatrix} (\beta + \alpha) y_n \\ -\alpha y_n \end{bmatrix}$$

In this case, $|\mathbf{J}| = 0$ and Tr $(\mathbf{J}) = -(\beta + \alpha) < 0$ and the model is characterized by a continuum of locally stable equilibria: $y^* = y_n$ remains the unique equilibrium of the real economy, but what emerges as the steady state rate of inflation will depend on initial conditions.

Finally, consider the case where instead of equation (3.4), we have

$$m = m_{-1} - \beta(y - y_n) - \gamma(p - p^T)$$

$$\Rightarrow \quad \dot{m} = -\beta(y - y_n) - \gamma(p - p^T)$$

$$\Rightarrow \quad \dot{y} = -(\beta + \alpha)(y - y_n) - \gamma(p - p^T) \qquad \text{(3A.2c)}$$

Combining (3A.2c) and (3A.1) yields

$$\begin{bmatrix} \dot{y} \\ \dot{p} \end{bmatrix} = \begin{bmatrix} -(\beta + \alpha) & -\gamma \\ \alpha & 0 \end{bmatrix} \begin{bmatrix} y \\ p \end{bmatrix} + \begin{bmatrix} (\beta + \alpha)y_n + \gamma p^T \\ -\alpha y_n \end{bmatrix}$$

In this case, $|\mathbf{J}| = \alpha\gamma > 0$ and Tr $(\mathbf{J}) = -(\beta + \alpha) < 0$. Once again, the equilibrium of the model ($y^* = y_n$ and $p^* = p^T$) is a stable focus if $\beta^2 < \alpha(4\gamma - 2\beta - \alpha)$, and a stable node if $\beta^2 \geq \alpha(4\gamma - 2\beta - \alpha)$.

4. Monetary policy divergences in the euro area: the early record of the European Central Bank

Georgios Chortareas

1. INTRODUCTION[1]

This chapter attempts to contribute to our understanding and monitoring of cyclical divergences within the euro area. In particular, we provide some simple analytical tools for assessing the degree of convergence in monetary policy needs in Europe. In contrast to most existing attempts that monitor divergences of real and nominal variables in the euro area, we examine whether the progress towards Economic and Monetary Union (EMU) during the early years of the European Central Bank (ECB) has enhanced convergence in the monetary policy needs of the participating countries or imposed a straitjacket on them. In other words, we focus on divergent policy needs (or warranted policy divergences) rather than divergences of macroeconomic variables.

We use simple policy rules as a consistent benchmark to provide a framework for assessing whether the policy needs of EMU participant countries converge. In order to capture any form of divergences we need a benchmark. Such a benchmark would approximate the optimal monetary policy rule that shows how each individual euro area member country would run its monetary policy optimally if it were not a member of a monetary union. Defining 'optimal monetary policy' is not an easy task, let alone when one considers more than one country. In this chapter we try to tackle this problem by using Taylor rules as such a consistent benchmark. A Taylor rule is a simple way to describe a monetary policy regime when the interest rate is set in response to inflation and output gaps. Our choice of a Taylor-rule benchmark as an appropriate framework for assessing divergences is corroborated by other recent policy analyses that impose or estimate Taylor-rule reaction functions for the euro area. We use a simple Taylor-rule specification to run a counterfactual experiment and ask how the euro area national central banks might set interest rates in their respective countries had monetary policy not been

delegated to the ECB. This approach is timely since it provides preliminary evidence on whether the need for national monetary policy tends to disappear in a monetary union. We consider the period from 1991 to 2001 with particular emphasis on the developments during the two-year pre-accession period and the first two years of the EMU.

The analysis can form the basis for a set of indicators for regular monitoring of policy divergences in the euro area. In the next section we provide a motivation, a brief literature review and discuss how we obtain the 'warranted' interest rates using Taylor rules. In section 3 we construct divergence indicators for the euro area. In section 4 we discuss some qualifications of our analysis, and section 5 concludes.

2. USING TAYLOR RULES AND MONETARY POLICY 'THERMOMETERS' FOR THE EURO AREA

Although various attempts have been made to create divergence indicators for the euro area, they focus almost exclusively on (real and nominal) observable variables. Such statistical indicators of cyclical divergences usually focus on real GDP growth, output gaps, the Harmonize Index of Consumer Prices (HICP) inflation and so on. Of course some analysts and policymakers may suggest that cyclical divergence within the euro area is first and foremost a national issue and consequently the national governments' responsibility to respond to using the appropriate fiscal or structural policies. One implication of such reasoning is that since the ECB's primary responsibility relates to monetary and financial stability, it should not be concerned with such divergences.

Since the key macroeconomic variables typically enter the central banks' reaction functions, however, real divergences affect (or ought to affect) the setting of monetary policy. A large body of the literature using reaction functions shows that monetary policy responds not only to deviations of inflation from target, but also to deviations of output from desired levels.[2] The focus of this chapter is on divergent policy needs (or warranted policy divergences) rather than divergences of macroeconomic variables. Of course, the two types of divergences are not irrelevant to each other since simple policy rules are typically a linear function of the basic cyclical indicators.

We examine to what extent the observed actual interest rate convergence in the euro area is warranted. To discuss this issue one needs to have a consistent benchmark, for which we use the interest rates implied by Taylor rules. Taylor rules provide a useful way of analysing monetary policy decisions. They link the policy interest rate to deviations of the inflation rate and output from their targeted levels. In principle, they can be thought of as a restricted version of some optimal rule that would respond to a wider set of indicators.

Taylor rules have performed relatively well in describing the behaviour of central banks in many developed countries.[3] In addition, relative to more complicated optimal rules they are simple, understandable and manageable. On the other hand, because they allow for the use of only a limited number of variables they may not be robust in the face of particular types of shocks.

Suggesting that a Taylor rule is an exact guide to the ECB's and the European national central banks' monetary policies would be an oversimplification. Nevertheless, many authors have recently employed Taylor rules as a tool for modelling and assessing the responses of ECB's monetary policy to short-term developments in prices and real activity. A number of academic papers use sophisticated econometric analysis to characterize monetary policy,[4] while another set of policy-oriented analyses imposes *ad hoc* Taylor rules. For example, the Centre for Economic Policy Research (CEPR) reports in the series 'Monitoring the ECB' (Begg et al. 1998; Favero et al. 2000) use Taylor rules in an attempt to track the ECB's behaviour.

An interesting approach, termed a 'monetary policy thermometer' by Bjorksten and Syrjanen (1999), seems to be useful for applied policy analysis and in particular for obtaining a bird's-eye view assessment of the one-size-fits-all policy. Bjorksten and Syrjanen (1999) use a simple Taylor rule as a benchmark for judging the stance of the ECB's monetary policy in 1999. They calculate an 'optimal' Taylor-rule short-term interest rate for each country of the euro area and then compare it to the calculated optimal interest rate for the aggregate euro area. In other words, they consider how close the 'ideal' aggregate EMU monetary policy stance is relative to the 'ideal' monetary policy stance of each individual country. A monetary policy 'thermometer' showing the optimal EMU interest rate versus the optimal country-specific rates captures their results. Countries for which the Taylor-rule-implied interest rate (TRIR) exceeds the EMU TRIR (which in their version of the rule coincided with the ECB set interest rate during 1999) are considered to be in need of some 'cooling'. The reverse holds for countries with TRIRs below the EMU TRIR.

Bjorksten and Syrjanen (1999) assume that the targeted inflation rate is 1 per cent. They also consider alternative values for the policy response parameters (1.5 to inflation and 0.5 to output gaps).[5] Although the use of the Taylor rule is extremely simple in analytical terms, it introduces the idea of a 'monetary thermometer' that can be developed further and possibly offer further insights to the discussion about the one-size-fits-all policy. The work of Bjorksten and Syrjanen (1999), however, is static, focusing on one observation. We develop a dynamic version of the monetary policy thermometer that produces a series of the rule-implied interest rates.

Begg et al. (1998) use a simple Taylor rule to perform a similar exercise. They impose the weights of the Fed's and the Bundesbank's Taylor-rule-

type reaction functions as estimated by Clarida et al. (1998). Favero et al. (2000) also use a simple forward-looking Taylor rule, based on the work of Clarida et al. (1998). They derive the monthly output gaps using deviations of the logarithm of industrial production from the Hodrick–Prescott filter suggested trend. They estimate policy rules for the Fed and Bundesbank for the period 1987–89 using monthly data and obtain reaction function coefficients for the Fed ($\alpha_1 = 1.0$, $\alpha_2 = 0.9$), and the Bundesbank ($\alpha_1 = 1.3$, $\alpha_2 = 0.2$). Using these coefficients in simulations, the authors find that the Taylor rule for the ECB in both cases fails to explain the 50 basis point cut in interest rates in April 1999. For the Taylor rule to explain this behaviour a much higher weight on the output gap response parameter must be attached. The interest rate rise in November 1999 brings the actual policy rate closer to the TRIR. As an explanation for the inability of the Taylor rule to track the ECB's behaviour in early 1999 the authors suggest that the ECB may have reacted to developments in the 'troubled' economies of the euro area, that is, Germany and Italy. To show this they consider a Taylor rule with Germany and Italy only (weights 0.65 and 0.35 respectively), which performs better. They also consider the possibility of monetary targeting within the context of the ECB's two-pillar strategy, with less encouraging results.

Of course any analysis of the early ECB record has to rely on an imposed Taylor rule, since no historical record of the ECB's policymaking is available. Some of those studies directly impose the weights originally suggested by Taylor and some estimate reaction functions for the Bundesbank and use the resulting weights. The workhorse specification of such reaction functions is that of Clarida et al. (1998), who estimate monetary policy reaction functions for Germany, Japan, the USA, the UK, France and Italy (from 1979 to 1993). They use a quadratic trend to detrend the log of industrial production and obtain a monthly measure of the output gap (the resulting residuals correspond to the output gap).

Gerlach and Schnabel (2000) show that a Taylor rule captures the behaviour of average interest rates in the EMU area during 1990–98Q4. They first regress the actual EMU (weighted average) interest rate on the contemporaneous EMU output gap and inflation rate and find that the coefficients on the output gap and the inflation rate are close to 0.5 and 1.5. They proceed to estimate a reaction function which is similar to that of Clarida et al. (1998) but also allows for the inclusion of an additional variable – the federal funds rate, or money growth, or the real euro/dollar exchange rate, or lagged inflation. Of those variables only the federal funds rate appears statistically significant. They conclude that if the ECB were to conduct monetary policy using the Taylor rule it would not deviate too much from the past average interest rate setting behaviour in the EMU area.

Studies also exist that consider individual country reaction functions. For example Wyplosz (1999), in addition to inflation and output gaps, includes lagged M2, the German interest rate, and the real exchange rate against the US dollar. Angeloni and Dedola (1999) provide GMM (generalized method of moments) estimates of the individual country reaction functions for Germany, France, Italy, Spain, Netherlands and the UK. The authors use the foreign interest rate, the lagged interest rate, the real effective exchange rate and M3 in their reaction functions. They consider both backward- and forward-looking inflation measures.

Other applied policy analyses by policy institutions and private sector institutions use Taylor rules to consider the ECB's early record. The IMF (1998) uses the Taylor rule to consider how inflation prospects and the narrowing of output gaps would affect the ECB's decisions about short-term interest rates. Mayer (1999) derives a Taylor rule where the policy rates, in addition to inflation and output gaps, respond to changes in money, velocity and potential GDP growth. In contrast to the above-mentioned work, which typically uses the weights in the central bank's reaction function to estimate past behaviour, Mayer imposes the weights assumed in the original Taylor specification.

Thus it appears that using a monetary policy benchmark to evaluate to what extent a single monetary policy in a monetary union puts strain on its members can be an interesting and fruitful exercise. This chapter adds to this literature in two ways. First, we extend and widen the concept of a monetary policy 'thermometer' by developing an intertemporal version of it. This approach allows us to capture shifts and changes in the benchmark and actual policy stance across the two different institutional regimes (i.e., pre EMU versus post EMU). Second, we use the same approach to address whether joining the EMU warrants a widening or closing of the dispersion between the individual member and the EMU-wide 'optimal' interest rates (as approximated by the Taylor-rule-implied interest rates). We can then compare the degree of convergence in the actual and warranted (TRIR) interest rates. In addition, this approach allows us to analyse to what extent policymakers, pre and post EMU, have actually been following rules, and provides some insight into whether countries deviated from their own Taylor rules in anticipation of EMU.

The interest rates implied by Taylor rules are sensitive to the assumptions that underlie the rules. Those assumptions refer to the equilibrium real interest rate, the central bank's inflation-aversion (i.e., the relative weights on inflation and output), the targeted inflation rate, and whether the central bank is forward- or backward-looking. Various combinations of such assumptions produce a wide range of rule-implied interest rates. In addition, the use of alternative inflation and output gap measures further widens the set of the short-term interest rates suggested by such rules. Using historical versus

current data also affects the resulting TRIR (Orphanides, 1998). Finally, the fact that we consider a group of countries rather than a single one makes the specification of the appropriate Taylor rule far more complicated. Therefore, although there is a wide variety of possible Taylor-rule specifications,[6] we choose a simple one that corresponds to the original Taylor rule as follows:

$$i_{j,t} = r^*_{j,t} + \pi_{j,t} + 0.5(\pi_{j,t} - \pi^*_{j,t}) + 0.5(y^g_{j,t}),$$

where, $i_{j,t}$ is the short-term interest rate set by the central bank of the *j*th country, $r^*_{j,t}$ is the equilibrium real interest rate, $\pi_{j,t}$ is the actual inflation rate, $\pi^*_{j,t}$ is the target inflation rate, and $y^g_{j,t}$ is the output gap (the difference between actual and potential output). We focus on the long-run solution of the reaction function and therefore do not introduce an interest rate smoothing term.

Inevitably, it is necessary to make some judgemental decisions regarding the assumptions that our suggested Taylor rule incorporates. The specification we present in this chapter assumes that the equilibrium real interest rate in all the euro area countries is 2 per cent.[7] Although the assumption of a constant real interest rate is in general unsatisfactory, it can be justified given the brief period we focus on. One could call such Taylor rules 'naive' because they result from assuming/imposing the policy response parameters and the real interest rate rather than estimating them.

We use quarterly data and we consider the 1991Q1–2000Q3 period and various sub-periods. Our inflation data consist of quarterly observations of year-on-year changes in the individual countries' consumer prices indices. The use of the appropriate output gap is a more challenging task given that they are not usually available in high frequencies. Many authors use industrial production because the monthly data availability allows them to generate more observations. Nevertheless, using GDP is more consistent with what the central banks react to. We use the Hodrick–Prescott filter to obtain potential output series, which we use in turn to construct the output gaps.

We first provide a chart of the actual short-term (three-month) interest rates that the individual EMU participant countries have converged towards (see Figure 4.1). We also construct a synthetic/aggregate interest rate using IMF purchasing power parity weights. We do not consider Luxembourg because of its small size and Greece because it didn't join the EMU until 2000.

During most of the 1990s Italy, Portugal and Spain consistently display higher interest rates than the synthetic EMU interest rates. Finland and Ireland also display higher than the synthetic interest rates. The Finnish interest rate and the Irish interest rate exceed the synthetic interest rate during 1991–93, and the second half of 1998 correspondingly. Finally, the Irish interest rate skyrockets briefly during the ERM crisis period. The interest rates of the

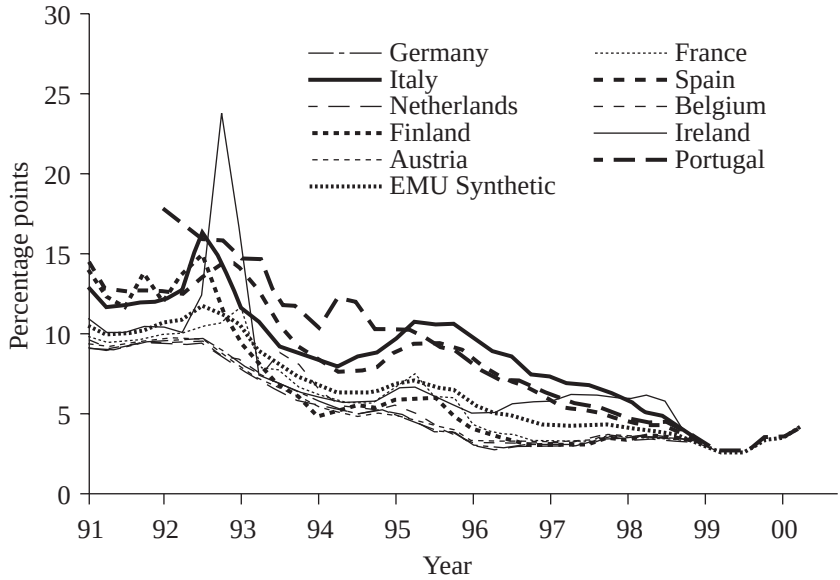

Figure 4.1 Actual individual-country and synthetic interest rates in the euro area

other EMU members move relatively closely to each other and they fall short of the synthetic EMU interest rate. Their deviations from the synthetic EMU rate are of a relatively low magnitude.

One possible explanation for the observed interest rate patterns in Figure 4.1 is that they reflect the optimal setting of monetary policy by national central banks according to a policy rule. Another possible explanation is that interest rates of countries typically considered as inflation-prone incorporated risk and inflation premia during that period. In addition, some central banks have been consistently following Bundesbank in an attempt to achieve credibility (countries with higher than the synthetic interest rate, however, would be less willing to follow the German monetary policy lead and more likely to have reaction functions conforming to a Taylor rule).

Figure 4.2 shows the TRIRs for each EMU participant country and their weighted average plotted against the actual synthetic euro area interest rate. In general the same countries that display higher than the synthetic actual interest rates in Figure 4.1 also appear to have TRIRs higher than the synthetic TRIR benchmark. In mid-1997 one can observe the highest degree of convergence. Convergence in the TRIRs reflects inflation and output gap convergence in the EMU countries; that is, it reflects actual convergence. This is because the simulated TRIRs are linear combinations involving those two variables. While

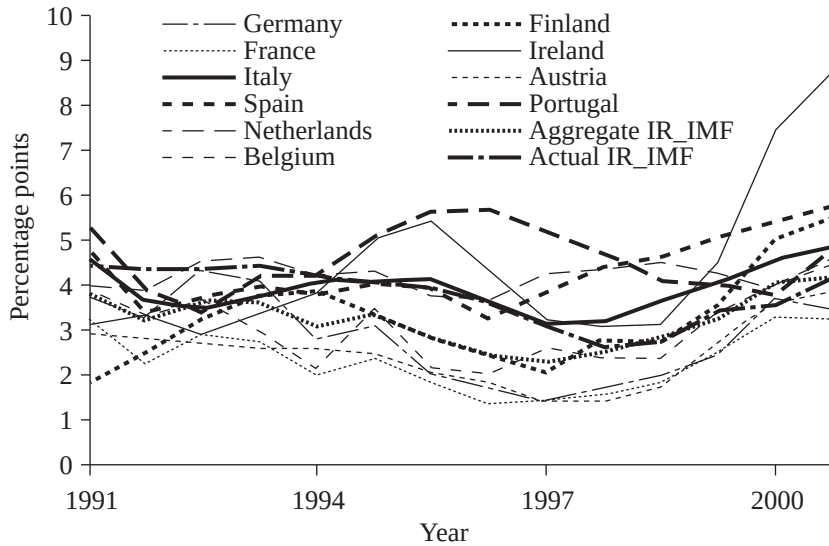

Figure 4.2 TRIRs for individual countries and the synthetic actual and TRIRs for the euro area

until 1997 only three or four individual country TRIRs exceeded the synthetic EMU rate, this situation has gradually changed during the EMU period so that by mid-2002 seven countries had TRIRs above the synthetic TRIR. This means that the benchmark policy of an EMU aggregates-only-minded ECB would be too tight for three out of the ten 'nationally focused' national central banks and too loose for the remaining seven. In other words, if the national central banks were able to cast their votes with only their national welfare in mind, the majority of them would vote for a tighter monetary policy. This is a possible way of addressing political economic aspects of the ECB's decision-making process. The literature often emphasizes the possibility that the national central banks' governors may vote according to their national priorities and not in aggregate EMU welfare terms.

To obtain a better insight into the possible divergences we subtract the warranted TRIRs from the actual interest rates (Figure 4.3). It emerges that although those differences are above zero on average until 1996, after 1997 they shift downwards and move around zero. Focusing on the period that a monetary union (or a quasi-monetary union) exists, we can see that, with the notable exception of Ireland, all the differentials between actual and TRIRs remain within the ± 1 per cent range around zero. Other interest rate differentials that exceed the ± 1 per cent range around zero after 1997 are those of Spain, Portugal and Finland. Of course, one possibility is that the TRIRs are

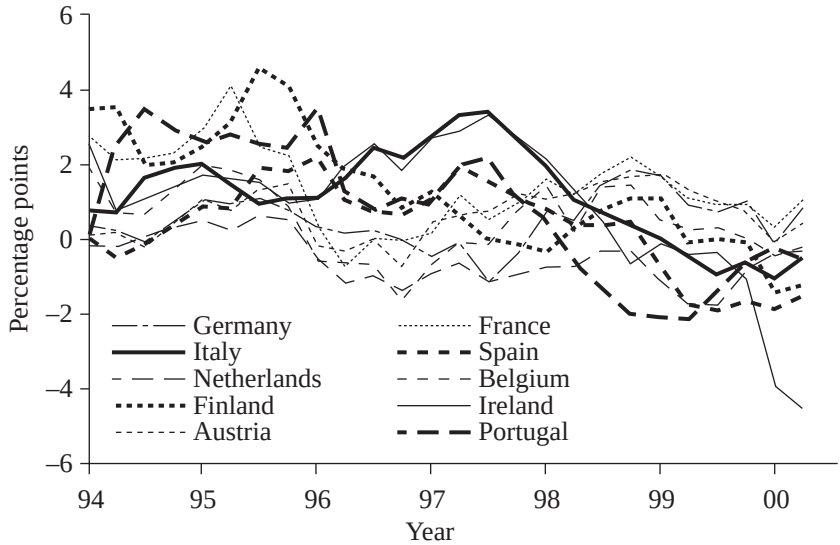

Figure 4.3 Interest rate differential: actual interest rate minus TRIR for individual EMU member countries

overstated because they are not adjusted for possible Balassa–Samuelson effects. That is, countries with lower income levels in a monetary union may display higher inflation rates than the high-income countries during the catch-up process. The TRIRs may reflect this inflation differential. Thus, TRIRs adjusted for possible Balassa–Samuelson effects would be lower and therefore the absolute differences between actual rates and TRIRs will be lower as well. We address this possibility below.

3. MONETARY POLICY DIVERGENCE INDICATORS FOR THE EURO AREA

In this section we consider simple measures of dispersion. We first provide the range, which is the simplest measure of dispersion available. The range for the actual rates and TRIRs is given by the difference between the highest and the lowest values of the interest rates for each given observation. In Figure 4.4 we show the range for the synthetic actual rate and the synthetic TRIR. We also observe that the strongest indication for convergence in policy needs takes place during 1997–98, consistent with our previous figures.

The problem with the range as a statistical measure of dispersion, however, is that it can be easily thrown off by extreme values. Thus we consider the

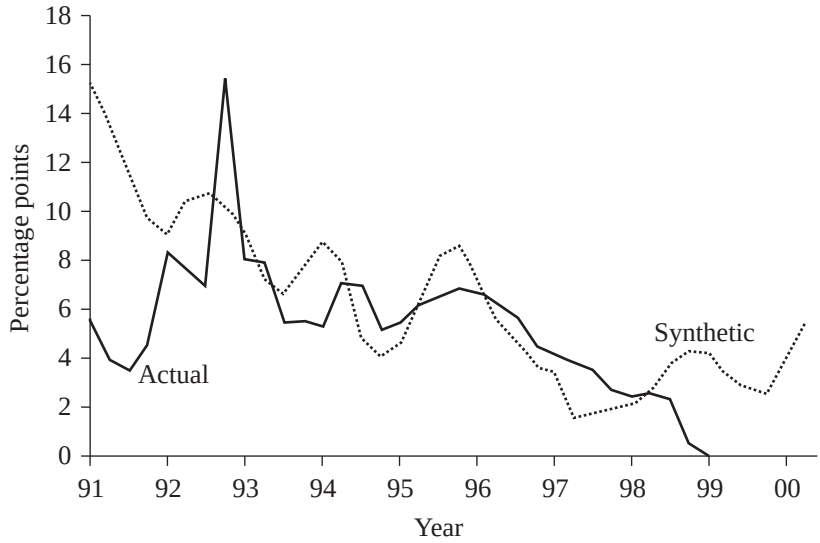

Figure 4.4 Range of synthetic actual rates and synethetic TRIRs in the euro area

standard deviation as a measure of interest rate dispersion in the euro area. The standard deviations for the actual rates and the TRIRs are given by the following two formulas respectively:

$$sd = \sqrt{\frac{1}{n-1}\sum_{j=1}^{10}(i_j - \bar{i})^2}, \quad \text{and}$$

$$sd = \sqrt{\frac{1}{n-1}\sum_{j=1}^{10}(TRIR_j - \overline{TRIR})^2}$$

The standard deviation of actual interest rates within the euro area declines consistently from 1996 to the end of 1998 and from January 1999 reduces to zero, since there is only one interest rate (Figure 4.5). The dispersion of the warranted interest rates, however, does not disappear and for the period 1977–2000 its mean value exceeds unity. One can interpret this dispersion measure as an index of potential stress in the EMU.

The standard deviation of actual versus the benchmark interest rates in a monetary union as presented above is a useful but possibly imperfect measure of divergent policy needs because it attaches the same weight to all member

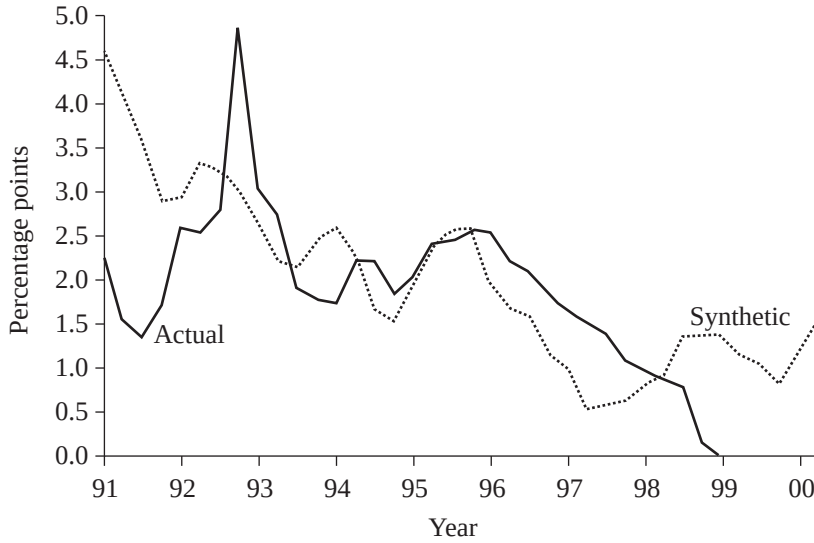

Figure 4.5 Standard deviation of actual interest rates from the synthetic actual interest rate

countries regardless of their economic size/importance. One can support this approach on the basis that the voting process in the ECB's governing council is unweighted. We calculate, however, the weighted standard deviation of the actual and benchmark interest rates as well. This measure is given by the following formulas for the actual rates and TRIRs respectively:

$$sd^w = \sqrt{\frac{1}{n-1}\sum_{j=1}^{10} w_j (i_j - i_{synthetic})^2}, \quad \text{and}$$

$$sd^w = \sqrt{\frac{1}{n-1}\sum_{j=1}^{10} w_j (TRIR_j - TRIR_{synthetic})^2}$$

The pattern that emerges in Figure 4.6 is consistent with that of Figure 4.5. The weighted standard deviation of the actual interest rate goes to zero after January 1999. The weighted standard deviation of the TRIR is slightly lower than the unweighted standard deviation since 1998, but does not differ significantly from it. Thus monetary policy is within a straitjacket even when weighted dispersion measures are used. Finally, Figure 4.7 shows the weighted and unweighted standard deviations for both the actual rates and the TRIRs.

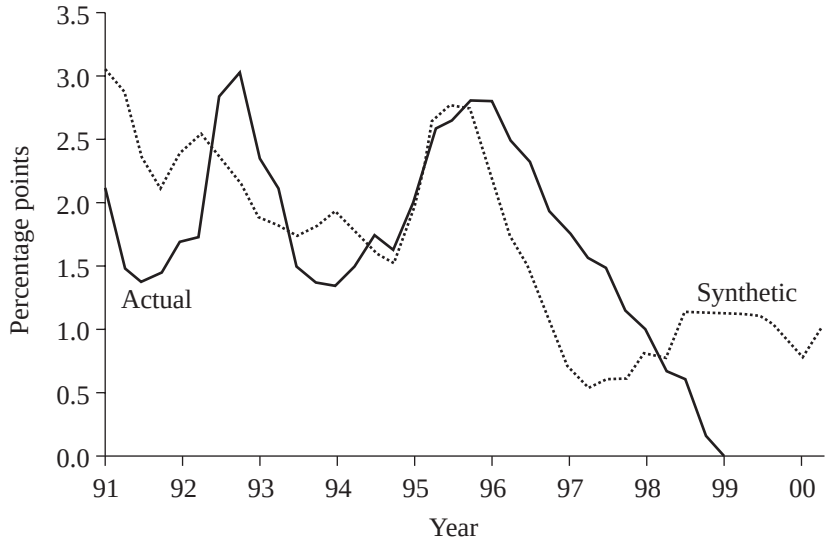

Figure 4.6 Weighted standard deviation of actual interest rates from the synthetic actual interest rate

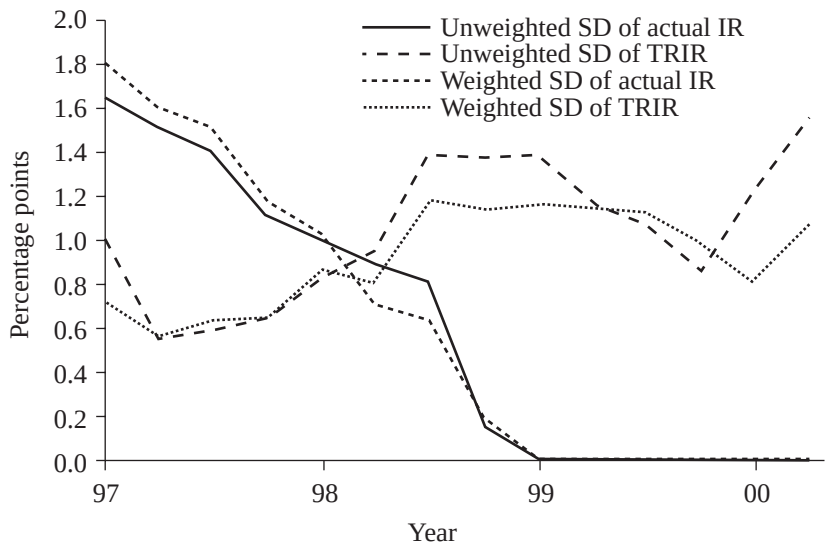

Figure 4.7 Weighted and unweighted standard deviations for actual rates and TRIRs

4. SOME QUALIFICATIONS

Of course the above analysis is subject to some qualifications and in this section we address some concerns that may arise. It is worth starting from the possible limitation of Taylor rules because of their simplicity, which prevents them from being a 'perfect benchmark' for monetary policy. Besides being a focal point of criticism, however, their simplicity is at the same time one of their advantages because it renders them easily understandable and manageable. The simplicity of Taylor rules is a virtue rather than a drawback because it makes it easy to identify the factors that drive any 'recommended' policy stance. Estimation of more complicated reaction functions is one way of correcting for this problem.

The Taylor rules may have to be adjusted for Balassa–Samuelson effects. As mentioned above, in the presence of Balassa–Samuelson effects the TRIRs would be lower and so will be the absolute differences between actual rates and TRIRs and the difference between the TRIRs and their mean. To consider the validity of this concern we conduct a simple experiment. We assume that the Balassa–Samuelson effect applies to three euro area countries (Ireland, Portugal and Spain). Under the assumption of faster growth in those countries during the catch-up process, the inflation rate and the optimal inflation target should be higher. Suppose that the inflation target is 1 per cent higher

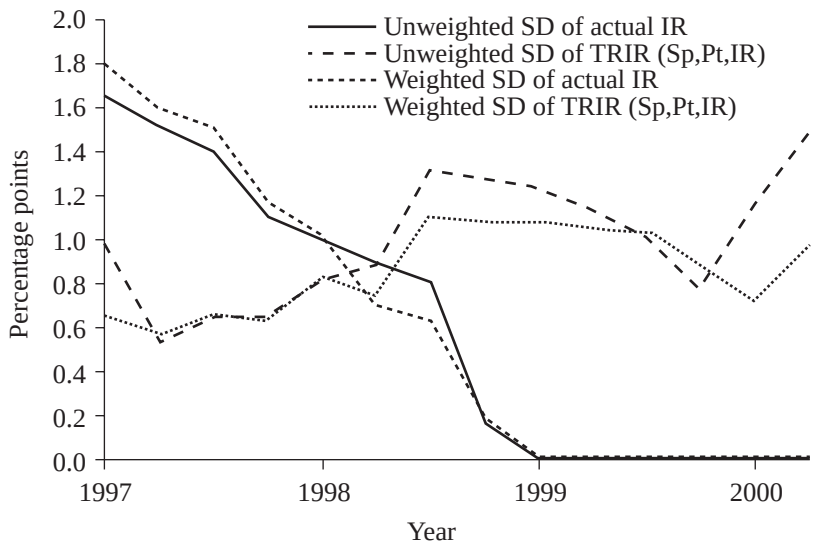

Figure 4.8 Weighted and unweighted standard deviations for actual rates and TRIRs

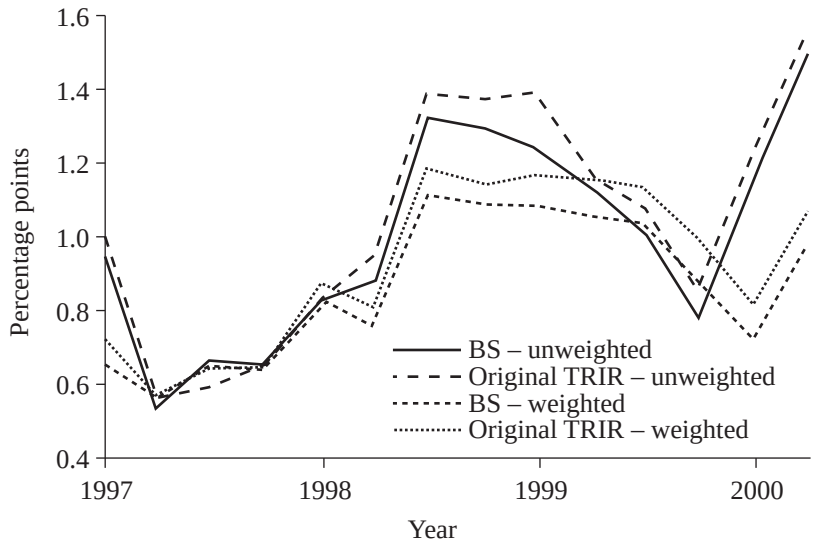

Figure 4.9 Weighted and unweighted standard deviations for actual rates and TRIRs with and without incorporating the Balassa–Samuelson effect

for Spain and 0.5 per cent higher for Ireland and Portugal than the target for the rest of the euro area. Figure 4.8 reproduces the standard deviations of Figure 4.7 when we allow for a higher inflation target that accommodates the Balassa–Samuelson effect in the three countries (the standard deviations of the actual interest rates remain the same). The dispersion measures adjusted for possible Balassa–Samuelson effects have only a minor impact on the weighted and unweighted standard deviations of the TRIRs. Figure 4.8 shows weighted and unweighted standard deviations for actual rates and TRIRs with and without incorporating a Balassa–Samuelson effect. To appreciate the difference that the Balassa–Samuelson effect can make, we provide in Figure 4.9 weighted and unweighted standard deviations for actual rates and TRIRs with and without incorporating the Balassa–Samuelson effect.

As mentioned earlier, in specifying a Taylor rule one has to make a number of assumptions regarding many aspects of that rule. Probably the most elusive aspect of such a rule is the equilibrium real interest rate, since it is unobservable. Taylor rules recommend setting the level of the policy interest rate to correspond to the state of the economy. This in turn has two components: one in levels that include the 'neutral' real interest rate and the inflation (or expected inflation) rate and one in changes that include deviations of inflation and output from bliss points.

In academic research Taylor rules have been considered using small calibrated models, large econometric models with rational expectations, representative agent models with optimizing behaviour, or in work that compares international and/or historical experiences. Much of the focus of this research is on the robustness of policy rules (see Taylor, 1999). The implicit assumption in estimated Taylor-rules-type reaction functions is that the economy's underlying neutral interest rates and the central bank's short-term inflation targets are constant in the short run. In addition to assuming constant values for each one of those variables, they appear together in the relevant regression results.

While in academic research the focus is often on revealing policy preferences (relative responses to output and inflation developments), interpreting past behaviour and providing a framework for thinking about policy issues, in applied policy analysis the objective of research is usually more ambitious. Applied policy analysis that uses Taylor rules has a strong normative element. In relevant work it is typical to plug the values of the right-hand-side variables into one (or more[8]) policy rule in order to obtain the TRIR. Clearly such Taylor-rule calculations are sensitive to the data selection and the assumptions used.

The modeller's choice of the neutral interest rate variable critical assumptions one has to make is about the equilibrium of neutral real interest rate since the TRIR changes in step with the real interest rate. The equilibrium real interest rate is the rate consistent with full employment (or output at its potential level) and is a benchmark for neutral policy. There are various approaches to specifying the appropriate real interest rate that the Taylor rule should incorporate.

One approach is to assume a plausible value for it. Taylor (1993) in his original study assumes that the equilibrium real interest rate is 2 per cent. Bjorksten and Syrjanen (1999) assume that the equilibrium real interest rate is 2 per cent for all EMU countries. A second approach is to calculate the difference between the average official short-term interest rate and the average inflation rate, both calculated over a long sample period. While consideration of a relatively long period is useful because it avoids the problem of cyclicality, it has the drawback that in periods when countries undergo structural and/or institutional change the historical real interest rate may not correspond to the current real interest rate. A third approach is to use an *ex post* real interest rate. Clarida et al. (1998) use the German *ex post* average real interest rate in Germany. Similarly, forward/expected real interest rates can be used.

A fourth approach is to use an adjusted *ex post* interest rate. For example, Gerlach and Schnabel (1999), who consider an EMU-wide Taylor rule, disapprove of the use of *ex post* real interest rates because low credibility of

monetary policy in some countries may have resulted in the overestimation of the equilibrium interest rates. Thus they first calculate the average realized real interest rate as the three-month nominal interest rate minus the CPI inflation over the past year and the average depreciation of the nominal exchange rate against the D-Mark. Then they regress the average real interest rate on a constant and the average rate of depreciation in order to obtain the 'credibility-adjusted' equilibrium interest rate. The last is the constant in the above regression.

Finally, there is an approach presented by Mayer (1999), who suggests that the method of Gerlach and Schnabel (1999) has two defects. First, they correct the *ex post* interest rate only for various exchange rate effects, and second, they calculate the equilibrium real interest rate using an arithmetic average of the country average interest rates (adjusted for exchange rate effects). The implication of the second flaw is that equal weights are assigned to all countries regardless of their economic size. Mayer's (1999) approach consists in the following steps: first, he makes the crucial assumption that the ECB has set actual interest rates correctly during the first ten months of 1999. Then, for given output gap estimates and differences between actual and targeted inflation he calculates the equilibrium interest rate that sets the actual interest rates in 1999 equal to the TRIR. This exercise produces an interest rate of 2.25 per cent. This approach, however, is not free from drawbacks either, since it depends on the assumption that the ECB set actual interest rates correctly during 1999.

5. SUMMARY AND CONCLUSIONS

In this chapter we provide a framework for assessing potential divergences in the monetary policy needs of the EMU members. We use Taylor rules as a consistent benchmark for describing systematic monetary policy and determining the warranted level of the interest rate. In contrast to other existing attempts to monitor divergences of real and nominal variables in the euro area, we examine whether the progress towards EMU during the early years of the ECB has enhanced convergence in the monetary policy needs of the participating countries or imposed a straitjacket on them. We provide a set of monetary policy divergence indicators. We apply them to both observed interest rates and to our measures of 'warranted' interest rates and examine whether the actual interest rates convergence process corresponds to the convergence process in the warranted interest rates.

In order to conceptualize any form of divergences we need a benchmark. We use Taylor rules as a consistent benchmark (which approximates the optimal monetary policy rule) in each EMU member country and the aggre-

gate euro area. We construct a Taylor rule for each EMU member country and for the euro area, compare the TRIR with the actual interest rate (before and after EMU), and the TRIRs with the actual synthetic euro area interest rate and the ECB interest rate (before and after EMU respectively). We then consider some simple divergence indicators for the euro area and provide the range, the weighted standard deviations and the non-weighted standard deviations of the actual rates and the TRIRs. We also perform some simple robustness checks and provide some discussion of our findings. The analytical framework we provide can form the basis for developing a set of indicators to allow regular monitoring of policy divergences in the euro area.

NOTES

1. This work was completed while the author was a Visiting Professor at the University of Athens. Professors Philip Arestis and Stephen M. Miller provided valuable comments.
2. For example, there is convincing empirical evidence that, historically, even the Bundesbank has been reacting to output as well as to inflation (see Clarida et al., 1998).
3. For example, see Clarida et al. (1998), Begg et al. (1998), Gerlach and Schnabel (1999). Other researchers, however, are more sceptical about the usefulness of Taylor rules, for example Kozicki (1999). Greenspan (1997) praises the attractive features of Taylor rules but with the caveat that they are at best 'guideposts' for central bankers' decisions.
4. Clarida et al. (1998, 2000), Peersman and Smets (1999), Gerlach and Schnabel (1999).
5. Gerlach and Schnabel (1999) estimate a reaction function for the EMU area (from 1990 to 1997) and find that the estimated weights on inflation and output gap are strikingly close to the above figures (0.45 and 1.58 respectively).
6. For example, see Peersman and Smets (1999), Isard et al. (1999), and so on.
7. Bjorksten and Syrjanen (1999) assume the real interest rate for EMU11 to be 2 per cent, Mayer (1999) 2.25 per cent.
8. Taylor (1999) suggests that policymakers should work with a portfolio of policy rules rather than with one rule. He clarifies that when he initially proposed a simple rule he suggested that it be used as a guideline along with other rules.

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5. Stock market prices and the conduct of monetary policy under the New Consensus Monetary Policy

Nigel Allington and John McCombie

1. INTRODUCTION

In this chapter we consider the broad question of whether or not central banks should take into account, either explicitly or implicitly, the rate of asset price inflation, especially when this is much more rapid than the growth of the CPI (consumer price index), in the determination of the nominal interest rate. We shall largely focus on stock market prices and confine our attention to the advanced countries. (Emerging markets raise additional considerations, such as poor prudential financial regulation.) This immediately raises both normative and positive issues. First, should the central bank attempt to influence asset prices through the use of interest rates and then, if it should, in what circumstances? Second, if the central bank should intervene, how effective is the use of interest rates in achieving this? If the answer to the latter is that it is not very effective, then should other instruments be used and, if so, what instruments? This merges into the wider question as to whether interest rates are effective in controlling inflation, *per se*, through influencing aggregate demand, as the New Consensus Monetary Policy suggests.

The New Consensus Monetary Policy, which suggests that the central bank should target inflation with no explicit consideration given to asset prices, is discussed in Chapters 2 and 6 (this volume). Therefore we begin by reviewing the evidence as to whether or not the crash of an asset price bubble has any serious adverse effects on the real economy. This leads to a consideration of two competing theories as to the causes of asset bubbles, namely the efficient markets hypothesis and the behavioural finance approach. The New Consensus macroeconomic model (Meyer, 2001) does not include assets in its specification and so we next consider briefly their role in the transmission mechanism. If the central bank should take cognizance of the rate of increase of asset prices, should it do so by explicitly including them in the inflationary target, thus removing any element of discretion? This is examined with

reference to both the theoretical arguments and the empirical evidence. A number of simulation models that have also attempted to answer this question are assessed. Finally we look at the issue of the relationship between interest rate changes and asset prices and report some new empirical results.

2. WHAT CAUSES ASSET PRICE BOOMS AND BUSTS?

If central banks are to intervene to collapse certain types of asset bubbles in order to prevent serious real effects, they have to be convinced that the latter will materialize in the absence of any action. If, say, a stock market crash occurs without any major adverse effects on output and unemployment, then the case for intervention, although it may still be there, becomes less pressing. It should be noted, though, that asset prices might still convey information about the future state of the economy without directly affecting this in any causal sense and hence still be of informational value. The problem is that there are very different views as to the causes of asset price bubbles.

The efficient markets hypothesis sees the price of an asset as reflecting the best available information concerning the fundamental values of that asset, and changes in its price reflecting rational expectations about its future values. Two commonly used indices that have been used to judge whether the value of the stock market is above the fundamental level are the price–dividend and price–earnings ratios.

The purpose of an asset is ultimately to permit consumption smoothing. The standard analysis assumes that arbitrage will equate the risk-free interest rate (such as the yield on Treasury bills) to the expected rate of return on the asset (including any capital gains) less the risk premium. Hence, the price–dividend ratio is given by $P/D = (1 + g)/(i + \rho - g)$, where g equals the growth of the dividend, i is the risk-free interest rate, and ρ is the risk premium. This is a variation of the 'Gordon Equation' (Gordon, 1962), which is a simple valuation formula widely used in finance. It can be seen that the fundamental asset price will increase as the rate of interest and the risk premium falls, or the expected dividend growth rate rises. If we assume that dividends are a stable fraction of earnings ($D = \lambda E$), we arrive at an expression for the price–earnings ratio as $P/E = \lambda(1 + g)/(i + \rho - g)$, where empirically for the USA the parameter λ takes a value of around 0.63 for the last century, falling to 0.52 over 1995–99.

The P/E ratio is often used to gauge, albeit imperfectly, whether the stock market at any particular time reflects the underlying fundamentals. For example, the P/E ratio for the Standard and Poor 500 stock index for 1950–99 has been around 16, with a growth in real dividends of 1 per cent, implying a risk-adjusted discount rate ($\xi = i + \rho$) of about 5 per cent. The P/E ratio for

the USA in the 1999 boom was about double the average at 32. The growth in real dividends had increased to an average growth of 2.4 per cent per annum over the period 1995–99. If the P/E ratio were to reflect fundamentals, this implies that ξ is approximately equal to 4 per cent (representing a fall of 1 percentage point) and that the dramatic increase in dividend growth compared with the historic norms was perceived as permanent.

Balke and Wohar (2001) consider that there is nothing implausible in this. There was much discussion about whether there was a 'new economy' in the USA with the information technology revolution supposedly ushering in an increase in trend productivity and hence leading to a rise in projected dividends. (However, productivity growth in the traditional manufacturing sector had not recovered from the 1973/4 slowdown.) Falling transaction costs and greater ease of portfolio diversification could have led to a fall in the risk premium, indeed eliminated it. Moreover, the rise of the 'share economy' could also have channelled proportionally more private savings into shares rather than other forms of saving (such as in savings and loan societies). The problem is that the P/E and P/D ratios are very sensitive to choices of the values of ξ and g and we are proxying investors' long-term expectations of these variables by their actual values.[1]

If the stock market boom was driven by changes in the fundamentals, then the crash of 2001 has to be explained in similar terms, namely, by new information that causes investors drastically to revise down their long-term expectations. Balke and Wohar (2001) suggest that this can be done in terms of an increase in the risk premium following the terrorist attacks of 11 September 2001, and the prospect of an economic slowdown could have led to a downward revision of the expected long-term growth of dividends. This line of reasoning is very much of an *ex post* justification and would imply a large degree of volatility in the fundamentals.

The logical procedure would be to survey investors to see what had affected their expectations. Neoclassical economics, for all its emphasis on the preferences and decisions of individual 'actors', has shown a great reluctance to determine empirically what these might be and how individuals actually behave. Fortunately, in this case, since the publication of Shiller's (1981) path-breaking article, there has developed a school of behavioural finance that actually does this (De Bondt, 2003). Shiller (1990) reports the results of surveys of investors in the USA and Japan following the October 1987 crash and real-estate market booms in the USA. Shiller found 'no recognizable trigger for the crash' and two-thirds of US and three-quarters of Japanese investors attributed the crash to 'investor psychology rather than fundamentals such as profits and interest rates'. In the case of changes in real-estate prices, Shiller sent questionnaires to homebuyers in a US city where prices had risen; where they had stayed the same; and where they had fallen. 'Not a

single person from among the 886 respondents cited any quantitative evidence about future trends in supply or demand, or professional forecasts of future supply or demand. There is a peculiar lack of interest in objective evidence about fundamentals' (Shiller, 1990, p. 59).

The behavioural finance places much more emphasis on 'popular models' where asset price booms or busts are seen as the result of feedback or herd behaviour and Ponzi finance, with the former the result of 'irrational exuberance' (Shiller, 2002). The impetus for the development of this approach comes from the equation $P_t = E_t\ (P_t^* \mid \Omega_t)$ (where E_t is the expectations operator), which is based on the relationship that the price P_t of a share (or portfolio of shares) at time t is equal to the discounted value of the expected dividends denoted by P^* conditional on the information set Ω at t. A forecast of P^* is given by $P_t^* = P_t + \varepsilon_t$, where ε_t is the forecast error. For an optimal forecast the error term must be uncorrelated with the information set at time t (which also includes P_t). This implies that $var(P_t^*) = var(P_t) + var(\varepsilon_t)$, or the variance of the forecast must be greater than the variance of the actual price. But empirically the converse proves to be the case. The conclusion that has been drawn is that the excess volatility of the actual price occurs for 'no fundamental reason at all, that they occur because of such things as sunspots or animal spirits or just mass psychology' (Shiller, 2002, p. 4). This has generated a considerable and ongoing controversy that we shall not discuss here.

It is possible to model bubbles as either exhibiting rational expectations or herd (i.e. contagion) behaviour, or indeed, both. On the one hand, Blanchard and Watson (1982) have shown that a rational bubble will occur when investors believe that they can sell an asset tomorrow for more than it costs today. They show that rational bubbles will emerge in a situation where there is a probability at each period of time that the bubble will continue (with a probability of χ) or crash with probability $(1 - \chi)$. As the probability of a crash increases over time, so the faster the asset price will have to increase to compensate the asset-holders for the greater probability of a price collapse. On the other hand, the behavioural approach sees the causes of bubbles reflecting more Keynes's (1936, 1937) view that what predominantly matters is the way an investor tries to guess how other investors view the likelihood of an increase in the price of an asset; in other words, 'what average opinion expects average opinion to be'. The emphasis of this approach is on Knightian uncertainty rather than risk. Topol (1991) presents a formal model that examines the effects of herd behaviour and mimetic behaviour.

However, what is more important for macroeconomic policymakers is whether or not changes in asset prices reflect changes in fundamentals. Where they do not, it is not of any great significance whether the bubble can be explained in terms of rational expectations or by psychological factors.

3. DO ASSET PRICE BUBBLES MATTER FOR MACROECONOMIC POLICY?

Regardless of whether we adopt the New Monetary Consensus model or a more Keynesian approach, it is still necessary for the monetary authorities to decide how to react to asset price changes. Clearly, a prerequisite for the monetary authorities to be concerned with asset bubbles is for their bursting to cause a major decline in economic activity and an increase in financial instability. It is, of course, not sufficient that there is an association – the key is that there needs to be causation. Indeed, it may well be that in some circumstances there is causation and at other times not. If so, the monetary authorities are faced with the difficulty of deciding precisely what these circumstances are and whether they warrant intervention.

Stock market bubbles have occurred from the earliest development of financial institutions (Kindleberger, 1989). One of the earliest and best known was tulipmania in the Netherlands in 1637 when, over the course of a month, the price of certain types of tulip bulbs rose to that of a town house, only to collapse rapidly thereafter. However, this example illustrates a problem that bedevils the analysis of bubbles. How do we identify a bubble as opposed to a rapid increase in stock market prices based on justifiable expectations of improvements in, for example, firm performance? In other words, how can the cause of the growth in stock market prices due to 'fundamentals' be differentiated from those that are due to 'irrational exuberance' or herd behaviour? Even with the benefit of hindsight, this can be difficult. Garber (1990), for example, argues that tulipmania could be largely explained by changes in fundamentals, while Baddeley and McCombie (2001) defend the traditional view.

It is even more difficult to make this distinction *ex ante*, as Irving Fisher's remarks in 1929 that US 'stocks appear to have reached a permanently high plateau' illustrate. After the crash, he still maintained that 'the market went up principally because of sound, justified expectations of earnings, and only partly because of unreasoning and unintelligent mania for buying'. A more contemporary example is the *Economist*'s view in April 1989 that Japanese stocks 'may be under-priced'. The IMF also failed to foresee the 1997 East Asian financial crisis.

Mishkin and White (2003) argue that one way to identify the collapse of a stock market bubble resulting from a change in investor sentiment rather than in fundamentals is that there should be both a rapid rise in interest rates and an increase in their spread. A stock market crash when initial balances are weak may lead to adverse selection in the credit markets as the net worth of some firms collapses and may, in extreme cases (especially in emerging markets), become negative. The problem is that the greater volatility of asset

prices generates noise so that a lender finds it difficult to discriminate between good and bad risks. The authors identified 15 crashes in the USA over the course of the twentieth century and found five cases when the firms' balance sheets were strong and so the relative downturns were relatively mild. The crashes of 1929 and 1987 were severe but the interest rate spread did not widen as the monetary authorities intervened. The remaining eight crashes were associated with either severe or moderate recessions.

The impact of stock market bubbles in the postwar period has been examined in *World Economic Outlook* (2003, and see also 2000), which identified 52 equity price busts in 19 countries between 1959 and 2002. This is equivalent to one crash per country every 13 years, suggesting that these are not all that rare, and all countries experienced at least one. The median equity price crash involved a peak-to-trough decline of about 45 per cent and took place over a period of ten quarters. The 1970s were the greatest period of instability, with over half the crashes occurring in this decade. There was an average decline in stock market prices of 60 per cent in 1973/74, following the collapse of the fixed exchange rate system of Bretton Woods and in conjunction with the quadrupling of the oil price.

It is important to note, however, that an equity boom did not invariably lead to a bust, as Mishkin and White (2003) also found. In fact, this only occurred in one-quarter of the sample. Bordo and Jeanne (2002a) examined 24 equity price booms over the period 1970–2000 and found that only three were immediately followed by a bust: Finland in 1988, Japan in 1989, and Spain in 1988 (where the date in each case is the last year of the bust). Likewise in a number of cases a boom did not precede a bust. This raises an important issue for monetary policy. Is it possible to discriminate *ex ante* between booms that do and those that do not lead to a bust? Equally, is it possible for the central bank to spot a forthcoming bust when there was no obvious boom? The fact that either of these is difficult inevitably reduces the role for the central bank in this area.

As far as house price busts were concerned, in 14 countries over the period 1970–2002 there were 20 crashes (as opposed to 25 equity price crashes), or, on average, one crash every 20 years for each country. House price crashes also seemed to be more clustered (notably around 1980–82 and 1989–92) than equity crashes. The *World Economic Outlook* (2003) identified three other important differences between housing price and stock market busts. First, price corrections during house price busts were less than those found in equities. Second, they tended to last longer (four years as opposed to two and a half years) and, third, a house price bust was more likely than a stock market crash to follow a boom. To this we can add a fourth difference: housing booms were more likely to end with a bust. The probability of this occurring is one in two, whereas for the stock market the probability is one in

eight (Bordo and Jeanne, 2002b). Nevertheless, housing and stock market crashes tended to overlap and were associated with downturns in the economy during the 1970s to 1990s.

Do asset price busts have real effects? The evidence suggests that under some, but not all, circumstances they do. 'On average, the output level three years after an equity price bust was about 4% below the level that it would have prevailed with the average growth rate during the three years up to the bust' (*World Economic Outlook*, 2003, p. 68). The impact of house price busts was more serious, lasted longer and was accompanied by a decline in output that was nearly twice that associated with stock market busts. The house price bust had not just a greater negative effect on residential construction but also, importantly, on consumption and aggregate demand. The onset of the economic recession occurred simultaneously with, or just after, the beginning of the bust but the timing of the recovery was generally independent of the seriousness of the crash. The transmission of these effects is discussed in greater detail below.

4. ASSET PRICES AND THE TRANSMISSION MECHANISM

The monetary transmission mechanism, despite considerable research effort, largely remains what Bernanke and Gertler (1995) have dubbed a 'black box'. In particular, the traditional mechanism associated with the 'Keynes effect' and the interest rate channel now appears empirically unimportant, with expected output growth having more effect on output than changes in interest rates. A second mechanism that relates the impact of interest rates on exchange rates to the Harrod foreign trade multiplier, providing the Marshall–Lerner conditions are met, has proved to be more robust in the short run.

More recently the role of asset prices in the transmission mechanism has received attention (Mishkin, 1995 and 2001). If interest rates fall through an expansionary monetary policy, equities become more attractive to investors than bonds and consequently the market value of firms increases. Here, an increase in stock market prices affects Tobin's *q* (the ratio of the market price of a firm to the replacement cost of capital) and the resulting low value for *q* creates an incentive for firms to invest in new capital. Despite its intuitive appeal, however, Bernanke and Gertler (1995) find that the supporting empirical evidence is far from robust.

The credit channel also shows the impact of changes in stock market prices on output. First, the market rate of interest can affect the financial position of firms (the balance sheet effect). If stock market prices rise, the value of firms' assets and collateral worth increases, enabling them to borrow to invest on

much more favourable terms. Firms have an incentive to issue new equity or sell debt to finance expansion rather than use the usually cheaper retained profits, because the external finance premium has effectively been reduced. Investment rises and output expands.

Second, the bank lending channel emphasizes the role banks play in financing small and medium-sized enterprises, even though institutional changes have reduced the contribution banks now make. But to the extent that they still provide finance, any tightening of monetary policy that reduces the price of securities, and therefore the capital of the banks, makes it increasingly difficult for them to attract deposits and to continue to make loans.

The balance sheet channel can also operate on households' balance sheets and their spending. Under the Modigliani life-cycle model, as households hold part of their wealth in shares, an expansionary monetary policy by increasing the price of shares would raise household wealth and increase consumption. The size of the wealth effect is debatable in the UK, however, because most households hold equities indirectly via their pension funds so that changes in the value of equities are not likely to have a great immediate effect. Moreover, the fact that any increase in the value of equities would have to be spread over the households' lifetime leads to little increase in consumption. On the other hand, in a less stable financial world where households anticipate a fall in income, the resort to more liquid assets like equities in place of housing and consumer durables, while reducing financial distress, might actually produce a greater rise in consumption when asset prices recover.

5. SHOULD ASSET PRICES BE EXPLICITLY INCLUDED IN THE MEASURE OF INFLATION?

Given that the New Consensus in monetary policy is concerned with the importance of targeting inflation, should asset prices be included in the index to be targeted, or, less controversially, should the monetary authorities at least take note of them in deciding the appropriate rate of interest? In this section we examine the first of these questions.

The theoretical case for including asset prices in the target inflation index has recently been championed by Goodhart (2001), drawing on the neglected argument of Alchian and Klein (1973). (See also Goodhart and Hofmann 2000, 2001.) Alchian and Klein start from the premise that consumers are interested not only in the cost of goods and services today, but also in their future prices. In other words, it is necessary to consider intertemporal consumption, as the utility of a consumer at any point in time is a function of consumption today and in the future. As prices for these future goods are not

generally accessible, one should use asset prices as a proxy. The representative consumer has a lifetime budget constraint (assuming no bequests) that is equal to current consumption and the sum of all future consumption. But consumers at time *t* allocate their wealth into current consumption and their asset holdings. Thus the price of assets at time *t* is a function of the future prices of the consumption goods and, so the argument goes, ought to be taken explicitly into account.

Shibuya (1992) has shown that an empirical approximation for Alchian and Klein's price index, in growth rate terms, is given by the equation $\pi_{AK} = \alpha\pi_C + (1 - \alpha)\pi_{AP}$, where π_{AK} is the growth of the Alchian–Klein index, π_C is the rate of price inflation as conventionally measured and π_{AP} the rate of increase of asset prices, respectively. However, given that claims to future consumption are substantially larger than claims to current consumption, the value of $(1 - \alpha)$ will be well over 90 per cent. Consequently, it will dominate, and probably greatly increase the volatility of, the index.

Moreover, is it reasonable to expect that changes in asset prices entirely, or largely, reflect the changes in the expected rate of inflation of future goods and services? This is the theoretical reason for explicitly including asset prices in the price index to be targeted. In this argument, it is not that the rate of growth of asset prices *per se* should be stabilized as an end in itself – it is that they provide a better prediction of the future path of the prices of goods and services than the current measures.

Goodhart (2001) points to cases where there are clear differences in the signals put out by the retail price index and asset prices. For example, Japan throughout the later 1980s and early 1990s had one of the lowest and most stable rates of inflation in terms of the conventional measures. 'Yet most of us do not regard Japan's monetary policy as having been exemplary. Why not? The main reason for a more adverse judgement is that the policy makers were not able to prevent an asset price bubble and bust in the same period' (Goodhart, 2001, p. F340). The reason why asset prices should be formally incorporated into the targeted index is that, generally, while the monetary authorities express concern over 'irrational exuberance' and the likelihood of 'sustainability', they 'find themselves largely incapable of any (pre-emptive) action in response to asset price changes themselves in advance of any (consequential) effects coming through onto current goods and services prices, [they are] paralysed in practice' (Goodhart, 2001, p. F342). Indeed, if anything, there is an asymmetric reaction, with central banks attempting to mitigate the effect of a slump while reluctant to prick the bubble in the first place. If asset prices were formally included in the inflationary target, this problem would not arise. But this presupposes that, say, increases in asset prices are not driven by improving fundamentals and, as we have seen, it is very difficult to determine the cause of an asset price boom. But even when they are not

driven by fundamentals, do changes in asset prices provide any better information about future conditions of the real economy or would taking account of them just increase the amount of noise? This is an empirical question and we next turn to a consideration of the evidence.

5.1 The Econometric Evidence

A large number of studies have looked at the changes in asset prices, the inflation rate and real economic activity (see Cecchetti et al., 2001 for a summary of the evidence). Here we will merely review what we see as some of the more interesting studies.

Goodhart (2001) undertook some preliminary tests by regressing the degree of variation in output (the absolute deviation of the growth of output from its trend) on its lagged value and similarly constructed variations in the CPI, share prices, and house prices for 14 advanced countries. The overall statistical fits were not particularly good, but the most significant regressor was house prices. Share prices and the exchange rate were not generally statistically significant. Consequently, the inflationary target should, according to Goodhart, 'give considerable weight to housing prices, though less, perhaps none, to equity prices' (Goodhart, 2001, p. F345).

This is not to say that increases in equity prices are unimportant, as, operating via the credit channel and bank lending channels, their overall effect could be through their impact on aggregate demand. Consequently, it could be that the influence of stock prices is being picked up in the variations in the CPI (but, as we note below, there is little empirical evidence for this). However, if it were true, it would not be necessary to target them directly. Cecchetti et al. (2000), using a VAR and performing out-of-sample tests, find that no single indicator improves the predictive ability of the lagged inflation term, although rather more favourable results were found by Cecchetti et al. (2001, p. 92). They found that 'although the model based on purely past inflation provides superior forecasts more frequently than the one that includes other variables as well, there are still many periods where the model including asset prices performs better'. They also found, not surprisingly, that the predictive ability of asset prices varied between countries.

Filardo (2000, p. 18) found that house prices do explain future consumer price inflation 'but the marginal improvement in forecasting accuracy is fairly small'. Stock market prices are not statistically significantly correlated with consumer price inflation. Stock and Watson (2001) have undertaken a comprehensive review of the literature on the relationship between output growth and inflation. They find that asset prices predict inflation or output growth in some countries in some periods, but it is difficult to predict when this will be

the case. Consequently, the relationships tend to be unstable and in-sample performance is often not replicated in the out-of-sample performance.

The overall consensus at present is that asset prices should not be included in the target price index, *pace* Goodhart. This is partly because of their volatility and lack of predictive power, but there is also the pragmatic reason that the present targets are well established and well understood by the public. To introduce a more complicated target could undermine confidence in the strategy (Vickers, 1999).

This leads to the next question: even if, for empirical and practical purposes, there is no overwhelming case for including asset prices in the inflation target, should the central bank react to asset prices? This could be done, for example, by including asset prices in a Taylor rule.

6. SHOULD THE CENTRAL BANK REACT TO CHANGES IN ASSET PRICES?

6.1 Simulation Models

One way of answering this question is to use a macroeconomic model to simulate the effect of using, and not using, asset prices in the way the central bank targets inflation. The simulation models differ in their complexity but they have the same basic structure. In Mishkin (2001), there is an IS relationship, a Phillips curve and a Taylor-rule relationship. In order for asset prices to affect the real economy, this variable is either added to the Phillips curve or the IS curve, or both (as asset prices affect output through Tobin's *q*, the balance sheet channel and the bank lending channel). If the central bank is assumed to react to asset price changes, the variable is included in the Taylor rule. A relationship determining the rate of change of asset prices is also usually included. The model can then be used to determine the effect of the central bank targeting asset prices when they do and do not affect output, and the consequences of the central bank taking no action in similar circumstances.

Filardo (2000), using a simple simulation model (asset prices only affect output via the Phillips curve), computes the net benefit for a central bank that is equally averse to inflation and output variability and for one that is relatively inflation averse. The net benefits are calculated as the sum of the benefit obtained when asset prices do and do not correctly predict inflation, each weighted by the probability of this occurring (taken for simplicity to be 50 per cent in each case). Filardo (2000, p. 24) concludes, using a loss function, 'the results using a model calibrated to the U.S. economy indicate that the expected net benefit of Goodhart's recommendation is negative, regardless of the central bank's preferences'.

Bernanke and Gertler (1999) use the standard dynamic new-Keynesian model and incorporate credit channel effects, including the financial accelerator. The latter is the mechanism by which increasing sales boosts firms' cash flows and hence leads to a further increase in asset prices (Bernanke et al., 1999). They also allow asset prices to be driven by changes in 'fundamentals' (i.e. technology shocks) and 'non-fundamentals'. While an exogenous bubble can cause the economy to overheat, the conclusion that they draw from all the various simulations is that 'it can be quite dangerous for policy simultaneously to respond to stock prices and to accommodate inflation. However, when policy acts aggressively [as measured by the strength of the interest rate response to changes in expected inflation] to stabilize expected inflation, whether policy also responds independently to stock prices is not of great consequence' (Bernanke et al., 1999, p. 28). A weak accommodative policy is far worse than the aggressive policy, whether or not the latter reacts to stock prices. Central banks should only react to asset prices, therefore, to the extent that they affect the central bank's forecast of inflation.

The problem of using simulation exercises is that slightly changing the specification of the model can radically alter the conclusions reached and, indeed, short of experimenting with the model, the reader can be left rather confused as to what is actually causing the disparate results. This is demonstrated by Cecchetti et al. (2001) and Cecchetti et al. (2002), who used variations of the Bernanke and Gertler simulation models and arrived at the opposite conclusion. For example, they use a loss function where the central bank minimizes the weighted average of the variability of output and inflation and this rule always means that the central bank should react to asset prices. They come to the overall conclusion that 'you have to work hard to find a case in which policy should not react to asset prices in the presence of a bubble' (Cecchetti et al., 2001, p. 25). They emphasize that this is not the same as targeting asset prices directly.[2]

Does this negate Bernanke and Gertler's opposite conclusions? Not necessarily. Bernanke and Gertler (2001) repeat their earlier exercise with some modifications and confirm their earlier conclusion. The reason, they claim, that Cecchetti et al. (2001) differ is because they assume that the bubble lasts a precise amount of time (five periods in the model) and neglect the fact that shocks other than a bubble may be driving asset prices.

Cecchetti et al. (2002), in their comment on this second paper, do not seem to agree. They argue that the disagreement turns largely on whether a central bank can distinguish between financial and technology shocks. They do concede that when it is unclear whether asset prices change due to shifts in fundamentals or irrational exuberance, then it would be dangerous to target this variable. But they argue that there are cases where most people would agree that 'egregious misalignments exist', namely Japanese stock and land

prices in 1989 and NASDAQ in late 1999. Besides, is measuring fundamental misalignments any more difficult than estimating the output gap?

The problem with simulation models is that you essentially get out what you put in. An example of this is Kent and Lowe's (1997) simulation model cited by Cecchetti et al. (2001) as evidence that central banks should react to asset prices. Kent and Lowe have a simple three-period model where the deviation of inflation from the central bank's target is a function of the deviation of the asset price from its fundamental level. Use of a dummy variable allows the deviation of inflation to fall when there is a crash in asset prices. There is an asymmetric effect in that the contractionary effects are worse than if the bubble had not occurred. The probability of the bubble bursting is an increasing function of the interest rate. They introduce an objective function of the central bank, which is to minimize the sum of the expected squared deviations of inflation from the target value. Kent and Lowe present some simulations but the point worth emphasizing is that given the structure of the model, it is hardly surprising that there is a role for the central bank. As it is built into the model that the bubble grows over time and the responding adverse effects of a crash also increase, then it is clearly optimal for the central bank to intervene to burst the bubble earlier than would otherwise occur, even at the expense of a tighter monetary policy that drives the inflationary rate temporarily below target. Equally, if the model were specified whereby the asset price inflation had no effect on real output (although in this model this would have to be incorporated through it having no effect on the CPI), then it would be hardly surprising that there was no case for the central bank to intervene.

6.2 Econometric Evidence

If simulation models result in contradictory results about the normative question as to whether the central banks should intervene, what does the econometric evidence say about the positive question of what they actually do in practice?

Movements in stock prices are likely to have an impact on monetary policy but the empirical evidence is hard to find because the stock market responds endogenously to monetary policy. In Allington and McCombie (2005), we utilize an identification technique developed by Rigobon (1999) to overcome this problem of simultaneity, later applied by Rigobon and Sack (2003) to US data, to estimate the Bank of England's monetary policy response to UK stock prices. Rigobon and Sack used the heteroskedasticity of stock market returns to estimate the monetary policy response because 'shifts in the variance of stock market shocks relative to monetary policy shocks affect the covariance between interest rates and stock prices in a manner that depends on the responsiveness of the interest rate to equity prices' (2003, p. 640).

The relationship between interest rates and stock prices is shown in the two equations below for interest rates and stock market returns:

$$i_t = \beta s_t + \theta x_t + \gamma z_t + u_{1t} \tag{5.1}$$

$$s_t = \alpha i_t + \varphi x_t + z_t + u_{2t} \tag{5.2}$$

where i_t is the three-month Treasury bill rate and s_t is the daily return on the FTSE 100 index for the period May 1984 to December 2003. The equations are in static reduced form and the dynamic interaction is characterized by a VAR with five lags for both the stock market return and interest rates. The variables x_t and z_t are macroeconomic shocks that can influence stock prices and interest rates; x_t includes consumer prices, producer prices, unemployment, retail sales and the effective exchange rate; and z_t other unobservable shocks common to both equations. A shock is defined as the difference between the released value and the expected value for the variable one week ahead. In equation (5.1), the high frequency monetary reaction or policy function, u_{1t}, denotes the monetary shock defined as deviations from the expected response of short-term interest rates. The stock price s_t can affect the economy through wealth effects, increased investment and the balance sheet channel, as we have discussed above. The Bank of England adjusts monetary policy as a reaction to the impact of these variables on inflation expectations; the parameter β measures the policy response to equity prices.

In equation (5.2) daily movements in stock prices are captured and expectations of future dividends and short-term interest rates are determined by current and lagged values of macroeconomic news, x_t and z_t, and the interest rate i_t. Shocks to stock prices u_{2t} are driven by changes in investors' risk preferences or non-fundamental movements in share prices.

The OLS estimate of β is negative, a perverse result, and most probably caused by the endogeneity of the stock market response. Rigobon and Sack deal with this by noting that the responsiveness of monetary policy will be a stronger determinant of the covariance between interest rates and stock returns when shocks in the equity market are more variable. For example, suppose that the variance of the stock market rises, while the variance of monetary policy remains unchanged. Then stock market returns and interest rates will reveal the monetary policy reaction more clearly: 'the disturbances are distributed around an ellipse that enlarges along the policy reaction function when the shocks to the stock market are more volatile' (Rigobon and Sack, 2003, p. 648). Hence the slope of the reaction function can be determined from changes in the covariance of monetary policy (interest rate) and asset prices over time.

Providing the parameters are stable across policy regimes and that the structural shocks are not correlated, Rigobon and Sack can estimate the value of β. A minimum of three different monetary policy regimes is sufficient to identify all the coefficients and to provide the equations to close the model and achieve identification. A reduced-form equation is estimated because of the presence of unobserved shocks, z_t.

To arrive at our own estimates, the covariance regimes have to be identified in terms of high and low variance in interest rates and stock market returns. It turned out that there were three cases: interest rates and stock returns have low variance; both have high variance; and interest rates high variance and stock returns low variance (there was no occasion when interest rates had low variance and stock returns high variance).[3] The interest rate responses to movements in the stock market were positive, with an estimated coefficient for β of 0.02478. Rigobon and Sack reported an estimate of 0.0214 for the USA. UK interest rates would appear therefore to be marginally more sensitive. Whereas a 5 per cent increase in the FTSE 100 index increases the UK three-month interest rate by 12.39 basis points, a similar increase in the Standard and Poor 500 index increases US interest rates by 10.7 basis points. Rigobon and Sack reported that the probability of a 25 basis point tightening following a 5 per cent rise in the stock market increased by 50 per cent, and in the case of the UK, the probability would be increased by 99 per cent.

We also redefined high variance as the 150-day rolling variance being half a standard deviation or more above its average which gave us four regimes; these were used to estimate β. The estimates were now lower at 0.0111, 0.0188 and 0.0162 (the fourth combination did not provide sensible results). This suggests that the response is much lower than in the case of the USA.

Finally, four policy regimes were chosen: (i) 1984 to September 1990, when there was exchange rate targeting; (ii) October 1990 to September 1992, when the UK entered the Exchange Rate Mechanism Mark I; (iii) October 1992 to May 1997, when inflation targeting came into force; and (iv) 1997 onwards, when the Bank of England gained independence. The estimates of β ranged from 0.0163 to –0.0044 using various combinations of three of the four policy regimes, but these results must be treated with caution as the use of the different policy regimes is unlikely to be as efficient as the previous methods in identifying the policy response function.

In an interesting paper, Bernanke and Kuttner (2003) approach the subject from the other direction: they use market-based measures of policy expectations to determine the effect of unanticipated changes in monetary policy on stock prices over the period May 1989 to December 2002 (excluding 17 September 2001). They found that a surprise 25 basis point increase in the interest rate announced by the Federal Reserve Open Markets Committee (FOMC) resulted in a decline in the daily Standard and Poor 500 index or the

Centre for Research in Security Prices (CRSP) value-weighted index of about 1 per cent in the day. In contrast, an expected change had no effect on stock prices. Using intra-day data, Gurkaynak et al. (2004) found a similar effect from a surprise change.

Evidence of this kind is rejected by Bullard and Schaling (2002), using a version of Woodford's (1999) small dynamic model and incorporating the monetary authority's reaction to equity prices in a simple Taylor-rule equation.

Their findings suggested that economic performance is definitely not improved by the addition of equity prices and that if this component was given undue weight, the rational expectations equilibrium became indeterminate and the macroeconomic effects of monetary policy highly unpredictable. Thus:

> By including additional asset prices – equities – in the policy rule, policymakers are in effect saying that they will use their influence over one asset price to help control or 'target' other asset prices. But, due to arbitrage in financial markets, any movements in short-term nominal interest rates actually add to the volatility of those other asset prices, even as they may be necessary to stabilise inflation and output. (Bullard and Schaling, 2002, p. 36)

There may, in fact, be a conflict in the policy response demanded by a movement in equity prices in comparison with that required by the output and inflation components of the Taylor rule. And they invoke an earlier wisdom that by reacting to equity prices the central bank would, in effect, be staring into a mirror.

Finally, Hayford and Malliaris (2002) considered whether or not the Greenspan Federal Reserve had been stock market 'neutral' using five tests, and concluded that monetary policy did not respond in a systematic way to changes in stock market valuations and that monetary policy actually accommodated the late 1990s stock market bubble.

7. SUMMARY AND CONCLUSIONS

In this chapter we have considered the arguments about what notice the conduct of monetary policy should take of asset (mainly stock market) bubbles and the econometric and the simulation evidence. The disadvantages of explicitly including asset prices in the inflation target outweigh the advantages, notwithstanding the arguments of Goodhart. The evidence about whether the central banks should take notice of asset price inflation is more mixed. The results of the simulation exercises are inconclusive and reflect the exact nature of the assumptions embedded in the model. The econometric evidence

is also not clear-cut. However, our own work has found that for the UK, just as Rigobon and Sack (2003) found for the USA, monetary policy does react to asset price changes, and this is confirmed by looking at the minutes of the FOMC. Asset price booms and busts can, but do not always, cause adverse effects on the real economy and the question is whether the central bank should attempt to prick the bubble before it has developed. But it is difficult to predict *a priori* when this will be the case and whether the rapid rise is determined by improving fundamentals or is largely speculative. Moreover, the interest rate is a very blunt instrument to accomplish this. If the aim is to prevent asset price bubbles, *per se*, then other controls might be more efficient. For example, in the case of house prices, introducing stricter limits on the loan–income ratio would be more effective. Finally, the debate about asset prices has been largely conducted within the framework of the New Monetary Consensus, but there are serious doubts about whether this is a satisfactory representation of monetary policy.

NOTES

1. There have been a number of cases where the valuation of a subsidiary of a company has been greater than the value of the company itself, which some have suggested shows the irrationality of investors. A notable case in 2000 was 3Com and its subsidiary Palm, 95 per cent of which was owned by 3Com. The traded share prices implied that for a time the market valued 3Com lower than the value of Palm. Cochrane (2003) has argued that this was not due to irrationality. There were so few Palm shares available for short-selling that the price included a convenience yield (δ) (in much the same way as holding cash does), which increased in size with the volume of trading. The *P/D* ratio in this case is $(1 + g)/(\xi - g - \delta)$ and so high values of g and δ could explain the temporary high valuation of Palm.
2. Mishkin (2001) argued, on *a priori* grounds, that there are serious flaws with this recommendation. First, it is difficult for the central bank to know when the bubble has actually developed. If the central bank does know that a bubble has developed and that it will eventually burst, then if it has no informational advantage over the market (and there is no reason to expect that this is not the case), 'the market knows this too and the bubble would unravel and thus would be unlikely to develop'. If the central bank does not know for certain that a bubble is in progress, then it is just as likely to pursue the wrong policy. Cecchetti et al. (2001) get the favourable results they do because they assume that the bubble is in progress. Second, all the empirical evidence suggests that the link between stock prices and monetary policy is weak and unstable. Thus 'if the central bank indicates that it wants stock prices to change in a particular direction, the exact opposite may occur making the central bank look inept'. (Mishkin, 1997 cites Greenspan's 1996 speech in which he suggested that with the Dow Jones at 6500 the market was displaying 'irrational exuberance'. The Dow Jones subsequently climbed to 11 000.)
3. A period of high variance is defined as the 150-day rolling variance of the residual being at least one standard deviation above its average.

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6. On the US post-'new economy' bubble: should asset prices be controlled?

Philip Arestis and Elias Karakitsos

1. INTRODUCTION[1]

On 26 November 2001 the National Bureau of Economic Research declared that the US economy's recession had begun in March 2001. The expansion had lasted for ten years and it was one of the longest ever recorded by any industrialized country. In the fourth quarter of 1999 the US growth rate reached 7 per cent, the highest in the 1990s. Unemployment fell to a 30-year low (3.9 per cent by April 2000), the rate of inflation was low (it averaged 2.5 per cent throughout the whole of the 1990s), faster growth in productivity was recorded, and faster growth in real wages. All these factors helped to reduce poverty and stabilize wage inequality (Temple, 2002). More recent data (see Council of Economic Advisers, 2004, Table A33), though, reveal that this is true only for the years 1998–2001. The stock market also produced massive gains, so that by the late 1990s the price/earnings ratios reached record levels for the whole of the twentieth century. Every year between 1995 and 1999 the US stock exchange Standard and Poor's Composite Index (S&P 500) produced an annualized total return (including dividends) over 20 per cent. By the end of that period, the performance of the stock market was concentrated in the stocks of large companies and of growth companies (those that had been delivering strong growth in earnings per share and were expected to continue to do so), especially in the areas of technology, media and telecommunications (TMT). The NASDAQ Composite Index, which was a heavy representative in technology shares, reached the level of 2000 for the first time during 1998 and peaked to 5048 on 10 March 2000.

The years 1998–2000 experienced Internet euphoria. Indeed, by 1998 the Internet share bubble had become a mania (Lee, 2004, p. 11; see also Schiller, 2000, who identifies the Internet phenomenon as the main factor of the US stock market mania). The success of the USA was the envy of the rest of the world. Politicians around the world were urging their governments and people to follow the US example. But in less than two years after the peak of the

business cycle had been reached in 1999, the US economy went into recession and dragged the rest of the world with it. The collapse of the stock market beginning March 2000 caused the optimism that had surrounded the 'new economy' to be followed by pessimism.

The mania to which we have just referred was not confined to the USA. It had spread around the world. By the end of the mania, it was actually more extreme outside the USA, and some of the valuations achieved by companies in the stock market were even more far reaching (Lee, 2004). An interesting characteristic of the 1990s financial bubble is that it incorporated not merely the US stock market, but also the global stock market and later on the bond markets. Its impact on wealth (in the form of financial market capitalization) probably represented the greatest financial mania in monetary history. Its international dimension was far reaching. It was a truly 'global bubble', in that it affected all financial markets of the world. The reaction of the monetary authorities to the burst of the bubble, in the USA in particular and to a lesser extent in the rest of the world, was unparalleled in world monetary history in that they reacted aggressively and pre-emptively, slashing interest rates to historically low levels.[2]

The purpose of this chapter is to investigate the causes of the burst of that bubble and its consequences. It is also to examine whether targeting asset prices might avoid bubbles.

2. THE 'NEW ECONOMY'

The developments we have briefly summarized above produced what one might label as the 'new economy' with its own rules, different from what had been conventionally known. In this 'new paradigm' opportunities for growth, particularly in the TMT industry, were thought to be limitless. This 'new economy' was based on the premise that its composition comprised services, essentially information, which became more important than physical commodities such as steel and copper. Tevlin and Whelan (2002) report that growth in real equipment investment over the period 1992–98 averaged 11.2 per cent per year, due essentially to soaring investment in computers. Indeed, Oliner and Sichel (2000) and Stiroh (2002), among others, refer to the business investment in computers and related equipment. The former note that it rose more than fourfold between 1995 and 1999, while the latter suggests that US firms invested more than $2.4 trillion in IT-related assets.

A further important characteristic was that of increasing returns to scale, given that in the knowledge- and information-based economy the cost of producing more units of a given output is very small after the initial investment is undertaken. But above all it was the unexpected acceleration of productivity

growth in the mid-1990s that can be construed as the most important characteristic of the 'new economy' (see also Temple, 2002). Using growth accounting, the contribution of information and communications technology (ICT) capital (including computer hardware, software and telecommunications equipment) to productivity growth can be assessed. Temple (2002) provides a summary of studies that have undertaken this exercise. The overall conclusion of this study is that a substantial increase in the contribution of ICT investment to aggregate growth took place, and that 'the production and adoption of ICT can account for most of the acceleration in labour productivity growth between the first and second halves of the 1990s' (p. 248).

Low inflation and falling unemployment are two further characteristics of considerable significance over the period. This, however, appears to be an interesting puzzle about the 'new economy'. How can low and stable inflation be associated with unemployment rates that would normally make rising inflation inevitable? By the beginning of 2000 inflation was at 3.3 per cent and unemployment at 4 per cent. The latter was, in fact, below the 'consensus' estimate of the non-accelerating inflation rate of unemployment (NAIRU) by about 2 percentage points. Inflation should have been accelerating and monetary policy should have been aggressively tightening. By contrast, the Federal Reserve System (Fed) held interest rates steady. US monetary policy authorities resorted to the 1990s productivity growth to justify a 'loose' rather than a 'tight' policy. Greenspan (2004a) is very explicit on the matter:

> As a consequence of the improving trend in structural productivity growth that was apparent from 1995 forward, we at the Fed were able to be much more accommodative to the rise in economic growth than our past experiences would have deemed prudent. We were motivated, in part, by the view that the evident structural economic changes rendered suspect, at best, the prevailing notion in the early 1990s of an elevated and reasonably stable NAIRU. Those views were reinforced as inflation continued to fall in the context of a declining unemployment rate that by 2000 had dipped below 4 per cent in the United States for the first time in three decades. (p. 3)

However important that recognition was for the policy stance of the Fed, productivity growth in itself cannot explain the behaviour of inflation and unemployment at the time. A challenge for the adherents of NAIRU thereby emerged, as Greenspan (2004a) makes clear in the quote just cited. A number of explanations were inevitably put forward. Favourable supply shocks, a decline in the NAIRU, unexpected productivity growth, or a combination of all these factors have been proposed (see, for example, Temple, 2002, p. 251, for a brief summary).

The 'globalized' world economy was another important dimension of the 'new economy'. National economies became interdependent, with companies being able to sell into a competitive world economy. In such an economy, the

growth potential could be said to be limitless and the 'perfect' nature of competition should not allow inflation to materialize given that 'pricing power' weakened substantially. With inflation conquered, the possibility of recessions disappeared because no longer would inflation tend to get out of control once economic growth was sustained for some time. The rise in productivity that the TMT supposedly made possible should have resulted in profit share rising. This, however, could not possibly have materialized in view of the substantially weakened 'price power'. If anything, it was higher labour productivity that emerged, which increased real wages rather than profit share.

In terms of the policy contribution to the 'new economy', Greenspan (2000) distinguishes between the effects of monetary and fiscal policy. In terms of monetary policy he suggests that although it 'did not produce the intellectual insights behind the technological advances that have been responsible for the recent phenomenal reshaping of our economic landscape', it has, none the less, 'been instrumental … in establishing a stable financial and economic environment with low inflation that is conducive to the investments that have exploited these innovative technologies' (p. 3). Fiscal policy also played a crucial role:

> The emergence of surpluses in the unified budget and of the associated increase in government saving over the past few years has been exceptionally important to the balance of the expansion, because the surpluses have been absorbing a portion of the potential excess of demand over sustainable supply associated partly with the wealth effect.[3] Moreover, because the surpluses are augmenting the pool of domestic saving, they have held interest rates below the levels that otherwise would have been needed to achieve financial and economic balance during this period of exceptional economic growth. They have, in effect, helped to finance and sustain the productive private investment that has been key to capturing the benefits of the newer technologies that, in turn, have boosted the long-term growth potential of the U.S. economy. (Ibid., p. 3)

It is implicit in Greenspan's argument that if the surpluses had not reduced demand, the Fed might have raised interest rates to cool the economy down. Indeed, and, more recently, Greenspan (2004a) claimed victory in the Fed's battle to limit the damage from the burst of the stock market bubble. The claim focuses on the observation that

> There appears to be enough evidence, at least tentatively, to conclude that our strategy of addressing the bubble's consequences rather than the bubble itself has been successful. Despite the stock market plunge, terrorist attacks, corporate scandals, and wars in Afghanistan and Iraq, we experienced an exceptionally mild recession – even milder than that of a decade earlier … much of the ability of the U.S. economy to absorb these consequences of shocks resulted from notably improved structural flexibility. But highly aggressive monetary policy ease was doubtless also a significant contributor to stability. (Ibid., p. 4)

There are strong doubts, however, about the 'new economy' paradigm. Critics claim that there has been no big increase in trend economic growth; this has certainly not been the case globally and perhaps not even in the USA. What actually happened was that the financial asset mania suppressed inflation in the USA, thereby enabling the business cycle expansion, and the accompanying cyclical upswing in productivity, to be sustained for a longer time period, making what in effect was a cyclical phenomenon look like a secular shift (Lee, 2004). Gordon (2000) expresses similar doubts in his observation that the productivity gains of the 1990s may be temporary. Furthermore, there is no guarantee that inflation will remain low either. Given that there was no productivity acceleration outside the manufacturing sector (although non-manufacturing sector companies were often intensive users of ICT), a great deal of doubt is, in fact, cast on the 'new economy' model. A further blow to the model was the stock market mania, which actually received a great deal of media attention. By 2002, however, the stock market fell substantially so that the 'new economy' optimism disappeared. Indeed, the supporters of the 'new economy' model have been proved wrong!

While it is true that there is some support for the argument that there was no productivity miracle and no increase in potential output growth in the 1990s, in reality the truth may be somewhere in between. TMT produced some productivity gains, especially in the non-manufacturing sector (mainly services), and probably raised potential output growth from 2.2 per cent in the 1980s business cycle to 3–3.5 per cent in the 1990s cycle. With hindsight potential output growth was 3.1 per cent measured from peak to peak of the cycle (that is, between 1989 and 2000). The advocates of the new economy paradigm have argued that improved productivity raised potential output growth to 4 or even 6 per cent (see, for example, Arestis and Karakitsos, 2004).

In fact, equity prices fell continuously between March 2000 and the beginning of 2003. That bear market resembles the mid-1970s plunge in equity prices in magnitude. But it differs in terms of the causes, and consequently with respect to the factors that should be monitored to test its progress. In the 1970s, soaring inflation was the reason for the bear market due to the surge in the price of oil. It eroded households' real disposable income and corporate profits. That was a supply-led business cycle. Now, the bear market is caused by asset and debt deflation triggered by the burst of the 'new economy' bubble.

The 2001 recession was very mild, as it was caused by the inventory correction associated with the burst of the 'new economy' bubble. Although with current economic fundamentals based on quarterly data up to the fourth quarter of 2003 the Standard and Poor (S&P) index may be fairly valued (see Arestis and Karakitsos, 2004, ch. 10, table 2), the fair value may fall if the

economy moves into a situation which triggers a property market crash. This may very well happen if interest rates rise. Then poor prospects in the corporate sector may materialize that affect the real disposable income of the personal sector. The forces that may drive the economy to that situation are related to imbalances in the corporate and personal sectors that might start infecting the balance sheet of the commercial banks. The final stage of this process involves a spiral between banks and the non-bank private sector (personal and corporate). Banks cut lending to the non-bank private sector (credit crunch), which worsens the economic health of the latter, reflected subsequently as a further deterioration in the balance sheet of the banks. As the income of the personal sector falls, households find it increasingly difficult to service their debt. House repossessions soar as the recession deepens. Similarly, companies cannot service their debt as profits plunge. Banks respond to this adverse development by cutting new lending (credit crunch) and the liquidity that the central bank injects into the economy fails to reach the ultimate borrowers (what Keynes, 1936, called the liquidity trap).

3. THE BUBBLE AND ITS AFTERMATH

In the course of 1999 fears of a recession following the SE Asian and the Russian crisis in 1997–98 were quickly dispelled and the US economy grew more strongly than in the whole of the 1990s. The corporate sector was on a spending spree on IT, in the hope of huge productivity gains that would allow profits to grow further. The personal sector was on an even stronger spending spree, buying houses, cars and other durable goods, as well as services. The Fed started tightening monetary policy in the middle of 1999 for fear that this huge growth might rekindle inflation. But the Fed move was mainly preemptive, as inflation remained tamed, and a soft landing in 2001 had been predicted, meaning a cooling down of the economy to more sustainable rates of growth that would prolong the business cycle and allow prosperity to continue without the threat of inflation. But the economy refused to slow down and the Fed continued to tighten, with the Fed funds rate rising from 4.75 per cent to 6.5 per cent. However, once the economy started responding to the high level of interest rates, it decelerated sharply and the pace gathered steam. In the first quarter of 2001 the economy fell into recession. Not only did interest rates, but also the price of oil, contribute to the recession. The price of oil soared from less than $10 per barrel at the end of 1998 to more than $35 in August 2000. The rise in oil price eroded both the income of households and the profits of the corporate sector and accelerated the downswing.

The first signs of strain appeared in manufacturing, with a build-up of inventories of unsold goods, in particular durables. The manufacturing sector

responded in the second half of 2000 by cutting production, shedding labour and slashing investment expenditure. Services continued to be buoyant and consumer spending remained resilient, giving rise to hopes that the soft landing was on target. However, in spite of the huge efforts of the corporate sector to reduce its unwanted stocks, the inventories-to-sales ratio continued to rise as sales fell faster than inventories. In the first quarter of 2001 the weakness in manufacturing, instead of having been contained, spread to other sectors of the economy and the NBER officially declared in November the beginning of the recession in March 2001. What is puzzling in this story is that the economy fell into recession because of excess inventories. This had not been the cause of a recession in the 50 years previously. But the overhang of inventories was only the symptom of the recession, not the cause. The true cause was the burst of the NASDAQ (technology) bubble in March 2000. The technology miracle that promised so many hopes and gave so much prosperity between 1994 and 2000 simply collapsed. The budget surplus of the period 1997–2001 may have caused relevant problems, of course. To the extent that it reduced non-government savings, it must have caused severe problems to the credit structure of the system, thereby promoting the bursting of the bubble.

The problem with the NASDAQ bubble was the ever-increasing gap between what is technologically feasible, which captures the imagination of the stock market, and the harsh reality of the slow adjustment in consumer habits. IT companies invested and created the capacity for all people to shop from the Internet, talk on mobile phones with people all over the world all day long and do things that people could not even have dreamt about less than a decade before. All of a sudden everything that one could imagine was technologically feasible and companies offered it as if everyone was ready to change their way of life. Before one generation of telecoms was utilized, another was ready to take its place. This does not mean, of course, that the technology would never be used. With time, the economy, the consumer and society's habits would adapt and the technology would be fully utilized. The dream of the new society where technology would be centre stage would become a reality, but it would take a long time. The daydreamers thought that all this change would take place overnight. 'Dot' companies mushroomed and their stock market value soared. Investors adopted the dream and priced such companies as if the dream had become a reality. Unfortunately, most dot companies were making losses, but they held the promise of making profits in the future. For as long as the corporate spending growth on equipment and software carried on increasing, the promise of future profitability of Internet companies was kept alive. But in March 2000 (after the 'millenium bug' was over) the corporate sector cut drastically its expenditure on equipment and software and with it was lost the dream that the dot companies would ever

become profitable. The NASDAQ bubble had been pricked! The harsh reality is that every bubble is the same. The bubble is always created by an event that changes permanently future profitability. Every discovery that changed permanently future profitability resulted in a bubble. The bubble was always fuelled by credit that allowed the finance of the dream. But in every case the bubble burst because the discovery was not made in a vacuum. For the discovery to be fully exploited the overall economy needs time to adapt and society's habits need time to change. From this point of view the technology bubble is not different from the railway or canal bubble.

The effects of the burst of a bubble are also qualitatively the same. As asset prices (stock prices, property and land prices) fall the corporate and/or the personal sector is left with huge debts that must be serviced and ultimately repaid. These debts are accumulated when optimism is running high and asset prices are soaring, as in the NASDAQ case, and reflect the perception of the permanent improvement in corporate profitability. Companies are not worried by accumulating debt, and banks and investors are not worried by granting the loans or investing in the companies when corporate expenditure is thought profitable. But because it takes time for the economy and for society habits to adapt to the new environment, the expenditure is never profitable in the short run; and if the government budget is in surplus it deteriorates the whole process. The tragic economic consequences of the burst of a bubble are always positively related to the debt level that was accumulated in the rosy years of the expansion. The picture was very different in 1987, when the fiscal deficit helped to prevent similar consequences. The 1987 crash was different in that there was sufficient spending to keep the real economy afloat; indeed, there was enough financial equity to support the credit structure.

There have been three episodes when an asset and debt deflation caused recession in the nineteenth and twentieth centuries.[4] The Great Depression of 1876–90 (associated with the railway bubble), the Depression of 1929–40 (associated with the electricity and automobile bubble) and the deflation of Japan that started in 1989 and has not yet finished (associated with electronics). The current asset and debt deflation is associated with the telecommunications and Internet bubble. In all these cases the process of eliminating the serious imbalances associated with the burst of the bubble took a long time, over a decade. As the recent experience of Japan shows, in a secular bear market there are sharp, but short-lived, rallies that give rise to false hopes of an end of the bear market. In an asset and debt deflation environment the non-bank private sector retrenches, as its huge debt, acquired in the rosy years of rising asset prices, is inconsistent with falling asset prices. The process of reducing debt through saving and curtailing spending is long, causing a secular bear equity market. This is exactly what happened in the USA recently.

The pre-bubble stock market mania produced a huge increase in investment, and a sharp decline in private savings (helped by the government surplus). Historically, the personal and non-financial business sectors in the USA (the bulk of the private sector) had not run a deficit until the 1990s (some US governments had run deficits; see Arestis et al., 2004); subsequently their financial balance plunged into huge deficit. By 2001, the financial balance of the corporate sector had reached its lowest level over the entire previous 50 years. Thereafter, the corporate sector financial balance turned into a surplus, as a result of corporate restructuring (see Arestis and Karakitsos, 2004, figure 1). One important implication of this imbalance was the creation of an enormous build-up of debt within the economy. By 2003, total private debt reached a level equivalent to one-and-a-half times GDP, compared to roughly equal to GDP in the early 1980s (see *Flow of Funds Accounts of the United States*, Federal Reserve System, October 2003). Another significant imbalance is the US current account deficit, which has recently reached over 5 per cent of GDP on an annual basis (and at the time of writing it is showing little sign of improvement). This has been financed by the huge inflow of capital from overseas, emanating from the desire to save in dollar-denominated assets by non-US residents – which resulted in a flood of cheap imports. A staggering $47bn inflow is needed per month to finance this deficit (although one might suggest that this is how much the overseas sector has to export to meet its savings desire). The relevant monthly average figure for the first eight months in 2003 was $59bn, actually up from $47.9bn in 2002. But it slumped in September and October 2003 to $4.3bn and $27.8bn, respectively, thereby falling significantly below the threshold of $47bn. However, the November and December 2003 figures jumped to $87.5bn and $75.7bn, respectively (data from the monthly report of the US Treasury, as reported in *Financial Times*, 18 February 2004). The US bond market behaviour is relevant to our discussion. The US, and other government, bond markets suffered in 1999 as the Internet boom entered its most frenzied phase and the Fed began to raise interest rates. When the equity bubble burst, bonds appreciated as investors switched out of equities into bonds – so much so that the argument has been put forward that a complete collapse of the equity market is unlikely so long as the bond market performs strongly (Warburton, 1999). This is possible when central banks keep interest rates low, so that large investors and hedge funds can borrow short term to fund positions in long-term debt.

It may be fruitful to look at the standard income identity as a way of summarizing the argument so far:

$$(S - I) + (T - G) = (X - Q)$$

where S is savings, I is investment, T is taxes, G is government expenditure, X is exports, and Q is imports. It suggests that the surplus of the private sector, that is the personal sector and the corporate sector combined, $(S - I)$, plus the surplus of the government sector $(T - G)$, should always be equal to the foreign sector surplus $(X - Q)$. The equity bear market was accompanied by a sharp fall in investment, so that the corporate sector's deficit was thereby corrected to a significant degree, although it is doubtful whether this correction is yet sufficient. The personal sector deficit has also improved slightly, but it remains a long way from its historic large surpluses. So $(S - I)$ is still in deficit. The government sector $(T - G)$ has turned from surplus to deficit, so that $(X - Q)$ has also moved into deficit; this, of course, shows the deficiency of savings for the economy as a whole.[5]

In principle, five possible solutions to the problem suggest themselves: (i) a decline in the stock market of sufficient magnitude; (ii) a severe recession in the economy; (iii) a major fall in the dollar exchange rate (in excess of 30 per cent); (iv) a proactively large government deficit; and (v) a combination of the four factors to which we have just alluded. The first two, along with the fourth, are the result of insufficient aggregate demand due to a small government deficit that fails to accommodate the savings desires of the domestic and foreign sectors. The third possibility presents itself when the foreign sector tries to spend rather than save its dollar holdings, which would also tend to increase US aggregate demand.

The inevitable conclusion is then that the US financial bubble exacerbated imbalances in the economy: namely, excessive debt, deficient savings and a growing external imbalance. The financial bubble encourages stronger domestic demand, but it does not necessarily encourage stronger overseas demand. In the ballooning of the bubble the currency may be strengthened by capital inflow attracted by the bubble-boosted returns on domestic assets, but the deterioration in the balance-of-payments trade and current accounts is not sustainable indefinitely, unless, of course, the foreign sector wishes to accumulate US dollar-denominated assets indefinitely. Ultimately, though, it is conceivable that the foreign sector may not wish to carry on accumulating US dollar-denominated assets. Indeed, 'given the already-substantial accumulation of dollar-denominated debt, foreign investors, both private and official, may become less willing to absorb ever-growing claims on U.S. residents' (Greenspan, 2004b, p. 6). In a general sense, the currency would then fall. Just as the financial bubble was the cause of the (real) dollar exchange rate appreciation, due to investment being higher relative to savings which drew capital into the USA, its bursting should be expected to lead to (real) dollar depreciation. But still there is the question of why the dollar has not depreciated even more than hitherto, as the bubble has been unwinding.[6] Three reasons suggest themselves:

1. The global nature of the asset bubble and foreign central bank reaction to its unwinding. The asset bubble was, of course, global in nature. Central banks outside the USA also accommodated the financial bubble. However, in the USA the monetary authority response was a great deal more aggressive than elsewhere. In the short run, this supports the dollar because of the impression that the European economies are faring no better than the USA. In the long run it means that the 'day of reckoning' is merely postponed.
2. Foreign government and central bank support of the dollar. The Bank of Japan has been intervening in the foreign exchange market in an attempt to prevent the yen from appreciating; the other Asian central banks have been accumulating foreign reserves, mostly dollars (the Chinese central bank in particular) and US Treasuries in an attempt to manage their exchange rates against the dollar.
3. The exceptionally aggressive easing in US fiscal policy. The federal budget turned from a surplus equivalent to 2.3 per cent of GDP in 2000(1Q), when we had the stock market peak, to a deficit of 4.2 per cent of the GDP by 2003(2Q), a massive swing of 6.5 per cent of GDP. Higher government deficit has been adding to private savings, domestic and overseas; but still government deficit is not enough to meet savings desires. It would appear that the US desired saving rate is short relative to desired investment, and this may be a factor that mitigates the fall in the dollar exchange rate.

In spite of the burst of the new economy bubble, the recession was relatively mild and so far it has not threatened to become similar in magnitude to that of Japan or the 1930s. Why is that?

Table 6.1 shows the changes in personal sector wealth since the burst of the equity bubble. Net wealth, defined as assets less liabilities, peaked in March 2000 at $43.4 trillion or 615 per cent of disposable income and bottomed at $38.7 trillion or 493 per cent of disposable income in September 2002, as equity prices plunged. The loss in net wealth between the peak and the trough of the equity bubble is $4.7 trillion or 122 per cent of disposable income. The equity market rally since the end of the Iraq war and the boom in property market has turned these losses into gains of the order of $3.3 trillion, but as a per cent of disposable income it is still 74 per cent lower than the peak of the bubble.

These shifts in net wealth obscure the risk of replacing the equity by the property bubble. Table 6.1 shows the breakdown of net wealth into its constituent components. By the end of the third quarter of 2004 the $3.2 trillion losses in total assets (defined as tangible and financial) between the peak and the trough of the bubble had been turned into gains of the order of $6.6 trillion.

Table 6.1 US personal sector balance sheet

	Net Wealth	Net Wealth as % of Nominal Disposable income	Total Assets	Total Assets as % of Nominal Disposable income	Tangible Assets	Tangible Assets as % of Nominal Disposable income	Financial Assets	Financial Assets as % of Nominal Disposable income	Liabilities	Liabilities as % of Nominal Disposable income
Peak of Equity Bubble (March 2000)	43 428	615	50 384	714	14 558	206	35 827	508	6 956	99
Bottom of Equity Bubble (Sep 2002)	38 705	493	47 138	601	17 876	228	29 262	373	8 433	107
Latest Quarter (Sep 2004)	46 681	541	56 975	660	21 699	252	35 276	409	10 293	119
Loss between Peak & Bottom of Bubble	–4 723	–122	–3 246	–113	3 318	22	–6 564	–135	1 477	9
Latest Gain or Loss since Peak of Bubble	3 253	–74	6 590	–53	7 141	45	–551	–99	3 337	21

Source: Fed (2004).

Table 6.2 US source and uses of housing capital gains (billions of dollars)

	Real Estate of Households	Percentage of Owner's Equity in Household Real Estate	Extracted Home Equity	Disposable Personal Income (Nominal)	Personal Income	Fiscal Support	Consumption (Nominal)
Peak of Equity Bubble (Mar 2000)	10 506	56.9	4018	7059	8266	1207	6 614
Bottom of Equity Bubble (Sep 2002)	13 268	56.8	4 456	7 849	8 896	1 047	7 428
Latest Quarter (Jun 2003)	16 583	56.2	4 849	8 627	9 672	1 044	8 278
Difference between Peak & Bottom of Bubble	2 762	–0.1	438	790	630	160	814
Difference since Peak of Bubble	6 077	–0.7	831	1 568	1 406	163	1 664

Source: Fed (2004).

However, this is largely due to the gains in tangible assets (mainly property), which more than offset the losses in financial assets. The rally in equity prices since the end of the Iraq war has almost eliminated the losses in financial assets from $6.6 trillion to just $0.5 trillion. Households, though, have continued to borrow heavily in the last four years of the order of $3.3 trillion or 21 per cent of disposable income. This accounts for the deterioration in net wealth. The rate of debt accumulation in the last four years is unprecedented. There is no other four-year period, since records began in 1952, in which debt increased at such frenetic pace. The second highest rate is just over 10 per cent of disposable income that occurred between April and September 1987, after the peak of the property market in April 1987. The rate of debt accumulation fell rapidly after the equity market crash in October 1987.

Table 6.2 shows the role of the property market in supporting consumer expenditure and cushioning the economy in its recent downturn. The boom in the residential property market has resulted in capital gains of the order of $6.1 trillion for households between the peak of the equity bubble and the third quarter of 2004. However, households continuously borrowed against their property to finance consumer expenditure in the recent downturn. Accordingly, the percentage of owner's equity in household real estate keeps falling. Between the peak of the equity bubble and the third quarter of 2004 the owner's equity in household real estate has fallen from 56.9 per cent of disposable income to 56.2 per cent. This represents $831 billion home equity extraction (i.e. realized capital gains), which accounts for 50 per cent of the consumer expenditure in this period. The fiscal support to the personal sector in the form of tax cuts and other benefits account for an additional $163 billion during this period. Hence, taken together, the fiscal support and the home equity extraction account for 60 per cent of consumer expenditure in the last four years. This explains why the consumer remained resilient throughout the recent downturn.

Still, the question remains whether the causes and consequences of the US post-'new economy' bubble suggest that asset prices should be controlled as a means of containing financial imbalances. It is to this question we now turn.

4. SHOULD ASSET PRICES BE CONTROLLED?

In this section we examine the possibility of targeting net wealth as a means of avoiding booms and busts of bubbles. This is particularly pertinent in view of the argument that can be advanced (see, for example, Arestis and Karakitsos, 2004, ch. 6) that the bubble is still there, with the vestiges of the mania remaining in the stock market, while the force of the bubble has moved to the government bond market, and to the property market in particular.

4.1 Asset Price Inflation and Bubbles

The standard argument in terms of asset price control is that asset price inflation (the percentage yearly change in equity prices, house prices or land prices) is out of the realm of central banks, as it reflects market forces; any control is widely regarded as interfering with the principles of the free market economy, or, indeed, it is the result of 'irrational exuberance'. Bernanke and Gertler (2000) argue that trying to stabilize asset prices is problematic, essentially because it is uncertain whether a given change in asset values results from fundamental or non-fundamental factors or both. In this thesis, proactive monetary policy would require the authorities to outperform market participants. Inflation targeting in this view is what is important, where policy should not respond to changes in asset prices. Clews (2002) argues along similar lines, and concludes that asset price movements 'rarely give simple unequivocal messages for policy on their own' so that they are 'unlikely to be suitable as intermediate targets for a policy whose main aim is to control inflation' (p. 185). Greenspan (2002a, 2002b) argues that the size of the change in the rate of interest to prick a bubble may be substantial and harmful to the real economy.[7]

Yet the experience of many countries, including of course the USA during the period under investigation, shows that successful control of CPI inflation does not guarantee low asset price inflation. When asset price inflation gets out of control bubbles are built and while they grow they generate a great deal of euphoria. But bubbles ultimately burst with devastating consequences not only for the investors in the stock markets, but also for the economy as a whole. The experience of the last 20 years shows that the adverse consequences of the burst of a bubble hit not only weak economies, but also strong economies such as the USA and Japan. Goodhart's (2001) suggestion, based on Alchian and Klein (1973), that central banks should consider housing prices and, to a lesser extent, stock market prices in their policy decisions is very pertinent.

Targeting is possible through interest rates, exactly as in the case of CPI inflation, by monitoring and targeting the implications of asset prices on the spending patterns of consumers and companies. The variable that lends itself as a primary candidate for monitoring and control of asset price inflation is the net wealth of the private sector. Net wealth is defined as the assets less the liabilities of the personal sector. Assets include both financial and tangible. Financial assets include deposits, bonds and equities. Tangible assets include real estate and consumer durable goods. The liabilities of the personal sector include all forms of debt and mortgage, as well as consumer credit for all other purposes. Although in the short run the ratio of net wealth to disposable income can fluctuate widely, in the long run it is trendless, as it shows the

number of years it takes for households to buy a house and build financial wealth that would finance consumption for the rest of their lives and to leave bequests to their heirs. This ratio can neither be on an upward nor downward trend in the long run, as it would imply intergenerational changes in savings habits. Net wealth as a percentage of disposable income is mean-reverting.[8] It is this mean-reverting property of net wealth that allows the detection (or monitoring) of bubbles.

The reason that net wealth is such an ideal variable to monitor (and, perhaps, control) bubbles is that it is at the heart of the transmission mechanism of asset prices and debt to consumption. This is the underlying rationale. In the very long run consumption and real disposable income are growing at the same rate so that the ratio of consumption to income (the average propensity to consume) is equal to unity. But in the short run consumption can deviate substantially from income. In the permanent income–life-cycle hypothesis consumers save in good years and tap into these savings in bad years. Hence the savings ratio (savings as a percentage of disposable income) moves pro-cyclically: it rises in booms and falls in recessions. The validity of this relationship has been questioned (see, for example, Frowen and Karakitsos, 1996). The argument is that in a leveraged economy the savings ratio moves counter-cyclically (that is, it falls in a boom and rises in a recession). In boom years asset prices rise faster than usual as consumers borrow against these assets to invest even more (leveraging). Faster than usual rising asset prices make people feel rich, inducing them to relax their effort to save as they believe that they are in a better position to meet their desired levels of savings (for example, provide for their pension, leave to their heirs). Hence the savings ratio falls in a boom. In a recession asset prices fall and people are left with an overhang of debt. In order to repay their debt, people cut consumption out of current income and intensify on their effort to save in order to rebuild their wealth. Hence, the savings ratio increases in a recession. The counter-cyclical behaviour of the savings ratio, which is a characteristic of leveraged economies, aggravates the adverse consequences on the economy of the boom and bust of bubbles. In the short run, therefore, consumption depends on real disposable income and the savings ratio. The long-run forces that determine the savings ratio are net wealth and uncertainty about job security and income growth prospects (Arestis and Karakitsos, 2004, ch. 7). For these reasons, a rise in net wealth lowers the savings ratio and vice versa. An increase in uncertainty about job security and income growth prospects makes people more cautious, inducing them to refrain from spending out of current income, thereby raising the savings ratio.

As the previous analysis has shown, related to Tables 6.1 and 6.2, the easy monetary policy that was put in place to fend off the deflationary effects of the 'new economy' bubble has created other bubbles in its place, more nota-

bly the property and bond market bubble in the USA. To the extent that other countries followed the US example in the conduct of monetary policy has also led to the creation of similar bubbles, as in the UK, New Zealand and Australia. The combination of US easy fiscal and easy monetary policy has enabled the consumer to remain resilient in the face of falling equity prices and foil the deflation that has plagued Japan for the last fifteen years from developing in the USA. This gives support to the argument of Greenspan that dealing with the consequence of the bubble rather than trying to prevent it may be a better approach. The last proposition, though, invites some comment. The Fed Chairman recognized as early as 1996 the risks to the economy from the gradual building of the 'new economy' bubble, but he opted for talking the markets down with his famous remarks of 'irrational exuberance'. A view that did not fit at all with the free market view, which saw in these remarks a dangerous threat of a Fed involvement with, and interference in, the free functioning of financial markets. He gradually gave in and decided to deal with the consequences of the bubble rather than preventing it from getting out of control.

However, as we argue below, control of asset prices and the prevention of asset bubbles is not only desirable, but also feasible by targeting the net wealth of the personal sector. The Fed Chairman, though, does learn, if belatedly. In a speech at the annual Federal Reserve Jackson Hole Symposium (sponsored by the Federal Reserve Bank of Kansas City) on the 26 August 2005, he warned that asset prices are now having a greater impact on the US and world growth than it was previously thought. In fact he isolated the housing boom as an 'economic imbalance' alongside the US current account deficit. Whether or not he would go so far as to support asset price targeting if he were to serve for another term is an interesting 'conundrum'.

But only history will tell whether dealing with the consequences of the bubble was a premature conclusion, as substantial risks remain emanating from the huge imbalances in the form of the current account, the Federal debt and its financing which relies, to an increasing extent, on foreign buying of US Treasuries. Whereas a lot of attention is paid in the press to these imbalances, a more serious risk lies in the bond and property bubbles, which are interdependent. A rise in bond yields which can be triggered by a sudden move to a flexible exchange rate by China and the other Asian economies or simply a substantial revaluation of the renminbi, which protectionists in the US are favouring, may lead to much higher bond yields than otherwise. We have shown elsewhere that if the 20-year mortgage rate climbs into the 7–8 per cent range then the property bubble would burst (see Arestis and Karakitsos, 2004, Ch. 7). This would also take down the equity market and then the deflationary skeletons that have been put into the cupboard will be released and will come back with vengeance to cause a severe retrenchment by the

consumer that would drive the economy into recession. A taste of what is to happen is indicative of the shipping market that experienced an unprecedented boom as a result of the easy US monetary policy. Now that the Fed is gradually removing the accommodative bias, the shipping industry is experiencing a colossal bust, which has seen freight rates falling by nearly 90 per cent since December 2004.

4.2 Monetary Policy and Targeting of Net Wealth

For the US economy the average net wealth is around five times annual disposable income. Hence the Fed can have a target of net wealth of five annual disposable incomes, to the extent that it has an implicit target of 2–3 per cent for CPI inflation. Monetary policy should be tightened as the ratio of net wealth to disposable income rises much above this threshold and vice versa. An admissible range for net wealth may be 400–550 per cent of disposable income. This would allow asset price booms, but it would prevent them from becoming bubbles that will ultimately burst, with huge adverse consequences for the economy as a whole. Tightening of monetary policy would certainly prick the bubble, as it did in the case of Japan. Only in that case the Bank of Japan raised interest rates to combat CPI inflation. Had it done so much earlier, and if it had an explicit target on net wealth, it would have prevented the ballooning of the bubble and it would have minimized the consequences of the asset and debt deflation that followed the burst of the bubble. By allowing bubbles to balloon, a few people would certainly become much richer, but at the expense of the majority of people becoming poorer. Bubbles are the means through which income is redistributed within society. Such redistribution is skewed towards the very rich. Hence bubbles have the unpleasant effect of causing income inequality.

Tightening of monetary policy through interest rates would certainly lower asset prices – equities as well as property – through a number of channels. First and foremost, an interest rate rise changes market expectations of future corporate profitability. When a central bank avoids stop–go policies (that is, random swings) and, instead, changes monetary policy in a systematic and persistent way, it affects market expectations. Investors interpret a rise in interest rates as a step in a series of hikes that will last for a long period of time. Markets therefore interpret tightening of monetary policy as a signal of lower growth in the future that will reduce corporate profits. Because markets act as a discounting mechanism of future events they precipitate the fall in equity prices, long before actual profits are affected, thereby helping the task of the central bank.

Second, tightening of monetary policy induces investors to rebalance their portfolios. The expected return on equities falls, while the expected return of

the close substitutes rises. A rise in the short-term interest rate by the central bank raises the return on deposits and discourages investors from investing in the equity market. It induces a portfolio rebalancing out of equities into cash. Long-term interest rates also rise as a result of monetary tightening, but by less than short-term ones. Hence the yield curve flattens or becomes inverted, as a result of monetary tightening. Higher long-term interest rates induce another portfolio rebalancing, this time out of equities into bonds. High or rising interest rates will also prick bubbles in property. Evidence from our own work, see Arestis and Karakitsos (2004), suggests that the long-term interest rate is the single most important variable in the US housing market with a multiplier of two in the first and second years (see Chapter 6 below). This means that one percentage point hike in the long-term interest rate lowers house prices by more than 2 per cent, both one and two years later.

Asset price inflation always takes place when the economy is overheated – that is, when it grows faster than its potential. It is unthinkable that the economy would be in recession or recovery and asset price inflation would be high. Simply, equity prices would be low because corporate profits would be poor. Overheating of the economy may not actually lead to higher CPI inflation, but to higher asset price inflation. As in the case of the USA in the second half of the 1990s or of Japan in the 1980s, the lack of acceleration in CPI inflation when the economy is overheated leads to the erroneous conclusion that productivity must have risen and this allows the economy to grow at a faster rate without increasing inflation. In other words, it leads to the conclusion that the rate of growth of potential output must have risen. People in the USA in the second half of the 1990s frequently spoke of a productivity miracle that raised potential output growth substantially (see, for example, Greenspan, 2004a). In fact, there was no productivity miracle. In the USA there was some productivity improvement in the 1990s, as a result of the widespread use of computers in services. But potential output growth was only raised between 3.00 per cent and 3.50 per cent – hardly substantial.

Since asset inflation is associated with steady or gently rising CPI inflation when the economy is overheated, there is no real conflict between the two targets. The central bank can pursue simultaneously the targets of asset inflation and CPI inflation, if it so chooses.[9] If asset inflation were lowered before it became a bubble, the economy would have a ‘soft landing’. As in the case of the USA in 1994, the tightening of monetary policy was regarded as a means of prolonging the business cycle by killing the overheating before CPI inflation managed to get out of control. Similarly, tightening of monetary policy to kill asset inflation would prolong the business cycle and the economy would enjoy a ‘soft landing’. The overall conclusion is that asset inflation targeting is both desirable and feasible and in no way conflicts with the traditional role of the central bank in targeting CPI inflation. Net wealth as a

percentage of disposable income is the ideal variable for targeting asset price inflation, as it directly affects demand in the economy. Targeting of the net wealth to disposable income ratio does not interfere with market forces and how to distinguish between fundamental and irrational exuberance in asset prices, which has been at the heart of the argument against such targeting by Bernanke and others, as it deals with the consequences of the bubble on consumer expenditure and not with any particular asset price inflation rate.

5. SUMMARY AND CONCLUSIONS

Many countries have suffered in the last ten years or so from the boom and bust of bubbles and, in some of them, popular demands for action by the authorities have not abated. In this chapter we have dealt with the US experience. We have examined the US bubble of 2000, the related issue of the 'new economy' paradigm, the aftermath of the bubble, concentrating on its consequences before dealing with the issue of how we might tackle it. We have suggested that asset price inflation targeting may be both desirable and feasible and in no way conflicts with other policy objectives of the central bank, as for example in the case of inflation targeting.

The process of asset price inflation targeting involves monitoring and targeting the implications of asset prices on the spending patterns of consumers and companies, rather than asset prices themselves. It would simply be unacceptable for a central bank to have a target for one of the main stock market indices. The variable that lends itself as a primary candidate for monitoring and control of asset price inflation is the net wealth of the personal sector as a percentage of disposable income, as it is at the heart of the transmission mechanism from asset prices and debt to consumption. This variable is trendless (that is, it is stationary) and reverts to its mean, which is five times annual disposable income for the USA. Monetary policy can be tightened when the ratio of net wealth to disposable income rises above a particular threshold, say 550 per cent for the USA.

Critics of asset price inflation targeting claim that monetary tightening kills good growth that generates prosperity. Such arguments are based on the premise that the lack of CPI inflation when the economy is overheated is evidence of productivity improvement that has raised the growth of potential output. But this is an erroneous conclusion. Simply, the overheating is channelled to asset price inflation rather than CPI inflation. Clearly, the Fed never contemplated a rate hike to control the bubble, although its chairman tried to influence it with his by-now familiar remarks about 'irrational exuberance'. In fact, and more recently, the chairman of the Fed argued that there is tentative evidence to suggest that dealing with the consequences of the bub-

ble is preferable to dealing with the bubble itself (Greenspan, 2004a, 2004b). The case for asset price inflation targeting would become weak if the economy were to remain firmly on a sustained path to recovery. However, as this chapter has shown, in spite of the robust growth of the last nine months or so in 2003, there are still substantial risks to the economy, emanating from the fact that the imbalances that were created by the boom and bust of the bubble have not been corrected. If the economy were to stumble, and these imbalances were to reawaken, driving the economy down once again, then the case for asset price inflation targeting would become more pertinent.

NOTES

1. This chapter is based on the authors' book; see Arestis and Karakitsos (2004, ch. 2).
2. For example, the US Federal Reserve System reduced its 'funds' interest rate no fewer than 13 times between early 2001 and the time of writing (March 2004). This rate now stands at 1 per cent, a record low level. This is not confined to the USA. In the Economic and Monetary Union (EMU), the European Central Bank (ECB), although rather slow in reducing its 'repo' interest rate, is now holding this rate at 2 per cent. These are only two, but representative, examples of what the situation has been worldwide.
3. Greenspan (2000) defines wealth effects as follows: 'Historical evidence suggests that perhaps three to four cents out of every additional dollar of stock market wealth eventually is reflected in increased consumer purchases. The sharp rise in the amount of consumer outlays relative to disposable incomes in recent years, and the corresponding fall in the saving rate, has been consistent with this so-called wealth effect on household purchases. Moreover, higher stock prices, by lowering the cost of equity capital, have helped to support the boom in capital spending' (p. 2).
4. There were many recessions caused by asset and debt deflation throughout the seventeenth and eighteenth centuries. The most important were the tulip mania in the middle of the seventeenth century, and the Mississippi and South Sea bubble of the early eighteenth century (see, for example, Garber, 2000).
5. It should be noted that the statement in the text about the savings deficiency is only correct by the specific definition of national savings, namely equal to the trade gap. This measure of savings has no operational function apart from restating the trade gap. This is how it is meant to be used here.
6. Interestingly enough, the dollar reached a three-year low with respect to the euro (0.779), and an 11-year low with respect to pound sterling (0.53), after the chairman of the Fed delivered his semi-annual report on monetary policy to the Congress on 11/12 February 2004. He commented that a gradual weakening of the dollar would help narrow the US external deficit, and would have no adverse effect on US capital markets. The market interpreted that somehow unusual remark on currencies by the Fed chairman as a clear sign of the Fed's tacit acceptance of the dollar's slide.
7. An interesting proposal is contained in the study by Bordo and Jeanne (2002). Using a stylized model, they examine the possibility of pre-emptive monetary policy to conclude that 'optimal policy depends on the economic conditions in a complex, non-linear way and cannot be summarized by a simple policy rule of the type considered in the inflation-targeting literature' (p. 1).
8. Net wealth reverts to its mean, albeit at long intervals of five to ten years. This is a direct consequence of the fact that net wealth as a percentage of disposable income is a stationary variable; that is, its mean and standard deviation are not time-varying. Technically, it is integrated of order zero. The stationarity property follows from the fact that the constituent

components of net wealth, namely assets and liabilities, are each a non-stationary variable integrated of order one. Hence their difference (assets less liabilities) is stationary, that is, integrated of order zero. The mean-reverting property of net wealth implies that bubbles, and in general imbalances, can be identified and their consequences can be quantified.

9. This does not mean that we support inflation targeting, which has its own problems and peculiarities, as argued in Arestis and Sawyer (2003).

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7. Monetary policy in the information economy: old problems and new challenges

Michelle Baddeley and Giuseppe Fontana

1. INTRODUCTION

The aim of this chapter is to explore how the emerging information economy is going to affect monetary policy. It is increasingly evident that improvements in information processing and in communications are likely to transform several features of economic life. It is even more evident that banking and financial systems are likely to be the economic sectors most affected by those technological improvements (Woodford, 2001). Recently, economists have thus started to speculate on the economic implications of the development of electronic money (for example Federal Reserve Bank of Kansas City, 2001; Baddeley 2004).

The USA has been an innovator in the use of electronic money and a picture of the current state of affairs in the USA is thus a good starting point for understanding those incentives. Laurence Meyer, a member of the Board of Governors of the US Federal System, refers to a recent Fed study of retail payment systems showing among other things that the operating costs of the cheque-clearing system range from 0.25 to 1.00 per cent of GDP (Meyer, 2001, p. 6). Similarly, Weiner (1999) outlines some statistics about the evolution of non-cash payment types in the USA. He focuses on the period from 1997 onward. This is due to the fact that inconsistencies in the Bank of International Settlements (BIS) data, in terms of both the definitions of cheque transactions and the calculation of credit card transactions, make the comparison of different forms of transactions for the period before 1997 complicated.[1]

Table 7.1 and Figure 7.1 depict a more up-to-date analysis of the evolution of non-cash payment types, using consistent data sources. Three key points emerge from these data. First, the use of cheques has declined significantly over the five-year period between 1997 and 2001. Second, the fall in the proportion of transactions made by cheque has been accompanied by an

Table 7.1 Non-cash payment types in the USA as proportion of total transactions (%)

Year	Cheques	Debit	Credit	Paperless credit transfers	Direct debits
1997	0.69	0.06	0.19	0.04	0.02
1998	0.66	0.08	0.20	0.04	0.02
1999	0.62	0.11	0.21	0.04	0.02
2000	0.58	0.13	0.22	0.05	0.03
2001	0.54	0.16	0.22	0.05	0.03

Source: BIS, *Statistics and Payment and Settlement Systems for Selected Countries* ('Red Book'), April 2003.

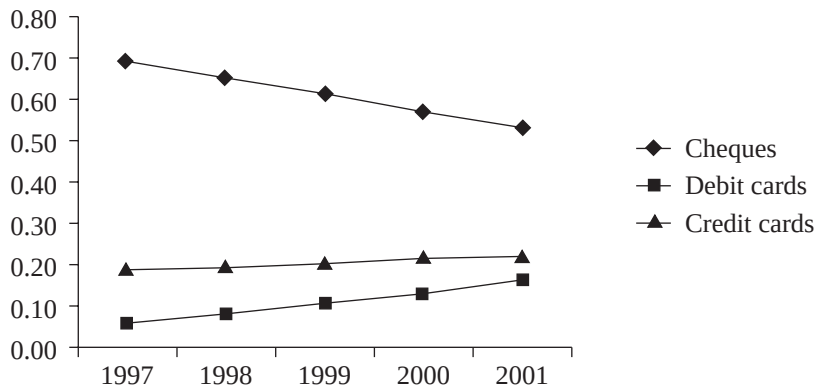


Figure 7.1 Proportion of transactions involving the use of cheques versus debit/credit cards

increasing use of card payment systems, particularly debit cards. Third, the number of debit card transactions has grown at an average annual growth rate of 33.6 per cent since 1997 – though from a small base. The use of electronic transactions broadly defined has also been reflected in the exponential growth of the volume of automated clearing house (ACH) transactions over the period 1992 to 2002, as shown in Table 7.2 and Figure 7.2.[2]

Economists have increasingly used these statistics in order to speculate on the future of central banks. Central banks are in a position of power and responsibility never seen before (King, 1999). But how are central banks going to retain that power and responsibility in the face of the challenges of the information economy? Would central banks prosper as a result of improvements in information processing and communications or would they

Table 7.2 Growth in ACH transactions

Year	Volume of transactions (millions)	Value (US$ trillions)	No. of companies using the ACH network
1992	2206	7.8	150
1993	2559	8.8	300
1994	2933	10.1	400
1995	3407	11.1	500
1996	3929	12.1	600
1997	4549	14.0	725
1998	5344	18.1	2000
1999	6122	19.1	2500
2000	6882	20.3	3000
2001	7994	22.1	3500
2002	8944	24.4	3500

Source: National Automated Clearing House Association (NACHA) – The Electronic Payments Association (www.nacha.org).

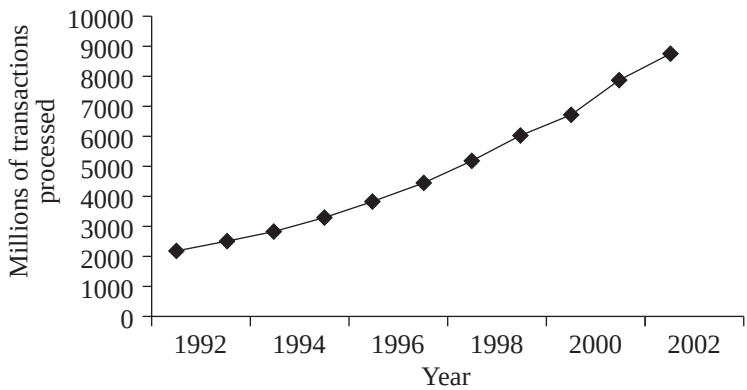


Figure 7.2 Volume of ACH transactions

soon disappear as a result of those improvements? A note of caution may be appropriate at this stage. In considering the implications for monetary policy of the development of information technologies, economists are bound to face a complicated challenge. In using economic analysis to address past developments in banking, economists have turned to historical evidence and logical reconstruction. Of course, this has not prevented heated debates but at least it has offered an anchor to the issues debated (see, for example, Goodhart,

1998 on the theories of the evolution of money). But the future development of the payments system and its impact on the banking system and financial markets depends on future entrepreneurial innovations that are inherently uncertain in form and evolution. Those innovations are difficult, if not impossible, to extrapolate or predict in detail (Selgin and White, 2003). Only by speculating on future developments can central banks face the technological challenges that lie ahead and in that way have a chance to retain their central position in policy-making. But one essential element in any analysis of the evolution of electronic money must necessarily start with some definitions, and some of the commonly used definitions of electronic money/electronic payment systems are outlined below.

2. CHARACTERISTICS OF ELECTRONIC MONEY

2.1 Definitions

For economists, definitions of money are narrow and must satisfy the three essential characteristics of money: it is a store of value, a unit of account and a medium of exchange. A large number of innovative electronic payment systems (for example PayPal and eGold) are essentially accounting devices and are 'piggy-backing' on money issued via banks. However, with the evolution of Internet banking, the technical and economic definitions of money are converging as credit is beginning to be issued electronically.

The ECB (1998, 2000), following the first official definition issued by the European Monetary Institute (EMI, 1996), define electronic money as follows:

> Electronic money is broadly defined as an electronic store of monetary value on a technical device that may be widely used for making payments to undertakings other than the issuer without necessarily involving bank accounts in the transactions, but acting as a prepaid bearer instrument. (ECB, 1998, p. 11)

This definition focuses on the pre-paid aspect of electronic money. The Basel Committee (1998) further divides types of electronic money into the categories of electronic purses (hardware- or card-based) and digital cash (software-, network-based). But whether these instruments are 'balanced-based' (that is, account-based) or 'token-based' (that is, involving the expenditure of electronic tokens), the essential characteristic is their pre-paid nature. For this reason, credit cards and debit cards are regarded as access products or electronic payment systems, not as electronic money (BIS, 1996; Basel Committee, 1998). In terms of collection of data, the ECB's statistics measure volumes of e-money issued by the euro area monetary financial institutions (MFIs),

including the amount outstanding of electronic money issued within the balance-sheet item 'overnight deposits' (ECB, 1998, 2000).

There is no legal requirement upon the ECB separately to collect data on electronic money from euro area MFIs, but most euro area central banks do collect these data. The broad definition of electronic money as essentially any form of electronic payment system coincides with technological definitions. Technological experts involved in the innovation of electronic payment systems define electronic money in broad terms, focusing on the transactions function of money; that is, it is any transfer of value employed using electronic means. Electronic money encompasses the use of money over the Internet, digital stored value systems and associated devices. Electronic payment systems can be divided into the two technological categories of hardware-based products, in which value is stored in a hardware device; and software-based products, in which software packages are used to allow the electronic transfer of value, for example via the Internet (Davies, 2002).

One of the 'puzzles' surrounding the evolution of electronic money has emerged because of confusions over terminology and definitions (Fullenkamp and Nsouli, 2004). This point is recognized by the Basel Committee of the Bank of International Settlements: electronic money is difficult to define because it blends particular technological and economic characteristics (Basel Committee, 1998; BIS, 1996). In addition, different e-money schemes will vary according to their technical implementation, the institutional arrangements required to support them, the way in which value is transferred, the recording of transactions and the currency of denomination (BIS, 1996). This means that several definitions of electronic money have evolved over time.

2.2 Constraints

Some constraints on the evolution of electronic monies emerge because it is not easy to mimic conventional money, particularly conventional cash, for example in terms of efficiency, wide acceptability, security, anonymity and easy transferability (including an ability to support multiple payments). The costs involved in producing and storing electronic cash are likely to be lower than those involved with printing, storing and carrying conventional cash. These cost savings will create some gains in terms of economic efficiency if the use of e-cash becomes more widespread. However, the costs involved in exchanging e-cash are relatively high in comparison with the costs involved in exchanging conventional cash. The current technology used in security protocols involves relatively high transactions costs and is not economical for 'micro-payment' systems. Innovations such as NetCard can support micro-payments by incorporating a digital signature into a whole stick of coins that can then be spent individually (with a given merchant). This system allows a

reduction in computational complexity for series of low-value payments to given merchants but is not particularly helpful for customers who want to spend their coins at a number of different sites.

No existing e-cash system is universally acceptable; most are not even widely acceptable. Existing e-cash systems are forms of 'inside' money (available to a select group of insiders) and this is particularly true for vendor-specific schemes. If an e-cash system is to be successfully adopted, it will have to attract a wide constituency, that is, become 'outside' money. It is because current e-cash schemes are not widely accepted that they must piggy-back on the non-cash money supply, that is, bank deposits and credit accounts. This implies that e-cash is just a means of redistributing 'IOU money' (that is, based on deposit and credit accounts) and financial intermediaries must necessarily be involved in its exchange. This contributes to the overall transactions costs involved in the exchange of deposit-based electronic cash systems.

In conventional cash systems, there is a simple bilateral interaction between buyers and sellers; the fact that no middle people are involved means that the transactions costs are lower. This bilateral exchange works because it is based upon a trusted social convention: cheap bits of paper/metal represent value. The backing of powerful institutions is required to support this sort of fragile social convention. Most people are too risk-averse to trust their fortunes to the fate of a single private enterprise; history has shown that even the most successful multinational companies do not necessarily prosper forever. If e-cash is to survive and prosper as a true cash system, then it requires the backing of trustworthy, stable institutions such as central banks – these could implement common protocols and act as unifying institutions. The development of e-cash as a form of outside money seems unlikely if e-cash systems do not receive this sort of government backing.

Potentially, the security of virtual money is greater than that of conventional money given the sophisticated printing and counterfeiting methods used for conventional cash. For e-money, however, adoption of widely available technologies that are tamper-resistant is limited by the US government's regulation of 'strong' cryptography, including export limits on 'long' (that is, complex) keys. It is only in practice and because of governmental constraints that the security and privacy of e-cash systems is limited (Swire, 1997). Many existing e-cash systems, particularly those that can be used with a number of different merchants, are not completely anonymous because the monitoring of their use is actually essential to the proper operation of these systems in order to prevent the double spending of virtual coins. This monitoring may be very costly, requiring collusion between institutions. The use of a conventional cash system allows direct interaction between buyer and seller and so it is not possible to monitor transactions taking place mediated using conventional cash. Anonymity is ensured. Conventional cash will be

preferred by those involved with criminal activities as long as criminals and tax evaders believe that electronic transactions will always leave some trace (Goodhart, 2000). It can be argued that complete anonymity is not desirable from a social welfare point of view (de Solages and Traore, 1998). In theory, a system of anonymity that is only revoked by some trusted authority when criminal activities take place would mean that criminal activity could be more effectively monitored and punished in a world of e-cash. But, in practice, the whole point is that criminals would not use a system that they believe allows effective monitoring and punishment. Even with such a system, until complete anonymity can be assured electronic cash cannot substitute completely for conventional cash for illicit transactions and there will always be a demand for conventional cash, whether or not agents admit their real reasons for holding it.

Within any system of e-cash, there are difficult trade-offs to manage between anonymity/privacy and security/reliability. These trade-offs surface in assessing the desirability of easy transferability of e-cash. Sander and Ta-Shma (1997) argue that non-transferability is an important feature for e-cash systems as it imposes limits on criminal abuses. However, whilst limiting transferability will reduce the potential for fraud, non-transferable e-cash systems will be less flexible and more costly. Assuming that double spending of electronic cash can be prevented, an e-cash system that allows multiple payments is likely to lower the monetary costs of transactions. However, for many e-cash systems devised so far (for example lottery ticket and voucher systems) each unit of e-cash can only be spent once, even if the tickets/tokens/vouchers are transferable before use (Rivest, 1997; Foo, 1997). So each unit of currency is only partially transferable; that is it is transferable only until it is spent. In contrast, conventional cash is spent many times by many different people; it is completely transferable. In response to this problem, some multiple-payment schemes have been suggested (Pagnia and Jansen, 1997). In these, the costs of issuing electronic cash will be greatly reduced as long as there is an effective mechanism to allow a given unit of currency to be transferred easily between many buyers and sellers. If this transferability is possible and a token can be spent many times, the average cost per transaction of issuing a given unit of currency will tend towards zero.

The use of crypotographic methods that can maintain security and anonymity simultaneously have some potential to promote transferability if a central bank can issue 'signed' money. Concerns about crime and fraud can also be addressed within such schemes, that is by using trusted authorities that have the power to monitor suspect transactions. However, the problem remains that large databases of past transactions must be maintained to prevent double spending. This requirement adds to the costs, and limits the scalability of such systems. Transactions costs are reduced in systems such as

NetCash because only outstanding tokens are monitored (Neumann and Medvinsky, 1998). However, these tokens are still not perfectly transferable because the holders of digital tokens/coins do not have to relinquish ownership of the digital coin when they spend it and the prevention of double spending requires processing time even if that time is reduced in comparison with other blind signature schemes (BSSs). In contrast, for conventional notes and coins, holders relinquish ownership of a physical entity when they spend a conventional note or coin and so the monitoring of double spending is not necessary.

2.3 e-Money vs Credit/Debit Cards

One of the challenges facing the banking system is developing a safe and cheap method of mediating e-commerce purchases. The processing of credit and debit transactions is conducted electronically though, as explained above, these do not count strictly as electronic monies as they do not involve the storage of value on an electronic device. Also, evidence suggests that on-line consumers are dissatisfied with the way they spend money on line and analysts predict that the use of credit cards to fund on-line transactions will decline significantly in the near future (*The Economist*, 2000). Quite apart from the constraints outlined above, does e-cash bestow any advantages relative to other forms of electronic payment? Electronic payments via credit card still dominate the market and, as explained above, many e-cash systems have not stood the test of time. Do we need a system of electronic cash when most people currently purchase goods and services over the Internet using credit cards? One of the main challenges confronting e-cash suppliers is providing effective micro-payments systems, whereby small amounts of money can be used electronically. Cheques and credit/debit cards do not suit small purchases; the key problem for cheques and credit-card systems is that they are not necessarily effective for micro-payments because of the costs involved in interactions between financial institutions (Neumann and Medvinsky, 1998). Using credit cards and cheques involves financial intermediaries, thus adding to the transactions costs involved in on-line purchases. If credit-card payments incur additional interest costs and other charges upon buyers, this will also add to the costs involved with using credit cards.

Another shortcoming emerges because credit-card purchases on the Internet are not anonymous and a person's spending patterns can be tracked using credit-card records. The same is true for mechanisms using electronic cheques. There is also an increased danger of fraudulent use of credit-card numbers by third parties. Using ATM cards/machines to access conventional cash is not susceptible to the same level of fraud because dedicated physical devices and anonymous PINs are essential to such transactions. It is costly to tap into

telephone networks but it is relatively straightforward to collect databases of credit-card numbers over the Internet because it is easy to intercept information (MacKie-Mason and Varian, 1998). So the use of credit cards to buy goods and services over the phone is not as susceptible to fraud as the use of credit-card numbers over the Internet. Whilst e-cash may well suffer from the same shortcomings as other forms of electronic payment, the financial risks for individual consumers are reduced. If a consumer is only risking the loss of a not particularly valuable electronic coin, he/she is far more likely to conduct transactions over the Internet than if he/she risks an enormous credit-card bill because someone has illicitly intercepted his/her number. Electronic cash therefore has financial potential that is not matched by alternative electronic financial instruments.

2.4 Real-world Examples

Whilst e-cash systems may in theory have potential advantages not provided by conventional cash systems, as outlined above, designers of effective e-cash systems have the task of exploiting the efficiency gains of electronic transfer while mimicking desirable characteristics of conventional cash in terms of widespread acceptability, security, anonymity and easy transferability. But many early, innovative e-cash products have not stood the test of time, for example schemes such as DigiCash and CyberCash (*The Economist*, 2000, pp. 77–9). Can this failure to develop e-cash systems in the real world be explained in terms of the characteristics outlined above? What underlies the success (or lack of success) of real-world e-cash systems?

PayPal is generally held to be the most successful example of an electronic cash system. The essence of its success lies in the fact that it is relatively widely accepted, being the preferred payment system for the popular e-Bay auction site (and it was bought up by e-Bay in 2003). In addition, the verification systems and buyer insurance instruments used by PayPal reassure customers about the relative security of the system. Anonymity is not a characteristic of PayPal, however, and easy transferability only applies to people who want to re-spend their money within the system; it is more difficult to extract money from the system than to set up an account in the first place. None the less, PayPal does seem to have captured some first-mover advantages in the implementation of an effective micro-payments system and its customer base has grown rapidly from about 185 000 in 2000 to over 45 million by 2004 (see *The Economist* 2000*b*, http://www.paypal.com/). It also has relatively low transactions costs (http://www.wired.com/news/ebiz). The links between PayPal and e-Bay have been an ingredient of success as they have helped to ensure relatively wide acceptability. And it is generally true that barter exchange payment systems complement some sort

of virtual marketplace (for example Barter Trust, BigVine, LassoBucks) have been relatively successful – *The Economist* 2000, p. 78).

Other real-world micro-payment systems have been less successful. DigiCash was designed to mimic the anonymity of conventional cash but ran into problems of limited acceptability, a problem that was exacerbated not only by the multiplicity of alternative, incompatible systems but also by the limited capital financing available for the project. In addition, the process of transferring money into an electronic 'mint' then to be spent in purchasing digital coins was relatively complicated (http://news.com.com/). CyberCash's CyberCoins system ran into similar problems.

PayDirect offers systems with low costs of entry, which are secure from a merchant's point of view but do not address the problem of merchant fraud. The initial-accounts-based system is relatively widely accepted but its interface with user accounts means that, in principle, spending is not anonymous and can be monitored. In 2003 PayDirect introduced its World Card – a stored-value card that can be used to access local currency via ATMs. To an extent this may promote easy transferability, but users of the World Card have to be identified when the cards are purchased.

Ultimately the real constraint is economic or institutional rather than technological, and lies in generating widespread acceptability; this is the problem that has been overcome most effectively by PayPal. Given the increasing dominance of PayPal within the electronic marketplace, its first-mover advantage will be difficult to reverse even if efficient technological solutions are designed to mimic all the other conventional cash characteristics outlined above.

3. NEW CHALLENGES FOR MONETARY POLICY

In the late 1990s academics and practitioners started systematic studies of the development of electronic money, together with the various policy issues it raises. For example, in the summer of 1996 members of the BIS met in Basle to discuss security issues related to the development of electronic money which then led to several important reports on e-money (for example Bank of International Settlements, 1996, 2000). Similarly, a provocative paper in 1999 by Benjamin Friedman touched off academic debate on the future of monetary policy (see Friedman, 1999; also *International Finance*, 2000). Notwithstanding the merit of the debate, from our perspective there are three related limiting features of those studies. First, the exclusive focus on US experience (reflecting the superior availability of US data) means that the distinct experiences of other OECD countries (particularly the EU countries) have been neglected. With monetary union in the EU, the development of

monetary institutions has been along a distinct track. Second, research has tended to concentrate on Mengerian explanations of electronic money emerging as a balancing of transactions costs (for example Kiyotaki and Wright, 1989); we argue that the transactions costs explanations will take us only so far; there needs to be a greater emphasis on the implications of Chartalist theories of money as a social convention for the evolution of electronic money. Third, data limitations have obscured the analysis of the key features affecting the development of electronic money. Each of these points is addressed in more detail below.

3.1 Mengerian vs Chartalist Theories of the Nature and Evolution of Money

Recent studies of the development of electronic money have been largely undertaken within the context of the Mengerian theory of money (for example Selgin and White, 2003). According to this theory, money is a natural outcome of the market. Money was first a special commodity selected for its particular properties, then replaced by coins made of a precious metal, with an exchange value approximately equal to the value of the metal in the coin. Later on money was minted in order to identify the quantity and quality of the metal. Finally, money became paper money, bank money and in recent times electronic money. In all these stages money is always and forever a commodity that promotes efficient reductions in the cost of transacting. Money is thus selected for its properties of, for example, divisibility, fungibility, durability and portability. This is still today the most popular theory of the nature and evolution of money. There have also been successful attempts to formalize it (for example Kiyotaki and Wright, 1989), but unfortunately this theory is rather weak on institutional details and historical empiricism (Schumpeter, 1954). An alternative and historically sounder view on the nature and origin of money is the so-called Chartalist theory (Goodhart, 1998; see also Capie et al., 2003). According to this theory, money is never the exclusive product of the market. Money is partly a creature of law. The state plays a major role in determining the currency of the country by declaring what it would accept for discharging tax liabilities. In fact the one-nation-one-currency rule is violated so rarely that exceptions border on insignificance. From our perspective, an important aspect of the Chartalist analysis is the key relationship between political sovereignty and central banking. The consensus view in modern macroeconomics is that as monopolist over the supply of monetary reserves, the central bank is able to affect interest rates and in that way to influence financial and non-financial economic activities in a country. But the suggestion has been made that the development of electronic money may attenuate, if not re-

move altogether, the monopolist role of the central bank through the erosion of the demand for monetary reserves. The Chartalist counter-argument is that taxes are usually paid in monetary form, and this raises the demand for base money. In other words, as long as the government believes that monetary policy is well served by the existence of the central bank, legal restrictions can be passed in order to maintain the monopolist role of the supplier of monetary reserves (Goodhart, 2000, pp. 206–7; see also Friedman, 2000, p. 265, note 4; King as quoted in Goodhart, 2000, p. 206, note 27). If our analysis should thus cast doubts on the Mengerian theory in favour of the Chartalist analysis, this would suggest a need for reconsideration of some of the key issues discussed in the debate on the policy implication of the development of electronic money.

Tables 7.1 and 7.2 and Figures 7.1 and 7.2 illustrate the increasing use of card-payment systems and the exponential growth of automated clearing-house (ACH) transactions. These increases have been fostered by improvements in information processing and in communications. For instance, electronic bill presentment and payment (EBPP) promises to strongly affect ACHs transactions by saving US businesses several billion dollars per year. In a typical virtual circle, businesses may pass on to customers some of those savings by, for example, boosting electronic commerce, which would further reinforce the use of EBPP. But, as long as electronic commerce is not included in the traditional surveys of retail stores, estimations of the volume of private consumption will be misleading. This means that as a result of the development of e-money policymakers have to face a further complication in setting the correct policy for, for example, controlling the inflation rate in a country.

3.2 US vs EU Experience

Most of those studies are exclusively based on US experience. This is reasonable if the USA is seen as the most developed capitalist country and a technological leader in the design of electronic payments systems. However, it is an unwarranted feature from a broader institutional perspective. For example, the modern literature centres on the likelihood of the Fed being obsolete, in the sense of private competing banks providing their own currencies. Those are interesting issues, but when examined from the EU perspective they sound rather outdated. The EU, especially after the creation of the euro area, is moving in the opposite direction, abolishing *de facto* the possibility of dealing with multiple currencies, price levels and cross-exchange rates. Table 7.3 shows trends in the use of different payment systems in Europe and the USA for the period 1995–2001. Interestingly, the growth in the number of automated teller machines (ATMs) has increased significantly in both the USA and the EU, although the rises for the EU were not as pronounced as for

Table 7.3 Trends in different payment systems, EU vs US, 1995–2001

	1995	1996	1997	1998	1999	2000	2001	Average growth, 1995–2001 (%)
Number of ATM machines per million inhabitants								
USA	466	524	616	691	832	991	1137	16.00
EU	2194	2358	2554	2793	2982	3213	3372	7.40
Credit and debit cards, no. of transactions								
USA			16 817.3	19 153.0	22 106.4	25 734.9	29 542.8	15.10
EU			6 175.9	7 434.3	8 649.8	9 846.1	44 208.7	63.60
Cheques, no. of transactions								
USA			46 569.4	45 169.7	43 812.0	42 500.0	41 222.6	–3.00
EU			9 413.9	9 147.0	8 511.5	8 259.6	7 890.9	–4.30
Cheques (as proportion of transactions in cheques/cards)								
USA			0.73	0.70	0.66	0.62	0.58	
EU			0.60	0.55	0.50	0.46	0.15	

Source: BIS, *Statistics on Payment and Settlement Systems in Selected Countries*, April 2003.

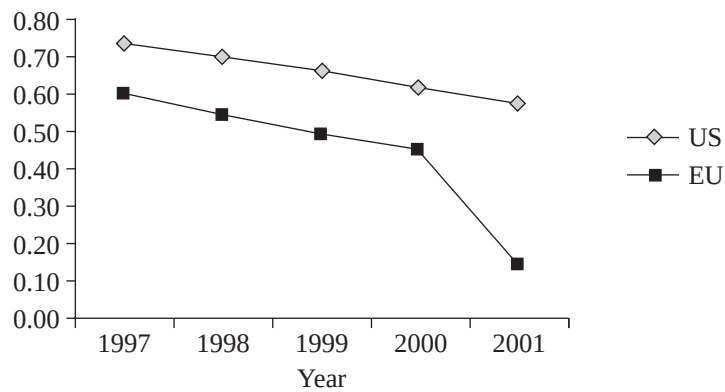
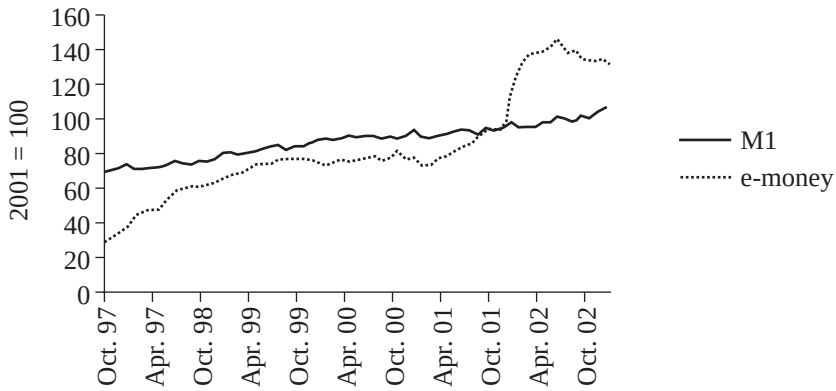


Figure 7.3 Cheque transactions as a proportion of total transactions (cheques + credit/debit cards), US vs EU, 1997–2001

Table 7.4 Notes and coins in circulation, US$ million

	1997	1998	1999	2000	2001
EU	323 996	346 626	328 035	304 545	207 132
USA	428 100	463 300	521 500	535 200	584 900



Source: ECB, http://www.ecb.int/stats/mb/emoney/emoney.csv

Figure 7.4 M1 versus e-money in the euro area, indexed, December 2001=100

the USA. These findings reflect at least in part the fact that by linking their ATM networks, US banks have found a way to bypass geographic branching restrictions (Guttmann, 2003, p. 5). Furthermore, the growth in the use of cards has been sustained in both the USA and the EU, with particularly large increases in debit-card transactions for the EU. Figure 7.3 shows that, whilst the use of cheques relative to cards has fallen in the USA, these falls have not been as substantial as those in the EU. Finally, Table 7.4 and Figure 7.4 illustrate the increasing use of e-money versus M1 volumes for the euro area. For the EU, notes and coins in circulation fell between 1997 and 2001, with an average annual fall of 10.6 per cent. For the USA, notes and coins in circulation increased over the same period, with an average annual growth rate of 8.1 per cent. This finding is consistent with the data above, which suggest that US producers/consumers seem to have a preference for taking cash from ATMs rather than depending on credit/debit transactions.

3.3 Data Collection and Analysis in the Information Economy

Recent studies investigating the impact of the emerging information economy on monetary policy have largely ignored data limitations in assessing the effects of the development of electronic money on the data used to set monetary policy (Hawkins, 2003, p. 104). For instance, Figure 7.4 plots the use of e-money versus M1 for the euro area. The figure shows that notes and coins are slowly replaced by e-money. This trend is indicative of a potential future problem for central banks, namely the underestimation of the size of the growth rate of M1. In order to resolve this problem, central banks may need to start planning data collections on e-money and include them in their statistics of monetary aggregates. Indeed, the European Central Bank (ECB) now collects information on e-money and includes it in its monetary aggregates as overnight deposits (European Central Bank, 1998). However, it is not clear that the traditional relationship between monetary aggregates and economic activity still holds when the former component is amended with the inclusion of e-money. If the development of electronic money brings efficiency to the payment system, the velocity of circulation of monetary aggregates should increase. Also, to the extent that electronic money is interest-bearing, the replacement of notes and coins with e-money further complicates the analysis and the decision-making process by central banks.

4. CONCLUSION AND FUTURE POLICY IMPLICATIONS

In this chapter we have discussed the nature and role of electronic money in the 'new economy'. We began by examining the definitions of electronic money used by economists, by policymakers and governmental institutions, and by technical specialists. The chapter then looked at some of the implications for the design of monetary policy. Improvements in information processing and in communications are transforming many aspects of economic activity, and the banking and financial systems are likely to be the most affected economic sectors. However, the implications for the design of macroeconomic policy are unlikely to be so profound, particularly as existing electronic payment systems do not focus on credit creation and instead piggyback on existing forms of credit creation.

Following from the policy analysis, an empirical analysis was made on data for the different forms of electronic payment systems for both the USA and the EU, focusing in particular on international differences in habit patterns/institutions in the use of electronic money and electronic payment systems. Data capturing the relationship between conventional monetary aggregates and electronic money in the EU were also presented. Data limitations

and issues were also explored. Three main points emerged from this analysis. First, the focus on the US experience should be rectified by examining data in a wider range of countries, especially in the EU. Second, a Chartalist approach, examining the monetary habits, institutions and social conventions across different countries should be the focus of theoretical analysis and policy design. This is in contrast to the current focus on Mengerian approaches that emphasize the importance of transactions costs as an explanation for the evolution of electronic money. We argue that the exclusive focus on Mengerian approaches is misplaced. Third, in the empirical analysis, the existence of key, substantive constraints on data as well as inconsistencies across data sources should be addressed if any analysis of the empirical patterns is to be regarded as useful.

In terms of future policy implications, it seems that whilst the development of electronic payment systems is likely to have important implications for industrial sectors and microeconomic activity, it is not so clear that electronic payment systems will affect macroeconomic policy design for two reasons. First, it is now widely recognized that the interest rate is the key policy instrument; monetary aggregates are difficult to control. This issue is not of direct relevance to this particular chapter. Second, the evolution of electronic money does not have many implications for the control of monetary aggregates and the creation of credit. This is because the economic and monetary system still relies on traditional, non-electronic forms of credit creation. Existing electronic payment systems are not widely adopted because they do not have the backing of central banks. The incentives for central banks to enter the business of creating electronic money themselves are limited, though there is no overriding technical reason why central banks should not create electronic money in the same way that they create conventional cash, though some technical work might have to be done in mimicking the desirable properties of conventional cash in terms of security, anonymity, divisibility and fungibility. Until central banks enter the business of creating electronic money, the key macroeconomic policy implication remains: electronic payment systems that piggy-back on other forms of credit creation will have no direct impacts on the monetary transmission mechanism. Furthermore, given the government's monopoly over the production of base money (which is unlikely to disappear while tax bills are paid using conventional notes and coins), for as long as the central banks concentrate on issuing conventional notes and coins and eschew the production of electronic money, conventional money will continue to play an inviolable role *vis-à-vis* electronic money.

NOTES

1. Weiner amalgamates different data sources in calculating his share of transactions, that is, National Automated Clearing House Association (NACHA) – Automated Clearing House (ACH) data and BIS cheque/card data). It's not clear that this is legitimate given that the ACH data reported are inconsistent with BIS data and Weiner's table does not indicate how direct debit transactions are included. For reasons of consistency, therefore, NACHA data are not used in the construction of our statistics.
2. These data are reported separately from BIS data since to our knowledge the two data sources cannot be reconciled on the basis of published information.

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8. The monetary policy outcomes curve: can the size and structure of public debt undermine policy objectives?

Stephanie Bell-Kelton and Rex Ballinger

1. INTRODUCTION

After decades (if not centuries) of attention, there remains scant agreement on many fundamental issues regarding monetary policy. Historically, the more hotly contested battles have centered on the issue of 'rules' versus 'discretion' – especially between monetarists and Keynesians. But aside from the battles over the relative merits of short- versus long-term policy objectives (that is, fine-tuning versus maintaining price stability and fiscal balance), the mainstream has generally agreed that monetary easing will, in the short run, have expansionary effects, while tightening will prove contractionary at the macro level.[1] This chapter challenges that common ground, arguing that when the government debt is large, and a significant portion of it is short-term or interest-variable, monetary easing (tightening) may well have contractionary (expansionary) effects, leading to perverse macro outcomes.

Thus our central question is whether raising (lowering) the interest rate is recessionary or expansionary. Our proposition is that it depends crucially upon the size, sectoral distribution and maturity of the government's outstanding debt. The question of whether the mix of public debt has any impact on the real economy through interest rate channels has recently been debated by an impressive cast of policymakers and academics (Chrystal, 1998). Our chapter addresses the subject matter of these debates, but it does so with reference to the work of Hyman Minsky, whose financial insights were not part of these recent discussions. Specifically, we consider Minsky's income, balance sheet and portfolio channels. We conclude with an empirical look at the relation between public debt structures and monetary policy outcomes in ten OECD countries.

2. THE IMPACT OF PUBLIC SPENDING AND PUBLIC DEBT ON THE ECONOMY

We begin by recognizing that any national government's spending can be divided into four categories: (1) government employment and spending on government production (for example military personnel and the postal service); (2) government contracts (for example Halliburton, Lockheed Martin and so on); (3) transfer payments (for example Social Security, Medicare and so on); and (4) interest on the government debt (Minsky, 1986). Since the purpose of this chapter is to examine the conditions under which rising (falling) interest rates may stimulate (contract) the economy, due to their impact on fiscal expenditure, we will focus our attention on the fourth category of government spending. To see how increased spending on debt service ultimately affects macro outcomes, we must consider the three channels through which public debt and interest expenditure affect our economy: the income and employment channel, the budget channel and the portfolio channel.

2.1 The Income and Employment Channel

The first and most obvious way that government spending affects the economy is by its impact on output and employment. When governments purchase goods and services from the private sector or issue contracts to private firms, there is a direct effect on income and employment.[2] In contrast, when governments transfer income to people, this has no direct effect on the economy. The economic impact comes only as the recipient – the unemployed, the elderly or the infirm – spends the funds that the government has transferred to them. In this sense, the interest income received by holders of public debt is no different from unemployment insurance, Social Security or Medicare; it is a form of government spending (that is, a transfer payment) that affects income and employment only indirectly, as the recipients of these transfers purchase newly produced goods and services.

2.2 The Budget Channel

The rules of accounting dictate that the financial positions (that is, surpluses and deficits) of all economic units must sum to zero. This simple truth follows from the fact that whenever a unit tenders money in payment for current output, some other unit receives a monetary payment. And, since we can consolidate units according to aggregate payments made and received, this proposition also holds true at the sectoral level (that is, across households, business firms, government and foreigners).[3] Thus, if the government

spends $50 billion more than it collects in taxes, the sum of the surpluses and deficits across all other sectors must result in a $50 billion surplus.[4] Combining households and business firms (bank and non-bank firms) into a unified private sector, equation (8.1) shows the familiar sectoral relation at the macro level.

$$\textit{Private sector surplus} = \textit{Public sector deficit} + \textit{Balance of payment surplus} \tag{8.1}$$

Incorporating these interdependencies, we see that when the federal government increases its expenditure on debt service – for example because it is forced to roll over maturing obligations at higher interest rates – the addition to the federal budget deficit must translate into an additional surplus elsewhere.[5] Thus the budget channel shows how income flows are affected by the government's budgetary stance, which is itself affected by the central bank's stance.

2.3 The Portfolio Channel

The portfolio channel and the budget channel are interrelated in that every federal budget deficit (surplus) implies the addition (absorption) of government securities to (from) the portfolios of households, commercial banks, credit unions, private pension funds, non-financial corporations, insurance companies and so on.[6] Once these government bonds are issued, holders benefit from the fact that they are: (1) free of default risk;[7] (2) highly liquid; and (3) able to store financing power for their holders. But the liquidity and financing power of a given portfolio depends not only on the volume of assets it contains but also on the value of those assets at any given time. And the central bank's interest rate policy can alter both.

As we have seen, central bank tightening can increase the outstanding volume of government securities, as higher deficits result in greater debt issuance. But it will also diminish the value of existing debt, since bond values vary inversely with interest rates.

When debt is skewed toward the shorter end of the maturity spectrum, central bank tightening will increase the volume of new debt issues, perhaps increasing expenditure as the flow of income to new bondholders rises. But, if long rates rise along with short rates, the stock value of longer-dated bonds will diminish, perhaps reducing expenditure via the wealth effect.

3. THE IMPACT OF CHANGING INTEREST RATES: A RANGE OF POSSIBLE MACRO EFFECTS

Conventional theory, which 'focuses only on the direct and secondary [that is, multiplier] effects of government spending', masks the 'much more powerful and pervasive' effects that work through the budget and portfolio implications of macro policy (Minsky, 1986, p. 21). Together, the income, budget and portfolio effects help us to think about the various channels through which the issuance and servicing of government debt affects private sector incomes and balance sheets. And it is only through a consideration of these stock and flow channels that we can begin to think about the conditions under which central bank policy, through its effect on incomes, balance sheets and portfolios, can produce macro outcomes that run afoul of the conventional wisdom. But this proposition requires further investigation. In order for monetary tightening to belie conventional theory, any negative interest rate effects – for example declining investment expenditure, a worsening of the current account, increased financial fragility or an adverse wealth effect – must be dominated by positive interest rate effects – for example increased spending and lending induced by income, budget and portfolio effects. We now turn to an examination of these opposing effects.

3.1 Negative Interest Rate Effects

According to mainstream economic theory, rising (declining) interest rates should adversely (favourably) affect the macro economy through two important channels: (1) the supply and demand for credit; and (2) relative demand for foreign (versus domestic) goods and services.[8] Thus, when the central bank takes a contractionary stance, it becomes more costly for banks to supply credit – given that it will now be more expensive for banks to acquire the reserves that must be held against newly created deposits.[9] Similarly, higher interest rates should, *ceteris paribus*, reduce the demand for bank credit – given the assumed (inverse) relationship between the quantity of credit demanded and the price of credit. Simply put, then, tight money policy should discourage bank lending as well as private sector demand – especially from the business sector – for credit-financed spending.[10]

Additionally, interest rate movements are thought to drive short-run movements in the (spot) exchange rate, which are then supposed to impact relative prices and, hence, current account balances. Figure 8.1 shows this standard, short-run result in its simplest graphical form. Here, central bank restraint causes the real money supply to contract (shifting M/P to M'/P), which places upward pressure on the interest rate (moving the equilibrium interest rate from R_1 to R_2), and generating imbalance in the foreign exchange market.

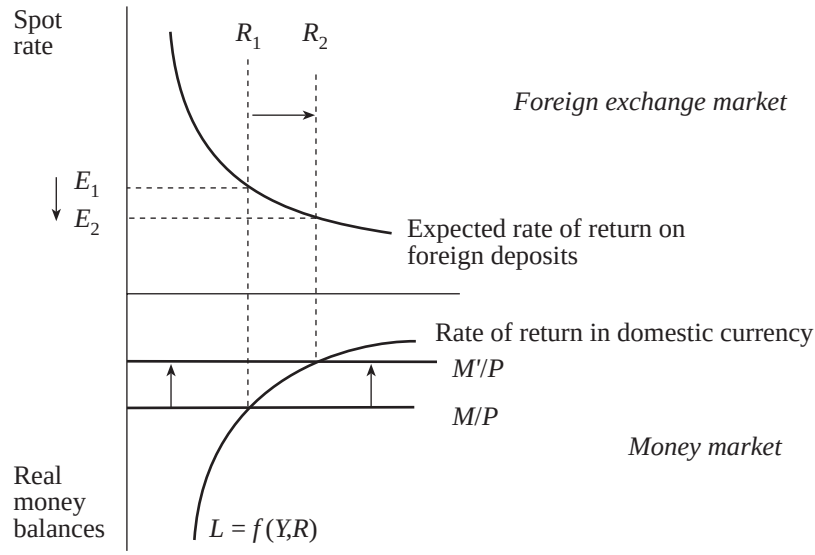

Figure 8.1 Short-run effect of contractionary monetary policy

To return the foreign exchange market to equilibrium, the domestic currency must appreciate (that is, the spot rate falls from E_1 to E_2) as investors attempt to increase their domestic currency holdings. As this is a short-run analysis, the real exchange rate $q = EP^*/P$ also appreciates (since domestic (P) and foreign (P^*) prices cannot readily adjust). Finally, assuming the Marshall–Lerner conditions hold, a real appreciation of the domestic currency should lead to a worsening of the home country's current account.[11]

Thus, according to standard, mainstream theory, monetary tightening should reduce aggregate output as the business sector responds to rising interest rates by reducing its demand for credit-financed capital expenditures. Moreover, the negative effect of declining investment should be exacerbated by the exchange rate effect, which presumes that rising interest rates will appreciate the domestic currency, causing a further drag on GDP as residents substitute relatively cheap imports for domestically produced goods and services. Thus conventional theory predicts that the macro economy will be adversely affected by contractionary monetary policy as (at least) two of the four components of aggregate demand – investment and net exports – decline in response to rising interest rates.

An alternative way to conceive of negative interest rate effects emanates from outside the purview of mainstream theory – from the work of H.P. Minsky. Minsky emphasized the complexity of the financial system as well as

the tendency for firms to finance investment and ownership of the stock of capital assets. As firms borrow to finance positions in capital assets, a contractual cash flow is established. However, as Minsky is famous for noting, serious problems can arise when the contractual outflows cannot be met with available cash inflows.[12]

He identified three types of positions that financing units can take: hedge, speculative and Ponzi. Each position is characterized by different relations between contractual cash flow commitments on debt and expected cash receipts earned by capital assets (quasi-rents)[13] or cash due to be paid on financial assets. As long as anticipated cash inflows (quasi-rents or payments due on financial assets) are expected to be more than sufficient to meet contractual payment commitments (now and in the future), Minsky characterized the unit's position as 'hedge'. In contract, when a unit expects its cash inflows (from operating assets or from owning financial claims) to be less than its cash payment commitments during some immediate (but relatively short) period, Minsky characterized the unit's position as 'speculative'. A firm that engages in speculative finance can meet its interest obligation using current and expected cash inflows, but it cannot retire maturing debt as it comes due (that is, it cannot meet its principal payment using current and anticipated inflows). It must, therefore, roll over its maturing debt. Finally, Minsky described a 'Ponzi' unit as one whose actual and expected cash inflow is insufficient even to pay interest on its outstanding obligations (that is, its current financing costs exceed its current income). Such a unit is forced to capitalize its interest by increasing its total indebtedness.

Since hedge units will fulfill their obligations independent of financial market considerations, the central bank's interest rate policy cannot undermine their secure positions. They are vulnerable only to the extent that quasi-rents fall below expected levels.[14] Speculative and Ponzi units are also susceptible to economic developments that reduce quasi-rents, but they face a sort of double jeopardy in that they are also vulnerable to developments in financial markets. This is because speculative and Ponzi units must roll over or increase debt, which means that rising interest rates will increase the cash flow commitments of these units without increasing their prospective receipts, thereby narrowing their margins of safety even further. Thus, if rising interest rates result in a reversal of the present value relations necessary to maintain the current pace of investment,[15] then it is easy to see how a deterioration of the financial environment (for example through tight monetary policy) can undermine an economic boom.

Another way to conceive of a negative interest rate effect is to consider how rising rates work through the portfolio channel. If long-term rates increase along with short rates, the value of longer-dated bonds will decline. This could induce reductions in aggregate expenditure, as bondholders re-

spond negatively to a decline in their wealth holdings. Ultimately, however, the strength of the wealth effect is likely to depend upon the distribution of government debt, for, as Goodhart (1999) noted, the wealth effect will probably be small when the bulk of the longer-dated government debt is held by long-term institutional investors, insurance companies and pension funds. Under such circumstances, the 'transmission mechanism between changes in short rates of interest and in expenditures' may diminish to the point of 'second-order importance at best' (1999, p. 70).

In sum, both mainstream and non-mainstream theory can accommodate negative interest rate effects. The primary difference is that the former accepts the rising-interest-rate/declining-GDP relation as a theoretical norm, while the latter makes it contingent on the current mix of hedge, speculative and Ponzi units in the economy.

3.2 Positive Interest Rate Effects

Many non-mainstream economists have argued that if the conventional wisdom regarding interest rate effects is not robust – that is, if rising interest rates are not predictably associated with declining investment and a worsening of the current account – then monetary policy can yield unexpected macro outcomes (that is, rising rates might have little or no effect on GDP.) Our aim is to push the critique a step further, seeking the conditions under which a far more peculiar outcome might occur.

Specifically, we are interested in a truly perverse interest rate effect, one in which GDP rises with monetary restraint or contracts with central bank easing. With this in mind, we proceed by hypothesizing that when the government's debt is large, appropriately distributed and sufficiently short-dated in its maturity, rising (declining) interest rates can be expansionary (contractionary), due to income, budget and portfolio effects.[16] Below, we provide some preliminary evidence to support our hypothesis.[17]

When monetary authorities adjust short-term interest rates, the impact on fiscal expenditures can be large. This is especially true when interest payments are variable (for example indexed) or when there is a large proportion of short-term debt that must be rolled over at the new rate. In the event that policy is contractionary, bonds will be rolled over at higher rates of interest. But interest rate policy will also affect asset values and the liquidity of portfolios. At the end of the day, the spending and lending propensities of those with relatively large public debt holdings may determine the policy outcome.

As Table 8.1 reveals, public debt holdings differ widely across nations.[18] In the UK, Belgium, Italy and Japan, for example, the financial sector holds the vast majority of all domestically held public debt. In contrast, the non-

Table 8.1 A sample distribution of government debt (figures in %)

(a)

Australia	1992	1994	1996	1998	2000
Households	33	34	45	51	49
Non-financial corporations	5	6	1	0	0
State and local governments	2	4	3	2	2
Total non-financial sector	40	45	50	54	51
Commonwealth bank group	3	1	0	4	6
Other banks	42	33	28	18	19
Money market dealers	4	7	3	0	0
Insurance companies	5	9	12	14	12
Private pension funds	1	1	0	0	0
Other financial	5	5	7	10	12
Total financial sector	60	55	50	46	49
Total domestic sector	100	100	100	100	100

Source: Reserve Bank of Australia (http://www.rba.gov.au/)

(b)

UK	1992	1994	1996	1998	2000
Individuals & private trusts	10	7	5	6	12
Public corporations and local governments	0	0	1	1	2
Other	10	13	11	6	1
Total non-financial sector	20	20	17	13	15
UK banks	8	10	10	6	3
Building societies	3	3	3	0	0
Insurance	43	44	44	47	46
Pension funds	25	21	25	31	34
Investment and unit trusts	1	2	1	2	2
Total financial sector	80	80	83	87	85
Total domestic sector	100	100	100	100	100

Source: Bank of England (http://www.bankofengland.co.uk/Links/setframe.html)

Table 8.1 continued

(c)

Belgium	1992	1994	1996	1998	2000
Individuals	14	7	3	7	8
Non-financial corporations	2	2	3	4	3
Total non-financial sector	16	9	6	11	12
Financial institutions	84	91	94	89	88
Total domestic sectors	100	100	100	100	100

Source: Die Oesterreichische Nationalbank (http://www.oenb.co.at/)

(d)

Italy	1996	1998	2000
Households	49	31	29
Non-financial corporations	2	2	2
Local governments	0	0	0
Total non-financial sector	52	33	31
Monetary financial institutions	32	31	33
Insurance and pensions	7	11	15
Financial auxiliaries	0	0	1
Other financial intermediaries	9	25	21
Total financial sector	48	67	69
Total domestic sector	100	100	100

Source: Bank of Italy (http://www.bancaditalia.it/)

Table 8.1 continued

(e)

Japan	1992	1994	1996	1998	2000
Households	4	4	4	3	3
Non-financial corporations	0	0	1	0	0
Local governments	0	0	0	0	0
Total non-financial sector	5	5	5	3	4
Depository institutions	37	39	36	35	38
Insurance and pensions	11	18	25	25	26
Other financial intermediaries	48	38	34	37	33
Total financial sector	95	95	95	97	96
Total domestic sector	100	100	100	100	100

Source: Bank of Japan (http://www.boj.or.jp/en/)

(f)

USA	1992	1994	1996	1998	2000
Households	28	34	37	35	34
Non-financial corporations	4	4	5	4	4
State and local governments	19	15	11	13	14
Total non-financial	51	53	52	52	52
Commercial banking	14	12	11	11	11
Savings institutions	2	1	1	1	0
Credit unions	1	1	1	1	0
Pension funds	5	5	5	4	4
Insurance	9	10	9	7	6
Mutual funds	9	8	9	12	12
State and local govt ret. funds	9	9	11	13	13
Total financial	49	47	48	48	48
Total domestic sector	100	100	100	100	100

Source: Board of Governors of the Federal Reserve System (http://www.federalreserve.gov/)

financial sector holds a majority of the total debt in Australia and the USA. This can be highly significant for, as Goodhart (1999) recently argued, the distribution may affect the manner in which the central bank's interest rate policy ultimately affects the real economy.

Looking more closely at the distribution of debt holdings within the non-financial sector, we see that non-financial corporations hold an extremely small fraction of total government debt. Indeed, they hold no public debt at all in Australia or Japan and only a small share elsewhere.[19] This means that the remaining portion of the public debt held by the non-financial sector must be held either by individuals/households or state/local governments. Looking again at Table 8.1, we find holdings among state/local governments to be rather unimportant (except in the USA, where state and local governments hold 14 per cent of the total). Thus, in every country examined above, the bulk of the debt held by the non-financial sector is held by individuals/households.

As the central bank holds government bonds, its interest rate policy affects the volume of interest income received by households with adjustable rate or maturing bonds. For example, if the monetary authority pushes up interest rates, then the flow of interest income to households will increase, which should induce some additional consumption spending (given the simple Keynesian consumption function). But as noted above, the change in interest rates will also affect the stock value of assets already in portfolios.[20] Thus, if in addition to the above-described income effect, households also respond to changes in the value of public debt, then monetary policy might also affect aggregate consumption through a portfolio (or wealth) effect.[21] If income and portfolio effects are both operable, then monetary outcomes may depend crucially on the maturity of the outstanding debt, as opposed to merely its distribution. This is because contractionary policy will raise interest expenditure by a larger amount when a relatively large share of the outstanding debt is short-term or interest-variable. When this is the case, rising interest rates may induce a positive interest rate effect (that is, increased consumption expenditure through the income effect). If the composition of debt is heavily skewed towards the longer end of the maturity spectrum, however, an increase in short-term interest rates will tend to reduce longer-term bond prices, thereby inducing a negative interest rate effect (that is, reduced consumption expenditure through the portfolio or wealth effect).

Finally, turning to the financial sector, we see that in modern economies with complex financial systems, surplus units (for example households) indirectly finance deficit units (for example governments) by acquiring the liabilities of financial institutions. Today, for example, surplus units acquire the liabilities of financial institutions such as banks, pension funds, insurance companies, savings institutions and so on, which themselves become the

direct holders of government debt. Consequently, much of the direct impact of the central bank's interest rate policy will be on the assets acquired and sold by financial institutions.

We are accustomed to thinking in terms of the negative effects of contractionary monetary policy, especially with respect to its impact on the financial sector. But it might also be possible for financial institutions to reap some benefit from a restrictive monetary stance. If, for example, these institutions hold sizable quantities of short- relative to longer-term debt, the additional flow of interest income they receive as maturing obligations are rolled over may significantly mitigate the negative effects due to increased borrowing costs and capital losses on longer-term holdings. When this is the case, margins of safety may remain robust enough to prevent banks from tightening credit requirements. Kuttner and Lown (1999) found that 'banks with larger debt holdings tended to continue lending at a faster rate following a policy tightening than banks with smaller debt holdings' (p. 5). Thus private sector spending and lending may continue unabated, even as the monetary authority attempts to apply the brakes.

4. THE RELATION OF PUBLIC DEBT TO MONETARY POLICY OUTCOMES

As we have argued above, the conventional outcomes associated with restrictive/expansionary central bank policy may be frustrated by opposing forces, driven by income, balance sheet and portfolio effects. Initially, we hypothesized that the government's debt would have to be large and composed of a sizable percentage of short-term issues in order for monetary policy to yield perverse macro effects. Figure 8.2 provides a graphical representation of our logic.[22]

Here, we see that monetary policy will have the predicted outcome when debt-to-GDP levels are low.[23] For example, when interest rates increase from i_3 to i_4, output declines from Y^* to Y. In contrast, contractionary policy will have expansionary effects when debt-to-GDP ratios are high. In this case, an increase in interest rates, say from i_1 to i_2, will result in an increase in GDP from Y to Y^*.

We now attempt to determine whether there is any evidence to support the hypothesis that perverse monetary policy outcomes are more likely in high-debt countries than in low-debt countries. Table 8.2 shows the debt classifications of the ten OECD countries in our sample.

Using the 60 per cent debt-to-GDP limits established under the Maastricht Treaty, six of the ten countries in our sample are classified as high-debt. Although we are primarily concerned with monetary outcomes in these six

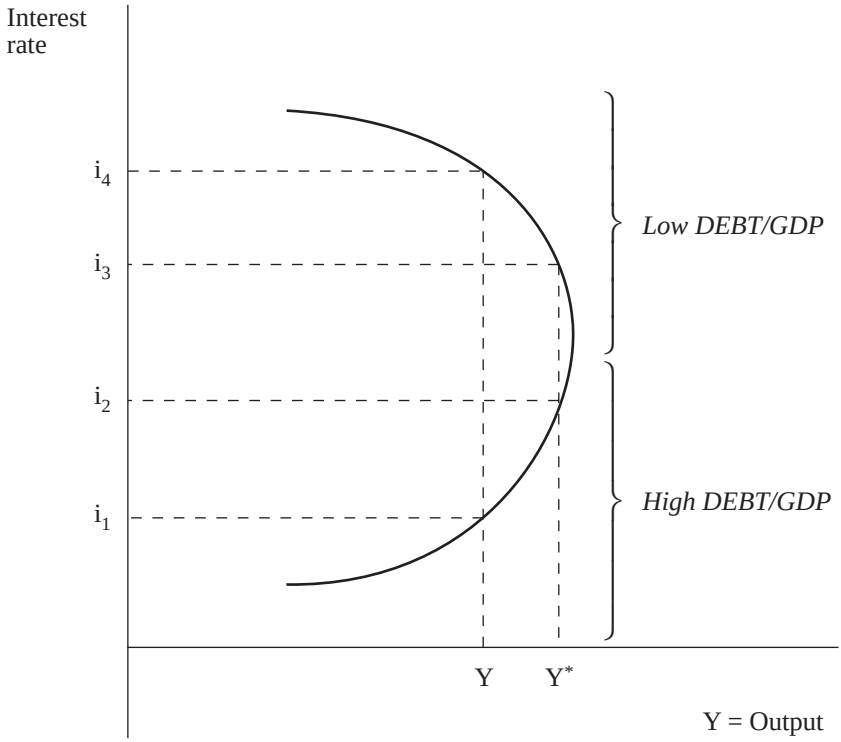

Figure 8.2 The monetary policy outcomes curve

countries, we shall also attempt to determine whether central bank policy yields conventional outcomes in the remaining four (low-debt) countries. Let us begin with the conventional case.

Figure 8.3 plots interest rates and GDP growth rates in the four low-debt countries. If monetary policy yields conventional outcomes, a fairly obvious pattern of opposing movements in these time series should be observable: GDP contracts with central bank tightening and expands with monetary easing.

The pattern of interest rate–GDP growth rate movements is striking. In Australia and Luxembourg, where debt-to-GDP levels have never been anywhere close to 60 per cent of GDP, interest rates and GDP growth rates clearly move in opposing directions. Interestingly, a quite similar opposing pattern is obvious in France (very nearly a mirror image) until about 1995, when debt-to-GDP levels were below 60 per cent. However, after 1995, as debt levels crept above 60 per cent, a high degree of co-movement becomes

Table 8.2 Debt classification using Maastricht debt criteria

	Average debt-to-GDP ratio, % (1990–2002)	Classification using 60 per cent Maastricht criteria
Australia	30.6	Low
Austria	64.2	High
Belgium	124.1	High
France	58.7	Low
Italy	127.0	High
Japan	99.5	High
Luxembourg	5.5	Low
Netherlands	69.3	High
UK	54.1	Low
USA	68.6	High

Source: OECD, *Economic Outlook*, No. 74.

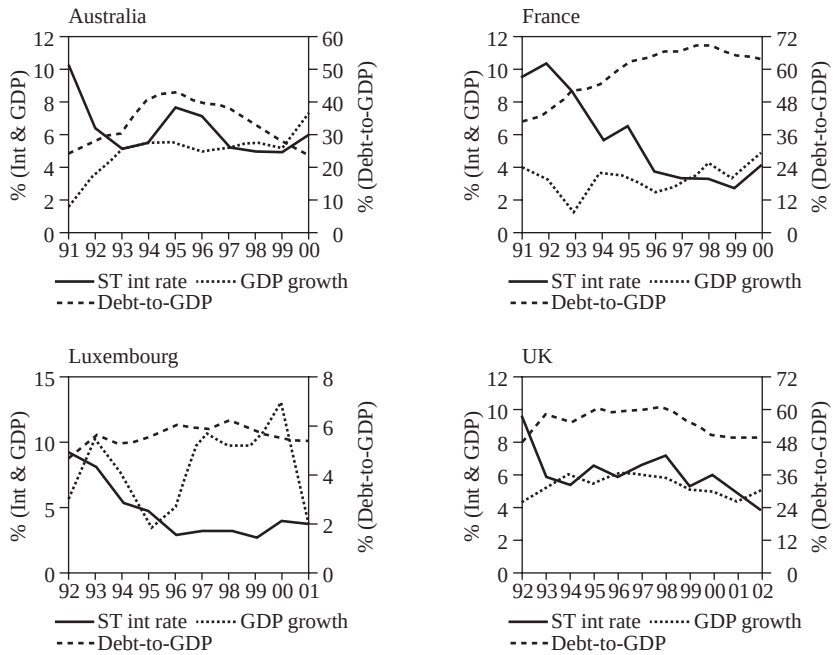

Figure 8.3 Interest rates and GDP growth in low-debt countries

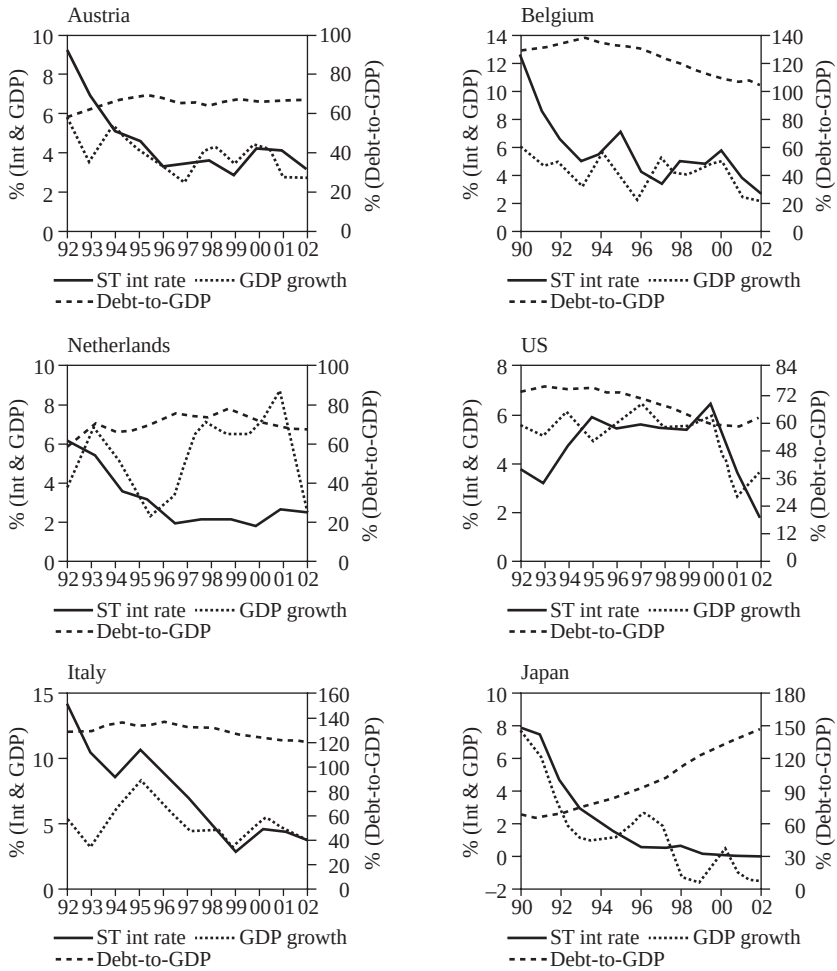

Figure 8.4 Interest rates and GDP growth in high-debt countries

apparent in these series. Finally, in the UK, monetary policy outcomes appear consistent with conventional theory, at least when debt levels are clearly below 60 per cent.

Time series for the six high-debt countries are shown in Figure 8.4.

Once again the patterns are striking. A high degree of co-movement is clearly apparent in each of our high-debt countries. Thus, in the high debt countries, any negative interest rate effects – for example declining investment or a worsening of the current account – appear to have been more than

Table 8.3 Maturity of government debt (figures in %)

(a) Low-debt countries

France	1994	1996	1998	2000
Short-term debt (BTF)	10	9	8	7
Medium-term debt (BTAN)	27	26	27	25
Long-term debt (OAT)	63	65	65	68

Source: Banque de France (http://www.francetresor.gouv.fr/oat/us/t02_01.html)

Australia	1994	1996	1998	2000
Notes (short-term issues)	19	15	11	7
Bonds	80	85	88	92

Source: Reserve Bank of Australia (http://www.rba.gov.au/)

UK	1994	1996	1998	2000
Bills	2	4	2	3
Gilts (including NILO)	98	96	98	97

Source: Bank of England (http://www.bankofengland.co.uk/Links/setframe.html)

(b) High-debt countries

Japan	1994	1996	1998	2000
Treasury bills	6	5	5	9
Medium-term bonds	5	8	7	14
Long-term bonds	89	87	88	77

Source: http://www.boj.or.jp/en/stat/stat_f.htm

USA	1994	1996	1998	2000
Bills	23	22	21	22
Notes	60	61	58	52
Bonds	16	16	19	21

Source: http://www.federalreserve.gov/releases/

Table 8.3 continued

(b) High-debt countries

Italy	1995	1996	1998	2000
Bills	21	18	12	9
Bonds	79	82	88	91

Source: Bank of Italy (http://www.bancaditalia.it/)

Belgium	1994	1996	1998	2000
Short-term debt	27	23	21	16
Long-term debt	73	77	79	84

Source: Die Oesterreichische Nationalbank (http://www.oenb.co.at/)

offset by positive interest rate effects, so that output increased even as interest rates rose. Focusing on the Italian experience, the potential for perverse macro effects was recognized by Dornbusch (1998), who noted that the private sector's substantial holdings of very short-dated public debt made consumption a positive function of interest rates.[24] As the Dornbusch study indicates, the maturity structure of the public debt can be an important consideration. Table 8.3 shows the maturity structure of outstanding debt in seven of our OECD countries. Thus we see that as Italy, whose outstanding short-term debt was relatively large, began cutting interest rates (in compliance with the Maastricht convergence criteria) in the early 1990s, it resulted in substantial reductions in interest expenditure, which appear to have contributed to a significant decline in output.[25] In contrast, in the UK, where short-dated offerings are negligible, monetary policy has had the predicted (that is, conventional) outcomes, even as debt–GDP ratios hovered around the 60 percent mark throughout most of the 1990s.

5. SUMMARY AND CONCLUSIONS

Today, most macroeconomists concede the non-neutrality of money, at least in the short run. Consistent with this position is the notion that central bank tightening will dampen the pace of economic activity while monetary easing should stimulate output and employment. Our chapter challenges the theoretical grounds for these conventional outcomes, arguing that outcomes

appear to depend – at least in part – upon the size, sectoral distribution and maturity of the government's debt. Our monetary policy outcomes (MPO) curve, which stressed the importance of debt size, summarized this argument graphically. Empirically, we showed that when high-debt countries pursue expansionary monetary policy, the outcome may be contractionary because lowering rates cuts fiscal expenditures, perhaps by a very large number (for example Italy a decade ago). Similarly, monetary tightening may have had stimulative effects in countries with high debt-to-GDP ratios. In contrast, we show that monetary policy has the predicted effects in countries with low debt-to-GDP ratios.

NOTES

1. Exceptions include New Classical models in which monetary policy is fully anticipated, as well as Real Business Cycle models where monetary policy has no short-run effects on the real economy.
2. There is also a secondary, or multiplier, effect. The impact of government spending through the income and employment channel is examined in any standard macro textbook.
3. These sectoral relations are emphasized in the work of Michael Kalecki (1971).
4. The household sector's budget position reflects the difference between disposable personal income and personal outlays. The business sector deficit is the excess of plant and equipment, inventory and corporate housing investment over business internal funds (where internal funds = retained earnings plus capital consumption allowances). And the foreign sector balance reflects changes in a nation's net acquisition of foreign assets.
5. Similarly, monetary easing might allow bonds to be rolled over at lower interest rates, thereby reducing fiscal deficits and, hence, diminishing the private sector surplus.
6. The portfolio effect was emphasized by Brainard and Tobin (1968) as well as Minsky (1986).
7. As long as governments issue debt denominated in a sovereign currency – that is, one that can be created and destroyed at will – financial markets should not attach default risk to these issues. Marketability is ultimately guaranteed by the central bank, which furnishes liquidity by buying government bonds.
8. We are using the term 'negative' in a relational rather than a normative way. We mean simply that there is a negative or inverse relation between the interest rate and the level of economic activity. Thus, if output declines as interest rates increase, one observes the negative interest rate effect.
9. When banks are not legally required to hold reserves (for example in Canada or the UK), an increase in the interest rate paid on member banks' clearing balances is supposed to discourage an expansion in the supply of credit by raising opportunity costs.
10. While the interest rate is occasionally introduced as an independent variable in the consumption function, macro theory continues to emphasize investment spending when referring to the mechanism through which monetary policy affects macro outcomes.
11. The Marshall–Lerner conditions refer to relative elasticities and require the volume effect to outweigh the value effect of the goods and services that continue to be imported and exported. A discussion of value and volume effects can be found in any international finance text, for example Krugman and Obstfeld (2000).
12. We are, of course, referring to Minsky's well-known financial instability hypothesis (FIH). The above discussion lays out the hypothesis only superficially. For a fuller treatment, see Minsky (1986) or Papadimitriou and Wray (2003).
13. References to the term quasi-rents can be found in Alfred Marshall and J.M. Keynes.

14. A shortfall in quasi-rents can occur because of a rising cost structure or a drop-off in revenues.
15. The profitability of any investment depends upon the relation between the present value of the expected quasi-rents and the full cost of the project. A project is financially feasible only if the former exceeds the latter.
16. The question of whether the size and composition of public debt is relevant for monetary policy decisions was taken up at a conference organized by the Bank of England in June 1998. The proceedings were published by the Bank of England (1998).
17. The research undertaken for this project marks only the first phase of what is sure to become part of an ongoing research project. As more data become available and the scope of the study broadens, the robustness of our findings must also be held to account.
18. Following Minsky (1986), the acquisition of government debt by the government bodies (for example the central bank, government agencies and government-sponsored agencies) and by foreigners has been subtracted from the total issued to derive private domestic acquisition.
19. Holdings are actually highest in the USA, where non-financial corporations hold just 4 per cent of the total.
20. It was reasonable to treat consumption as a simple function of disposable income in the early part of the twentieth century, when household wealth and consumer credit were relatively unimportant. But household wealth and consumer credit have become important factors, which now serve to attenuate passive consumption behaviour (Minsky, 1986).
21. Goodhart (1999) examined the likelihood of a wealth effect in the UK, focusing on the impact of interest rate movements on equities and foreign exchange.
22. Figure 8.2 presumes that the requisite mix of short- and long-term debt exists.
23. For lack of a more sensible alternative, we use the Maastricht criteria to define high- and low-debt countries. See Buiter et al. (1993) for a discussion of the arbitrary nature of the Maastricht deficit-to-GDP and debt-to-GDP limits.
24. In this paper, Dornbusch argued that the substitution and (small) wealth effects were outweighed by a relatively large income effect.
25. The resulting fiscal tightening kept the lira strong, which reduced aggregate demand, placing a further drag on GDP.

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9. The Old Lady in new clothes: uncertainty and the UK monetary policy framework

Mark Roberts

1. INTRODUCTION[1]

The last decade has witnessed substantial reform of monetary policy operating procedures in many developed countries, with the general trend being towards more open and independent central banks.[2] No better example of this is provided than by the UK. First, in the wake of sterling's departure from the Exchange Rate Mechanism (ERM) in September 1992, we saw, for the first time, the introduction of an explicitly announced target for inflation. This was quickly followed in February 1993 by the introduction of a quarterly *Inflation Report* published by the Bank of England and providing a regular assessment of the outlook for UK growth and inflation. However, the most significant reforms to the UK monetary policy framework came in May 1997, immediately following Labour's landslide general election victory.[3] These reforms retained, in a modified form, the explicit (government-set) inflation target introduced in 1992,[4] but delegated responsibility for the meeting of this target to the Bank of England as part of a new institutional framework for monetary policy. This new institutional framework emphasizes the need for transparency and accountability to an extent perhaps unparalleled in the history of monetary policymaking.[5] Certainly, long gone are the days by which the Governor of the Bank of England can live by the maxim 'Never explain, never excuse' by which Montague Norman, Governor in the 1930s, lived (quote given in Boyle, 1967, p. 217).

As has been widely commented upon, not least by members of the Bank of England's Monetary Policy Committee themselves, both the nominal and real performance of the UK economy dating back to the 1992 reforms has been impressive. In particular, in the words of Mervyn King, we may characterize the last decade as NICE – Non-Inflationary and Consistently Expansionary (King, 2004a, p. 2). Of course, there has been acknowledgement that 'success has many parents' (Lomax, 2004, p. 4), not least that labour and product

market reforms have also contributed to the NICEness of the last decade.[6] Notwithstanding this, however, the clear consensus remains that more independent and transparent monetary policy deserves a major part of the credit for the improved performance, especially in light of evidence that the 1997 reforms have both brought about a reduction in inflation expectations and succeeded in anchoring those expectations.[7]

In light of the above, the aim of this chapter is to provide a more detailed overview of the current framework for monetary policy making in the UK as it stands following the reforms of the 1990s. In doing so, it will be argued that the strength of the framework lies in its ability to deal with the problems facing monetary policymakers the world over. As we shall see, these problems arise not so much from the classic time inconsistency problem of discretionary monetary policy (Kydland and Prescott, 1977; Barro and Gordon, 1983a, 1983b) but from the fact that, as recognized by central bankers, the world is an open system in which uncertainty is rife. In light of this, the remainder of this chapter will proceed by first looking at the problems that confront monetary policymakers, emphasizing, in particular, the problems caused by the existence of uncertainty. It will then provide a more detailed description of the UK framework, analysing how it deals with these problems.

2. PROBLEMS WITH THE CONDUCT OF MONETARY POLICY

In the academic literature, the problem with the (socially) optimal conduct of monetary policy that has, until relatively recently, received the most attention is the problem of *time* or *dynamic inconsistency*. This problem was first analysed in the context of monetary policy by Kydland and Prescott (1977) and Barro and Gordon (1983a, 1983b). The basic idea is that we live in a Lipsey–Lancaster (1956–57) style second-best world in which irremovable distortions, arising from, for example, distortionary taxes and imperfections in product and labour markets, cause the equilibrium level of real output to be too low from a social viewpoint. These irremovable distortions create an incentive for a benevolent policymaker who has discretionary control over monetary policy to create 'surprise' inflation unless the economy exhibits an inflationary bias.[8] This inflationary bias involves no gain in real output above the equilibrium level and constitutes the time consistent outcome. It is an outcome, however, that is socially inferior to the outcome that would arise *if* the policymaker were able to precommit herself not to 'surprise'. In this (hypothetical) situation social welfare would be higher. This is because, whilst real output would still be at the equilibrium level, inflation would be at the level most desired by society.[9]

Several theoretical 'solutions' to the time inconsistency problem of discretionary monetary policy have been proposed in the theoretical literature. Two that have received amongst the most attention are *delegation* and *rules*. Delegation, as first considered by Rogoff (1985), involves society handing over control of monetary policy to an authority that is assumed to be more conservative than itself (usually stylized as a 'conservative central banker'). Conservative in this context means that the authority attaches a greater relative weight to deviations of inflation from target than to deviations of real output from target than does society.[10] This mitigates the inflationary bias by diluting the incentive to create 'surprise' inflation.[11] However, delegation in this case involves a downside. In particular, even when the amount of conservatism is optimally selected, it involves the cost of a socially sub-optimal response to supply shocks.[12, 13] The theoretical literature suggests, however, that appropriately written rules should be able to overcome this problem of sub-optimal stabilization. Thus, in simple New Keynesian style models of the macroeconomy, both Taylor-style and inflation targeting rules have been derived as optimal stabilization rules by, *inter alia*, Ball (1999) and Svensson (1997, 1999).[14, 15]

From the above, therefore, it would seem that society can both have its cake and eat it. Through the legislated implementation of an appropriately designed rule for monetary policy, society should both be able to remove any inflation bias and have optimal stabilization in response to not only demand shocks but also supply shocks. However, this conclusion is problematic because of the treatment of uncertainty in the models from which it is drawn. Thus, whilst uncertainty is present in these models, it takes a form that is relatively uninteresting from a policy viewpoint. In particular, it takes the form of additive uncertainty.[16] This form of uncertainty implies certainty equivalence in the derivation of results. As a consequence, it has no implications for the socially optimal policy rule (see Bean, 1999, p 115). Yet, in reality, uncertainty can take other forms. Moreover, the other forms that it can take seem to be endemic in the real world, including in the domain of monetary policymaking. That this is so is explicitly recognized by current monetary policymakers, including both the current Chairman of the Federal Reserve Open Markets Committee (FOMC), Alan Greenspan, and the current Governor of the Bank of England, Mervyn King. Thus, taking Greenspan first, in presenting at the San Diego meetings of the American Economic Association (AEA) in January 2004 he stated that 'uncertainty is not just a pervasive feature of the monetary policy landscape; *it is the defining characteristic of that landscape*' (p. 4, emphasis added). Following this, he went on to characterize FOMC meetings during his time as Chairman in the following terms: 'uncertainty characterised virtually every meeting, and, as the transcripts show, our ability to anticipate was limited' (p. 8). Turning to King, in

his Ely lecture at the same AEA meetings he talked about the problems caused for monetary policy by the inability to 'articulate all possible future states of the world' (see King, 2004b, p. 2).

From the relevant literature, we may classify these other forms of uncertainty that monetary policymakers take to be pervasive as: (i) multiplicative uncertainty, (ii) uncertainty about the accuracy of incoming data on the current state of the economy, and (iii) model uncertainty. *Multiplicative uncertainty* is the type of uncertainty associated with Brainard (1967) and comes in two forms. In the first, parameters in relationships between macroeconomic variables of interest to the policymaker are random variables that are structurally unstable (Brainard, 1967, p. 413; see also Freedman, 1999, p. 118).[17] Meanwhile, in the second form, the true values of the parameters are structurally stable but the estimates that may be obtained from them are imprecise and subject to revision over time (Brainard, 1967, p. 414; see also Freedman, 1999, p. 118). As pointed out by Bean (1999, p. 115), Friedman's (1968) 'long *and variable* lags' in the monetary policy transmission mechanism may be thought of as just one manifestation of such multiplicative uncertainty.[18] Turning to *uncertainty about the accuracy of incoming data* on the current state of the economy, data published by national statistical offices are known to be frequently unreliable and prone to revision, with the result that, as again pointed out by Bean (1999, p. 115), monetary policymakers are faced with a 'signal-extraction problem'. Moreover, this problem of uncertainty about assessing the accuracy of incoming data is exacerbated by the fact that policymakers, given the environment in which they operate, may want to take into account not only quantitative forms of data but also more qualitative forms of data. For example, in the US context, Greenspan (2004, pp. 6–7) talks about the FOMC taking into account circumstantial evidence concerning the increased flexibility of the US labour market and of increased competitive pressures resulting from globalization. Finally, *model uncertainty* relates to the fact that monetary policymakers can never be certain that the underlying structure of the economy is accurately represented by whatever model they are, either explicitly or implicitly, using to guide their decisions concerning the setting of their instrument (Freedman, 1999, p. 119). Important to note is that, although not usually considered in this way, these forms of uncertainty may have Knightian elements whereby it is impossible to assign objective probabilities to possible outcomes (Greenspan, 2004, p. 4).[19]

The consequence of operating in an environment characterized by uncertainty is that, *contra* the academic literature, the legislated implementation of a rule for monetary policy will not produce socially optimal results (King, 1997, p. 439; 2004b, p. 9). In particular, any rule would have to be designed on the basis of models estimated using historical data at a time when there is little reason to believe that the past distribution of shocks will provide a good

indication of the future distribution of shocks. Neither could policymakers be certain that these models correctly capture the underlying structure of the economy during the estimation period. Furthermore, even if they could be certain, they would have very good reason to doubt whether the models would continue to provide an accurate description of the underlying structure in the future, which is when policy based upon the rule would be implemented. On top of this, we may consider that, in such an environment, the adoption of a rule for monetary policy would, almost certainly, eventually end up undermining the credibility of the policymaker. This is because, given Knightian uncertainty, even if a socially optimal rule could be derived and implemented (extremely unlikely), its optimality would, inevitably, be only temporary. In other words, sooner or later its social optimality would break down. When this happens, socially sub-optimal outcomes will, by definition, result. Such sub-optimal outcomes will create pressure, including from financial markets, for the abandonment of the rule and, when the abandonment occurs, credibility will be lost.[20, 21]

Uncertainty not only makes monetary policy purely by rule undesirable, but also poses several other problems for its conduct. Thus, for example, Goodhart (1999, p. 109) points out how uncertainty, and, in particular, multiplicative uncertainty, creates an incentive for monetary policymakers to be hesitant in adjusting their instrument in response to shocks. This is problematic because, given the inherent dynamic structure of any economy, it can lead monetary policy to become subject to the syndrome of 'too little, too late' or, in Fedspeak, 'falling behind the curve'.[22] This syndrome, Goodhart argues, operates asymmetrically, being more important when it comes to dealing with inflationary pressures than with deflationary pressures. This is because 'Interest rate increases are rarely popular, while expansionary measures are so' (p. 109). Furthermore, we have so far argued as if policymakers are the only relevant party when it comes to a consideration of the socially optimal conduct of monetary policy. However, this is not the case. In particular, the 'public', including financial market participants and those actively involved in wage bargaining, are subject to all the same forms of uncertainty that confront monetary policymakers. Not only this, but, in order to formulate their expectations, they have to develop a model of the behaviour of the policymaker, which includes forming a judgement of what the objective function of the monetary policymaker is. Although it may be argued that this is more a case of asymmetric information than uncertainty, there can be no doubt that it poses additional problems for the optimal conduct of monetary policy. For example, monetary policy in the modern world usually takes the form of the central bank setting a single short-term interest rate, and the effectiveness of monetary policy then relies, to a large extent, upon changes in this rate affecting the entire term structure of interest rates in the desired

manner. Thus, from the expectations theory of the term structure of interest rates, we know that longer-term interest rates are a function of the whole trajectory of expected short-term rates.[23] However, if financial market participants are uncertain about the 'correct' model of policymaker behaviour, they will be further hindered in the already difficult task of forming accurate expectations of the likely future course of the central bank's key short-term rate. This will undermine the ability of the central bank to affect the yield curve in the predictable manner desired and, therefore, undermine its ability to conduct a socially optimal monetary policy.[24]

From the above it is clear, then, that the main problem that monetary policymakers face is how to avoid a systematic inflation bias while ensuring a socially optimal response to shocks *in a world of pervasive, and, perhaps, fundamental, uncertainty*. As indicated above, current monetary policymakers explicitly recognize this to be the primary problem. Along with this recognition has come a recognition by policymakers of their fallibility in decision making.[25] Because of their inclusion only of additive uncertainty, this is a fallibility not suggested by the models of monetary policy making that characterize most of the academic literature.

3. THE UK MONETARY POLICY FRAMEWORK

Having established that uncertainty lies at the heart of the problem of how to conduct socially optimal monetary policy, we can now progress to providing an overview of the current UK monetary policy framework. In doing so, we shall argue that its strength, a strength which helps account for its success to date, lies in its ability to deal with the issue of uncertainty.[26]

From the introduction it will be recalled that the monetary policy reforms of 1997 delegated responsibility for operational control of monetary policy from the government to the Bank of England. More specifically, the reforms passed control of the repo rate to a nine-member committee within the Bank known as the Monetary Policy Committee (MPC). Of these nine members, five are Bank of England officials. The most important of these is the Governor of the Bank of England because he occupies the position of Chair of the Committee and, as a consequence, holds the casting vote in the case of split decisions. Meanwhile, the remaining four members of the Committee are outside appointees made by the Chancellor of the Exchequer. Outside appointments are made on the basis of three-year contracts and the criterion for appointment is that the person have specialist expertise 'which is likely to be relevant to the Committee's functions' (Bank of England Act 1998).[27] In addition to these nine members, the Treasury has a right to have a representative present at all MPC meetings, although this representative has no voting

privileges. The primary purpose of this representative is to communicate the government's fiscal policy stance to the Committee, thereby helping to ensure efficient coordination between monetary and fiscal policy.[28]

As a consequence of the above, the Bank of England is said to be 'instrument independent'. However, it remains 'goal dependent' because the objectives of monetary policy continue, even after the 1997 reforms, to be set by the government and, in particular, the Chancellor of the Exchequer.[29] This goal dependence comes through the continued existence of an explicit (government) set target for inflation, inflation targeting having, as pointed out in the introduction, been first introduced in the UK in 1992. Until recently, this inflation target was specified in terms of RPIX, that is, the Retail Prices Index excluding mortgage repayments, with the target being 2.5 per cent at all times. However, in June 2003 the Chancellor announced that the target would be respecified in terms of the CPI (consumer price index) with the target becoming 2.0 per cent at all times.[30] This new target was introduced on 10 December 2003. Nevertheless, the new target, like the old target, is a symmetric target. Reflecting this symmetric nature, should inflation deviate from the target on either side by more than one percentage point, the Governor of the Bank of England, as the Chair of the MPC, is required to send an open letter to the Chancellor. In this open letter, the Governor, on behalf of the MPC, is obliged to explain: (i) why inflation has come to miss the target, (ii) what steps are going to be taken to bring inflation back to target, and (iii) the time period within which inflation is expected to return to target. If inflation remains +/– one percentage point away from the target three months after the sending of this letter, the Governor has to write a second open letter to the Chancellor. To be noted is that the inflation target provides the operational expression of the primary objective of monetary policy to 'maintain price stability'. This primary objective was set down in legislation in the Bank of England Act 1998. Also to be noted is that *subject to the meeting of this objective* the Act requires the MPC 'to support the economic policy of Her Majesty's Government, including its objectives for growth and employment'.

In line with the general trend across developed countries, the current UK monetary policy framework emphasizes both transparency and accountability. Transparency comes not only in the form of the existence of the explicit target for inflation against which the performance of the MPC can be judged, but also in the form of several other measures, just three of which shall be mentioned. First is the requirement that the MPC publish the minutes of its monthly meetings within six weeks of those meetings.[31] Second, in the quarterly *Inflation Report* that, from the introduction, we know has been a feature of UK monetary policy since 1993, the Bank of England publishes its forecasts, for up to 2.5 years ahead, of both inflation and GDP.[32] These forecasts take the form of 'fan charts' that show the probability distributions associated

with the forecasts. Third, the Bank has made publicly available details of the economic models that the MPC uses to help guide its work in the form of a book entitled *Economic Models at the Bank of England*. As for accountability, this is first, and most obviously, ensured through the open letter system described above. It is further ensured through the requirements that the MPC: (i) submit a monthly report on its activities to the Bank of England's Court of Directors and (ii) also makes reports and presents evidence to the Treasury Select Committee of the House of Commons on a regular basis. The requirement to publish the minutes of its meetings as a means of promoting transparency also contributes to the MPC's accountability, and it is important to note that the framework emphasizes not only collective accountability but also *individual* accountability. Thus, according to Lomax (2004, p. 3), 'all members [of the MPC] are individually accountable for their votes, which are made public with the minutes. Both the markets and the press take a keen interest in the pattern of voting, and members will often find a way to explain their thinking in more detail.'

As indicated, the strength of this framework for UK monetary policy resides in the fact that it is able to deal with the main problem that monetary policymakers face the world over. This is a problem that we described in the previous section as 'how to avoid a systematic inflation bias while ensuring a socially optimal response to shocks *in a world of pervasive, and, perhaps, fundamental, uncertainty*'. With respect to the avoidance of a systematic inflation bias, the framework first helps here by minimizing public uncertainty over the correct model of behaviour of the MPC. In particular, the explicit inflation target leaves the public in little doubt that the primary objective of the MPC is indeed that of price stability set out in the Bank of England Act 1998. This means that when inflation threatens to rise above the target, the public is able to correctly attribute the threatened rise to a shock rather than to a change in MPC, or, for that matter, government, objectives. The result is an anchoring of inflation expectations at, or near to, the target level of inflation, and this anchoring is undoubtedly further helped by the other features, over and above inflation targeting, promoting transparency and accountability.[33] This is so because the other measures help the public, most notably the financial markets and the media, to verify, so far as is possible, that the MPC is not guilty of storytelling in any outcome that takes inflation above the target – in other words, not guilty of attributing a missing of the inflation target to a shock when it is actually the result of intentional actions by the MPC itself. It hardly needs adding that the ability to effectively monitor the MPC that transparency and accountability brings in itself counteracts any incentive to storytell that might otherwise exist, therefore minimizing any possible problem of moral hazard.

Turning to socially optimal stabilization, it follows from the previous section that, through minimizing public uncertainty about the motives of the MPC in the way just described, the framework also makes the repo rate a more effective instrument for dealing with shocks. This is because it increases the public's ability to predict the future course of the repo rate, thereby aiding the MPC's ability to affect the entire term structure of interest rates in the desired manner. However, whilst this is important in helping to ensure something approximating socially optimal stabilization, more important is the fact that the UK monetary policy framework can best be characterized as providing the MPC with 'constrained discretion'.[34] This is because, although its target is specified in terms of current inflation, the MPC has, in practice, no choice but to organize discussion concerning its repo rate decisions on its published forecast of inflation. In particular, given the long lags inherent in the monetary policy transmission mechanism, the MPC typically looks at the correspondence between its central forecast for inflation 2.5 years ahead and its target rate of inflation. This helps the MPC avoid the 'too late' part of the 'too little, too late' syndrome (see previous section).[35]

However, organization of discussion around the published forecast of inflation does not reduce to a mechanical process of ensuring that the inflation forecast for 2.5 years ahead matches the target rate of inflation. Rather, the fact that the forecast for inflation is published in the form of a 'fan chart' alongside a similar forecast for GDP encourages MPC members both to take into account the real effects of its decisions and to explore the uncertainties inherent in the forecast by debating, for example, the assumptions underlying the forecast. This encouragement to explore uncertainties is also helped by the individual accountability of MPC members, an individual accountability that reduces the incentive to search for a consensus (Lomax, 2004, p. 11). Upon exploration of the uncertainties, the MPC might well decide to alter the targeting horizon for forecast inflation. Most obviously, in the unanticipated event of a large negative supply shock that pushes up inflation and generates a probability of a large fall in GDP over the next 2.5 years, the MPC may well decide to extend the targeting horizon for forecast inflation so that, 2.5 years ahead, forecast inflation has only partially adjusted back to the target rate. It might be thought that the need for the Governer of the Bank of England to write, possibly several, open letters to the Chancellor in the event of such a shock might act as a disincentive to such an extension of the targeting horizon by the MPC. However, according to King himself, this is not the case because 'avoiding the need to write such … letter[s] is *not* the objective of monetary policy' (King, 1997, p. 437, emphasis added). Such letters are not intended as a punishment in the form of public humiliation to the MPC as part of some Walsh-style optimal contract. Rather, they are intended as an opportunity for the MPC to communicate to the public that an

unanticipated shock has occurred and precisely what, in its view, the optimal response to that shock is.[36] Important to point out is that, in replying to the open letter(s), the Chancellor has the opportunity to instruct the MPC to take a different approach to dealing with a shock to that outlined. This implies that the Chancellor can state if he thinks the response to a shock proposed by the MPC is not socially optimal and, effectively, define the weights he perceives to be socially optimal that the MPC should be attaching to deviations of inflation from the target relative to deviations of real output from the equilibrium level.

To be noted is that the use of constrained discretion in the way described may well have a positive feedback on the anchoring of inflation expectations at a low level. If this is so, it will reinforce the ability of the UK monetary policy framework to avoid an inflation bias. In particular, we can hypothesize that the effective use of constrained discretion helps with the anchoring of inflation expectations because, *contra* Rogoff, there is no trade-off between a monetary policymaker's credibility and the social optimality of her response to supply shocks. Rather, the policymaker is more likely to be credible in the eyes of the public the better is her response to shocks perceived to be. This is because credibility can be thought of as a function of the perceived all-round competence of the policymaker and perceived all-round competence can itself be thought of as dependent on, *inter alia*, the perceived ability to deal with shocks.

4. SUMMARY AND CONCLUSIONS

In this chapter we have aimed to provide an overview of the UK monetary policy framework, a framework that, consistent with global trends, underwent considerable reform in the 1990s. These reforms have resulted in a regime in which monetary policy is operated by the Bank of England's Monetary Policy Committee in a transparent and accountable way according to the principles of constrained discretion. It has been argued that the strength of this framework lies in its successful confrontation of the key problem facing monetary policymakers the world over: how to go about conducting socially optimal monetary policy in a world in which uncertainty is prevasive Thus we may conclude that the new clothes which the reforms of the 1990s provided the Old Lady of Threadneedle Street with are well suited to the environment in which she finds herself.

NOTES

1. The author would like to thank participants at the conference 'The New Monetary Policy: Implications and Relevance' held at Downing College, Cambridge, for their useful comments upon a preliminary draft of this chapter. All usual disclaimers apply.
2. An exception is provided by the creation of the European Central Bank (ECB). Although the ECB is probably the most independent of all central banks, it displays a distinct lack of openness. Thus, for example, minutes of ECB policy meetings are only currently scheduled to be published with a 16-year lag (Barysch, 2002).
3. The Bank of England Act 1998 cemented these reforms in legislation.
4. The inflation target introduced in 1992 took the form of a range of 1–4 per cent for inflation as measured by the Retail Prices Index excluding mortgage repayments with the aim of the then government being to reduce inflation to the lower part of this range by the end of the Parliament (King, 1997, p. 434). This should be contrasted with the current form of the inflation target described later in the chapter.
5. Transparency may be defined as the extent to which a central bank's explanation of its policies to the public is open (King, 1997, p. 14).
6. The time inconsistency literature implies that a reduction of distortions will reduce the inflation bias associated with discretionary monetary policy. This literature is discussed in the next section.
7. Upon the day, 6 May, that the 1997 reforms were announced, the inflation premium, which can be thought of as measuring the sum of expected inflation and the inflation risk premium, fell from around 4.5 per cent to around 3.5 per cent. Since then, the inflation premium has drifted further downwards towards the MPC target level of RPIX inflation of 2.5 per cent that existed until December 2003 (see King, 2002, chart 2). Meanwhile, evidence that the 1997 reforms have better anchored inflation expectations in the UK is provided by Lombardelli and Salaheen (2003).
8. This incentive to 'surprise' is captured by the loss function that the policymaker is assumed to share with the public, which is of the form $L(\cdot) = w(\pi - \pi_T)^2 + (y - ky_e)^2$, where π is the rate of inflation, π_T is the target rate of inflation, y is real output, y_e is equilibrium real output, $k > 1$ is the distortion and w is the weight attached to deviations of π from π_T relative to deviations of y from the socially optimal level. Note that the constraint $k > 1$ implies that socially optimal real output ($= ky_e$) is greater than y_e. Also note that, in this context, discretionary control or discretion is taken to mean the period-by-period minimization by the policymaker of its loss function subject to the relevant constraints.
9. Kydland and Prescott (1977) can be thought of as providing a 'general theory' of time inconsistency, a 'general theory' that they illustrate using several examples, one of which constitutes a sketch model of its application to the monetary policy case. The contribution of Barro and Gordon (1983a, 1983b) was then to pick up and fully develop this sketch model of Kydland and Prescott's, making apparent, in particular, the role of distortions as the origin of the time inconsistency problem.
10. Hence, whilst the loss function of society might be $L(\cdot) = w(\pi - \pi_T)^2 + (y - ky_e)^2$ (see note 8) that of the conservative authority to which monetary policy has been delegated is $L(\cdot) = w_c(\pi - \pi_T)^2 + (y - ky_e)^2$, where $w_c > w$.
11. The fact that the inflation bias is only mitigated and not completely removed implies that delegation does not actually constitute a complete solution of the time inconsistency problem.
12. Stabilization policy in response to demand shocks remains socially optimal because such shocks push both inflation and real output in the same direction. This means that the policymaker can use the single tool of monetary policy to deal simultaneously with the (positive) deviation of inflation from target and the (negative) deviation of real output from target.
13. The implied trade-off between real volatility and inflation volatility may not, however, be such a problem for the UK given the rectangular shape of the policy frontiers between the

standard deviations of inflation and real output estimated by both Bean (1998) and Haldane et al. (1998). See also Goodhart (1999, p. 104).

14. For the nominal interest rate, Taylor-style rules take on the form $i_t = i^* + a(\pi_t - \pi_T) + b(y_t - y_e)$, whilst for the real interest rate they take on the form $r_t = r^* + c(\pi_t - \pi_T) + b(y_t - y_e)$. Note that $i^* = r^* + \pi_T$ where r^* is the equilibrium (or 'neutral') real interest rate. Also note that $c = a - 1$, thereby implying that i_t must increase by more than any increase in π_t if the real interest rate is to increase in response to $\pi_t > \pi_T$. Taylor rules provide a good fit to actual monetary policy in several countries (including the USA, UK, Germany and Japan) since the mid-1980s. However, the coefficients in optimally derived Taylor-style rules are higher than in these empirically fitted Taylor rules (see Ball, 1999, p. 8).
15. Other theoretical 'solutions' to the time inconsistency problem that have received attention in the academic literature are optimal contracts (e.g. Walsh, 1995), reputational equilibria (e.g. Backus and Driffil, 1985; Barro, 1986) and punishment equilibria (e.g. Barro and Gordon, 1983a, 1983b).
16. Thus, for example, in Ball, the economy is assumed to be described by two equations (see Ball, 1999, pp. 3–4). The first is a dynamic IS equation, $y_t = -\beta r_{t-1} + \lambda y_{t-1} + \varepsilon$. Meanwhile, the second is an accelerationist Phillips curve, $\pi_t = \pi_{t-1} + \alpha y_{t-1} + \eta$. Here, the notation is such that y is the output gap and r the difference between the real interest rate and its equilibrium (or 'neutral') level. It is the form in which the error terms, ε and η, enter these two equations that makes the uncertainty in Ball's model additive.
17. In this context, the following statement by Greenspan in his aforementioned AEA speech is informative: 'The economic world in which we function is best described by a structure whose parameters are continuously changing. The channels of monetary policy, consequently, are changing in tandem' (Greenspan, 2004, pp. 6–7).
18. The models of Ball (1999) and Svensson (1997, 1999) referred to above do incorporate long lags in the monetary policy transmission mechanism and, *prima facie*, would, therefore, seem to incorporate this source of uncertainty (see note 16, which implies that in Ball's model there is a two-period lag between a change in the real interest rate and its effect upon inflation). However, this is not the case because they assume the lags to be time invariant.
19. Where objective probabilities can be assigned, the uncertainty is more correctly characterized as 'risk'.
20. It is easy to think of possible examples along these lines from UK monetary history. Most recently, we may think of the UK's September 1992 departure from the ERM, a departure which destroyed the reputation for economic competence of the then Conservative government. The Conservative government was, of course, the monetary policymaker at that time.
21. The alternative, of course, is not to abandon the rule. However, this would obviously come at the cost of having to tolerate a socially unsatisfactory combination of real volatility and inflation volatility.
22. Friedman (1968, p. 177) also identifies a tendency for monetary policy to react too late to shocks given the existence of his 'long and variable' lags. Interestingly, however, his position may be characterized as uncertainty leading monetary policy to become subject to the syndrome of '*too much*, too late' rather than 'too little, too late'.
23. For an introduction to the expectations theory of the term structure of interest rates see Mishkin (2001).
24. See also Bernanke (2004), who describes a literature on adaptive learning by the public in an environment of asymmetric information. This literature yields the result that 'we have no guarantee that the economy will converge – even in infinite time – to the optimal rational expectations equilibrium' (p. 3). To be noted is that the adaptive learning literature obtains this result on the assumption that the public know the 'true' model of the structure of the economy with certainty and that then they use econometric methods to infer the underlying parameters. Obviously, in light of the arguments of the main text, the problems facing the public in forming accurate expectations are far more serious.
25. Witness, for example, the following admission from Greenspan (2004, p. 8): 'From time to time the FOMC made decisions, some to move and some not to move, that we came to regret'.

26. Given the familiarity of this framework to most, the description of its institutional details will be relatively brief. For a fuller description see Budd (1998) and the Bank of England Act 1998.
27. In addition to the Governor, the Bank of England officials that are members of the MPC are two Deputy Governors and two Executive Directors. The current identities of the Deputy Governors are Sir Andrew Large and Rachel Lomax, while those of the Executive Directors are Charles Bean and Paul Tucker. Meanwhile, the current identities of the outside appointees are Kate Barker, Richard Lambert, Stephen Nickell and David Walton.
28. Bhundia and O'Donnell (2002, pp. 153–5) provide a more detailed overview of the role of the Treasury representative on the MPC.
29. This also helps to ensure optimal coordination between fiscal and monetary policy because it means that the goals of both policies are set by the government.
30. The CPI was formerly known as the Harmonized Index of Consumer Prices (HICP) and is the same measure of inflation as used throughout the Eurozone. In terms of its comparison with RPIX, the main difference is that the RPIX includes house price inflation, whilst the CPI does not. For more details, see King (2004c).
31. In practice, the MPC does better than this. Thus, it normally publishes its minutes on the second Wednesday following each of its monthly meetings (see http://www.bankofengland.co.uk/Links/setframe.html). This is to be contrasted with the lag of about eight weeks with which the FOMC normally publishes its minutes (Bernanke, 2004, p. 5) and with ECB practice (see note 2).
32. These forecasts are made on the assumption of a constant repo rate.
33. In this light, it is interesting to note that Bernanke (2004, pp. 5–6) makes reference to several studies that suggest that in the USA, a country which does not have an explicit inflation target, long-term expectations of inflation are not anchored.
34. This terminology of 'constrained discretion' originates from Bernanke and Mishkin (1997).
35. The 'too little' part of the syndrome may, however, persist. This is because, despite the 1997 reforms, gradualism in adjusting the UK repo rate continues unabated (Goodhart, 2004).
36. Admittedly, however, it is difficult to say whether, in practice, open letters will operate in this manner. This is because, to date, there has been no need for the Governor of the Bank of England to write such an open letter. This is quite remarkable and was, according to Charles Goodhart, who was a member of the MPC at that time, completely unanticipated by the Committee at its very first meeting back in 1997. At that meeting, the MPC, based on historical data, estimated that it would need to write an open letter approximately every few months. See also Bean (1998, pp. 1806–8) for a prediction of the likely frequency of open letters made at the outset of the life of the MPC and, again, contrast this with reality as it has so far transpired.

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10. The experience of inflation targeting since 1993

Charles Goodhart

1. A SUCCESSFUL AND STABLE OUTCOME

Since 1993 the economy has remained on a very stable, and relatively successful, trajectory. The main feature of an inflation-targeting monetary regime is, of course, the achievement of that target. This has been successfully maintained, as shown in Figure 10.1. Meanwhile growth has remained consistent, with no quarter of negative growth since 1993. Moreover, the fluctuations in the growth rate in these last 11 years have been considerably lower than previously, with a marked reduction in the scale of cyclical fluctuations, as shown in Figure 10.2. Meanwhile unemployment has been steadily

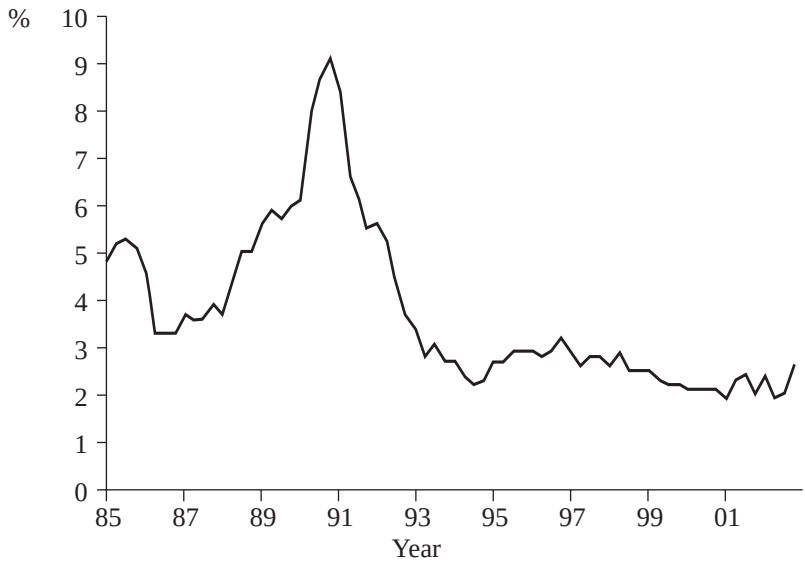

Figure 10.1 Annual RPIX

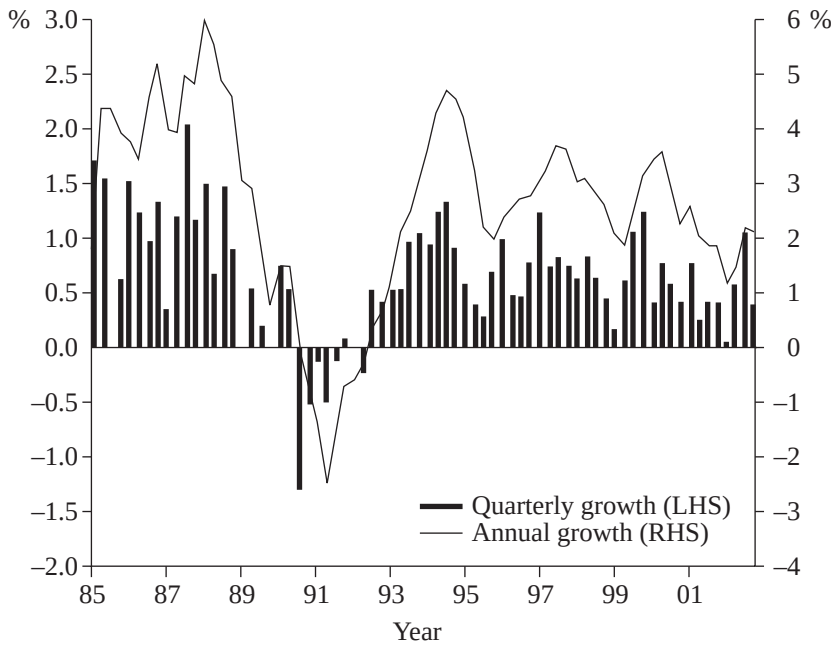

Figure 10.2 Real GDP growth

declining. The only fly in the ointment has been that the rate of growth of productivity per head has not matched the increases recently shown in the USA, and has, indeed, been slightly below the previous, and subsequently expected, average over time. Yet this general economic stability was achieved without having to vary the main instrument of demand management, to wit interest rates, very much. As shown in Figure 10.3, the fluctuations in official short-term interest rates have also been considerably lower than in previous years. In the 1960s and 1970s, it was not unknown for interest rates to be raised by 1, or 2, per cent at times of crisis, and similarly reduced during periods of greater calm and good fortune by steps of 0.5 per cent at a time. Since 1993, it has been unusual for interest rates to be changed more than 0.25 per cent in either direction at any time and no changes greater than 0.5 per cent have been seen.

We can demonstrate the greater stability, and the marked breaks in the time series, more formally following a paper designed to demonstrate just how unusual the recent decade has been, prepared by Luca Benati of the Bank of England. Figure 10.4(a) shows the structural breaks in RPIX inflation since 1947. This demonstrates, in particular, the extremely disturbed decade from about 1973 until about 1982, surrounded by two periods of more normal

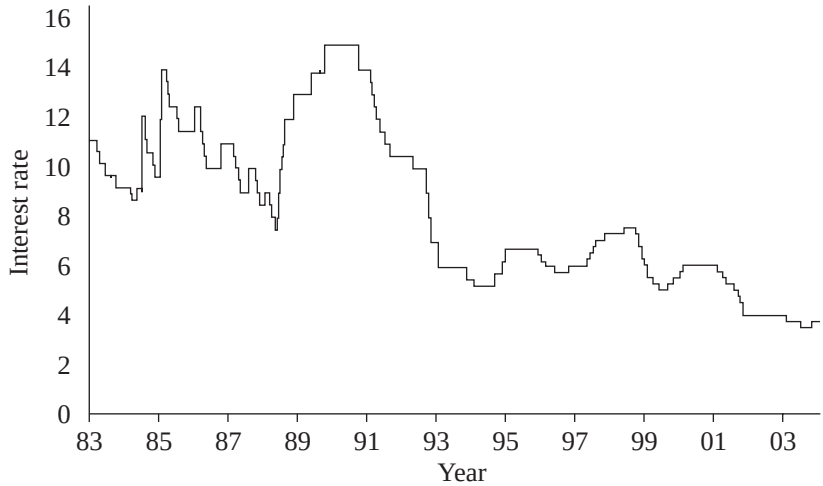

Figure 10.3 Official short-term interest rates

fluctuation from 1947 to 1973 and again from the 1980s until 1993. What is remarkable is the extreme stability of the last 11 years.

Figure 10.4(b) shows the estimated conditional mean of inflation and its 95 per cent confidence bands. Again note how tiny these bands have been since 1993.

Much the same is true of estimated real growth (see Figure 10.5). Here the period breaks down into three segments, with the first running from the start of the post-war period until 1981. The second ran from 1981 until 1993, and the last covers the final 11 years. The differences between these three periods, however, were not so marked. The middle period in the 1980s had, though it does not show up very clearly from the times series diagram, a slightly lower mean rate of growth and slightly higher variance than either the earlier or the later period. Again note that the last ten years, or so, had somewhat lower variance and very slightly higher mean growth than the earlier two periods, though the differences in this case are not nearly as marked as with inflation.

What is noticeable is that the auto-regression of inflation declined markedly, as inflation began to revert quite quickly to its mean target, whereas the auto-regression of output in fact rose quite sharply as the extent of cyclical fluctuation declined.

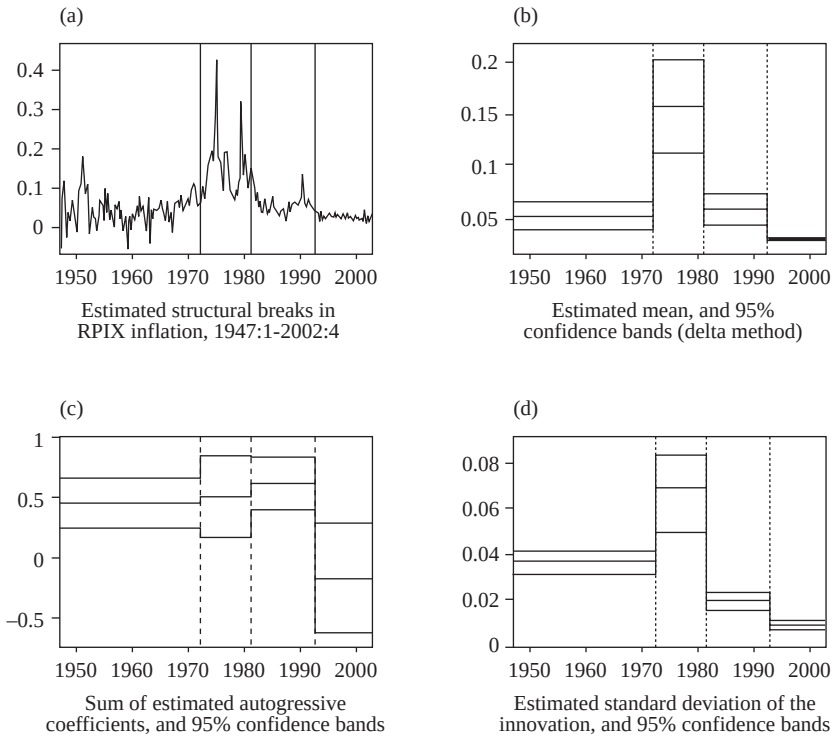

Figure 10.4 Some diagnostic data for RPIX

2. WHY SUCH STABILITY?

The first possibility is that there were just fewer shocks to have to offset. The Governor of the Bank of England, Mervyn King, tends to dismiss this claim. After all, this period included the Asian Crisis in 1997/98, the dot com bubble and bust between 1998 and 2002, 9/11, Iraq, and the war against terrorism. Nevertheless, I think that there is some evidence that the period has been typified by fewer external shocks affecting the UK economy. Again using the evidence provided by Benati, we can look at the standard deviation of the innovations, or shocks, and their 95 per cent confidence bands. We start with the innovations to inflation in Figure 10.4(d), and go on to the innovations to output in Figure 10.5(d). In both cases, there is quite a sharp reduction in the scale of these innovations in the last ten years or so.

A second suggestion, which has been put forward by some US economists, is that structural changes have taken place, which have had the effect of

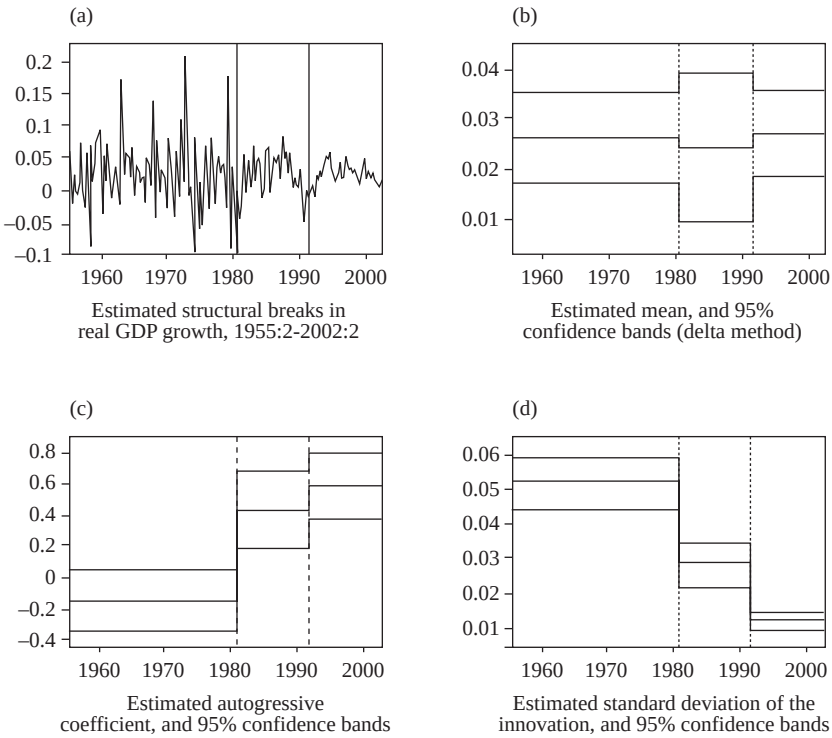

Figure 10.5 Some diagnostic data for output growth

reducing the scale of cyclical fluctuations. These structural changes include the shift of production towards services and away from manufacturing; there has also been a reduction in the scale of inventory cycles, partly as a result of this, though also partly due to factors such as 'just-in-time' ordering. Again many of the crises in previous decades were caused by balance of payments crises impinging on pegged, but adjustable, exchange rates. Since the end of the ERM, all the major exchange rates have either been completely fixed, as in the case of the euro zone, or floating. The move from the unstable middle of the exchange rate spectrum towards the more stable polar extremes may have caused the world to be more stable. Moreover, the 1970s and 1980s were punctuated by energy (oil) crises, with resulting very sharp changes in the real price of oil, and indeed of other commodities. There have been very few shocks of the same magnitude to energy and commodity prices in the last decade.

The preferred answer of the Governor, and indeed of most of my colleagues on the Monetary Policy Committee, has been that policy has been

better conducted since the introduction of inflation targets in 1993, and the subsequent enhancement of the likelihood of achieving such targets by the delegation to the Bank of operational independence in 1997. Having been somewhat involved myself, I would, naturally, agree that the policy regime, and indeed the tactical conduct of policy, has significantly improved over the last decade, compared with previous decades. Nevertheless, I think that improved policy can only take limited credit for the comparative success of economic conditions in recent years. Quite early in the life of the MPC, we, and the staff at the Bank, did an exercise to assess 'The Transmission Mechanism of Monetary Policy', which was published in 1999. If you read this, you will see that the maximum effect of a 1 per cent change in interest rates is to bring about a change in the opposite direction in output of about one-third of 1 per cent after about one year, and of about the same amount in inflation after about two years. If you go back to the diagram of official short-term interest rates (Figure 10.3), you will see that the maximum reached by interest rates during this period was about 7.5 per cent, whereas the minimum was about 3.5 per cent. This means that the maximum change in interest rates could have delivered a maximum shift in output of about 1.3 per cent, and similarly with inflation. Now a policy-induced maximum change of about just over 1 per cent at any time is not very large. Unless the shocks hitting the system were really quite small, the extent of policy-induced demand management, even if perfectly calibrated, could not be responsible for the achievement of the stability and successful growth that we have enjoyed.

It is, perhaps, possible that the influence of demand management, via interest rate changes, has been greater in practice than we thought a few years ago. In particular, the fact that the inflation target has been successfully achieved, and has thereby gained credibility, has resulted in expectations being much better anchored than in previous decades. With expectations thus stabilized, the fluctuations in nominal interest rates will have had a greater effect on real interest rates, and thereby possibly had a stronger effect on the economy.

There is, however, a counter to this. Perhaps the most reliable, and strongest, mechanism whereby changes in interest rates are thought to have affected the economy was through their effect on the exchange rate, at least in previous decades. An increase in interest rates would strengthen the exchange rate, thereby reducing output and leading to some reduction in inflation. In recent years, however, the effect of interest rate changes on the exchange rate has become considerably more uncertain. A larger proportion of international capital flows has involved direct investment, or equity-related investment, rather than fixed-interest-related investment. A rise in interest rates tends to lower profits, and to lead to a weaker equity market. So an increase in interest rates may deter inward equity-related investment, while at the same time

leading to an increase in inward fixed-interest investment. As a result, even the direction of effect on the exchange rate of a change in interest rates is now uncertain. In particular, uncovered interest parity seems to be failing even more dramatically in recent years than previously.

In addition, the pass-through from exchange rate changes on to import prices appears to have become even less in the last decade than previously. So, even when exchange rates do change, the direct effect on the propensity to import, and on to domestic inflation, has weakened considerably.

Are there any other possible explanations? One possible partial explanation is that the improvement in monetary regimes, and in policy generally, has not taken place just in the UK, but has occurred around the world. If so, then the UK has been sharing in greater worldwide stability. As the UK economy is medium-sized and open, most of the shocks affecting it come from abroad. If these also have been less in the last decade, then, perhaps, the UK has simply shared in a commonality of enhanced stability all around the globe. Perhaps it owes its stability to Alan Greenspan.

Yet another favourable factor has been that, for reasons that I have never seen fully explained, the UK exchange rate tends to be treated as half-way between that of the US dollar and of the euro. So some of the extreme exchange rate fluctuations that have affected other economies have had less impact on the UK.

3. SUMMARY AND CONCLUSIONS

I would suggest that *all* these partial explanations for greater stability have some validity. There have indeed been fewer shocks to the UK economy. This has probably been in large part because the world economy itself has been more stable; and this in turn has been due to a better policy regime in many countries around the world, notably in the USA. Meanwhile, there have been structural changes to the economy, involving a shift to services and away from manufacturing, which have had the, not fully intended, effect of reducing the sensitivity of the economy to shocks. Finally, I also believe that policy in the UK has been somewhat better conducted in the last decade than previously.

In this latter respect, I have recently been doing some research into the interactions between forecasts, policy reactions and outcomes. I think I can demonstrate that policy has successfully acted against unexpected shocks to the economy almost all the time since 1997. The scale of such policy reaction has, as indicated by my research, been generally too timid to offset unexpected shocks altogether. Nevertheless, the effect of policy has been systemically stabilizing to a significant extent. Such successful policy re-

sponse can be, to a degree, formalized and quantified in the following regressions:

Output

Policy change = $a + b$ forecast change

$a = 0.16$	$b = -0.18$	
(0.07)	(0.06)	$R^2 = 0.20$

where the forecast change is the unanticipated change to the forecast for GDP growth from $t + 7$ to $t + 1$, and policy change is the cumulative estimated change to output from interest rate adjustments from $t + 7$ to $t + 1$. The data period is from 1997 to 2003.

Inflation

Policy change = $a + b$ forecast change

$a = 0.01$	$b = -0.16$		
(0.76)	(0.06)	$R^2 = 0.10$	FP
$a = 0.01$	$b = -0.26$	$R^2 = 0.14$	OI
(0.83)	(0.07)		

where FP has the database extending for the whole period since 1993 and OI relates to the period since operational independence in 1997 (Q3).

11. Reflections on the Bank of Canada's monetary policy framework[1]

Charles Freedman

> Central bankers are always looking for more reliable guides to the conduct of monetary policy than they have had. (Bouey, 1982, p. 4)

1. INTRODUCTION

This chapter discusses the developments underlying the changes in the monetary policy framework in Canada over the past 30 years. Since the mid-1970s, monetary policy in Canada can be characterized as using, or searching for, a nominal anchor in a flexible exchange rate environment. Basing policy on a nominal anchor was viewed as a way of avoiding systematic policy errors of the sort that led to the breakout of inflation in the late 1960s and the first half of the 1970s.

There are four main nominal anchors discussed in the literature – a fixed exchange rate, a monetary aggregate target, a nominal spending target, and a price inflation or price level target. Of these, only two, a monetary aggregate target and an inflation target, were used in Canada in the period under discussion. Canada operated under a floating exchange rate regime over the entire period. And, to my knowledge, no country has used nominal spending as an official target. In the 1975–82 period, the anchor in Canada was the narrow monetary aggregate M1. With the withdrawal of M1 as a target in 1982, the Bank of Canada searched for an alternative anchor for the rest of the decade. In 1991, it introduced inflation targeting, which has subsequently served as the basis of policy.

2. THE SITUATION IN THE MID-1970s

To set the scene for a detailed discussion of the monetary policy arrangements over the past 30 years, I begin with a brief summary of the situation in Canada and much of the industrialized world in the mid-1970s. Inflation had

become a major problem for economic policy, following an increase in the latter part of the 1960s and a sharp rise in the 1972–75 period. Expectations of future inflation were becoming increasingly entrenched, with a widespread view that rates of inflation were likely to remain high.

While many economists explained these developments by the time inconsistency model (Barro and Gordon, 1983), my own view is that the step-up of inflation in the latter part of the 1960s and its acceleration in the 1970s was the result of the interaction of economic shocks and policy errors. The shocks included the increase in aggregate demand related to the Vietnam War in the latter part of the 1960s, the sharp oil price increase in 1973, and shifts in the natural rate of unemployment and/or the capacity rate of growth of output in the first half of the 1970s. The policy errors that led to the accommodation of the shock-induced inflation pressures resulted from an incorrect framework of analysis, a lack of awareness on the part of the authorities of the changes in the natural rate of unemployment and capacity output growth, and insufficient regard for the costs of inflation. Together, these factors resulted in what might otherwise have been a transitory bout of inflation pressures turning into an ongoing period of high and pervasive inflation.

Recall that the prevailing view among economists (if not among all central bankers) in the 1950s and 1960s was that there was a long-run trade-off between output (or unemployment) and inflation, and that the role of the authorities in this framework was to choose the optimal point on the trade-off curve. The appearance of a trade-off was a reflection of an environment in which inflation expectations were low and stable, and there was insufficient attention to the potential role of inflation expectations in the inflation process. The firmly held expectations of continuing low inflation during that period were likely the result of a long period of low peace-time inflation outcomes, buttressed by the fairly conservative economic policies of the 1950s.

Moreover, at the time, the economics profession underestimated the costs of inflation, since economists had difficulty in quantifying those costs. The empirical relationship between high rates of inflation and unpredictable rates of inflation was not widely recognized. Nor was there much awareness of many of the links between even a predictable or expected rate of inflation and unfavourable economic outcomes.

The Vietnam War expenditures and the political decision to have both 'guns and butter' was the direct cause of a period of excess demand in the second half of the 1960s, while the synchronized expansion of the major world economies was the key factor in creating global excess demand in the early 1970s. And the supply shocks of the 1970s, including most notably the oil price shock in 1973, were facilitated by the environment of global excess demand and, in addition, exacerbated the prevailing inflationary pressures. Although policymakers responded to the situation of strong demand and

supply shocks by taking tightening actions, these actions proved to be far from sufficient to offset the upward pressures on inflation, especially in the 1970s.

In part, the overly weak response to the demand and inflation pressures reflected a less-than-complete realization of the implications of unhinging the low level of inflation expectations that had provided an anchor for low inflation in preceding years. As well, in the early 1970s there was a worldwide decline in the rate of growth of productivity and, in some countries, a rise in the natural rate of unemployment. In Canada, both of these shocks occurred, with the rise in the natural rate of unemployment linked in part to an increase in the generosity of the unemployment insurance arrangements. Only gradually did the authorities become aware of these important structural changes in potential output growth and the natural rate of unemployment. Thus, policymakers were focusing on indicators of labour market and product market pressures that were very misleading. On the basis of these indicators they believed that they were tightening policy sufficiently to offset the inflationary pressures. It was also likely the case that insufficient attention was paid to the distinction between nominal and real interest rates. In the event, with the decline in the rate of growth of capacity, demand remained at unduly high levels relative to capacity, and the actions that policymakers took were insufficient to offset the inflation pressures.

The experience of high inflation, and the increased understanding by economists and central banks of the inflationary process and the costs of inflation, led to a stronger commitment to move the rate of inflation down and to keep it at low levels. However, the persistently high inflation rates of the 1970s had unhinged inflation expectations, thereby rendering the process of returning inflation to a lower path much harder. Once the genie of inflation was out of the bottle it proved very difficult to get it back in. Indeed, the rate of inflation only returned to low levels following a major worldwide recession in the early 1980s and another, in some countries, in the early 1990s.

To sum up, the combination of an overly optimistic estimate of capacity, an underestimate of the costs of inflation and insufficient attention to inflation expectations meant that policymakers were not aware at the time that they were taking serious risks of overheating the economy and they did not act sufficiently vigorously to offset the inflationary pressures that developed. And once inflation expectations became entrenched at a high level, it became much more difficult to get the rate of inflation down than would have been the case in an environment in which the public expected that inflation shocks would be temporary and rapidly reversed.

3. MONETARY AGGREGATES AS TARGETS IN CANADA, 1975–82

Against this background, many industrialized countries started to target monetary aggregates in the mid-1970s, with the objective of bringing down the rate of inflation from the high level that it had reached to the much lower level that was believed to be necessary for good economic performance. Thus the announced goal for monetary policy was to gradually bring down the targeted rate of growth of some measure of money (narrow in some countries, broad in others) from a high starting point to a much lower level and thereby wring inflation out of the system, and then to maintain a low rate of growth of money.

In Canada, the Bank of Canada introduced monetary aggregate targeting in late 1975, aiming at achieving a decelerating rate of growth of the narrow aggregate M1 in the expectation that such a policy approach would bring down the rate of inflation from the double-digit level that it had reached to a much lower rate. While a great deal of academic research had been done on the relationship between the growth of monetary aggregates and the rate of inflation, much internal analysis had to be done in the Bank on the demand for money relationship in Canada and on some of the mechanics of using a monetary aggregate as the target.

Economists held different views of the mechanism at work that would link the deceleration of money growth to a decline in the rate of inflation. The more monetarist view focused on a direct causal link between money growth and the rate of inflation. The typical view in central banking circles, in contrast, was that the mechanism operated through more traditional, structural relationships. Thus, too high a rate of inflation (that is, one that was higher than consistent with the targeted growth rate of money) would result in a rise in the rate of growth of money demanded above the target rate, leading the central bank to raise the policy interest rate. This would lead to a rise in short-term market interest rates, and, to a lesser extent, long-term interest rates, as well as to an appreciation of the exchange rate. These, in turn, would slow the growth of aggregate demand (relative to capacity) and bring about a lower rate of inflation.

Essential to this sequence of events were two preconditions. First was stability in the demand for money. This was necessary so that the appropriate signal would be forthcoming regarding the pace of growth of nominal aggregate demand and the needed change in interest rates. Second, the response of interest rates to the deviation between money and targeted money had to exert appropriate effects on demand and inflation.

While the Bank of Canada was successful in gradually reducing the rate of growth of M1 (from 9.3 per cent in the 1975–76 targeting period to 5.9 per

cent in the 1979–80 targeting period), it was less successful in keeping down the rate of inflation after an initial slowing. Thus the rate of increase of the CPI fell from almost 9 per cent in the 1975–76 targeting period to below 6 per cent in late 1976 before rising to about 10 per cent in the 1979–80 targeting period. And the CPI excluding food and energy prices followed a similar pattern, although it reached its low point in mid-1978. From the late-1980 base period to the withdrawal of the targets in November 1982, M1 grew only 0.4 per cent, while the rate of inflation was about 11 per cent.

The lack of success in reducing inflation in the context of a significant decline in M1 growth was due to the fact that the two preconditions for monetary aggregate targeting were not met. The first and more important problem was the instability in the demand for money, especially in the early 1980s. Indeed, this type of instability in the money demand relationship turned out to be a problem in most countries. While economists initially attributed the instability to the deregulation of financial institutions and markets that was then going on in many countries, it occurred also in some countries that had deregulated much earlier. In those countries, and Canada was one of them, the instability seemed to be related to innovations initiated by financial institutions in which they changed the characteristics of the various financial instruments and services that they offered to the public (Freedman, 1983; Courchene, 1983). As experience in many countries has subsequently shown, these kinds of innovations have continued apace and have lessened the information content of the monetary aggregates to the extent that they cannot bear the weight of being a formal target for monetary policy. In the case of Canada, as then-Governor Gerald Bouey (1983, p. 12) put it in a memorable phrase after the withdrawal of the targets in 1982, 'We did not abandon M1, M1 abandoned us.'

By the mid-1980s, just ten years after their introduction, most countries had abandoned monetary targets or had significantly downgraded the role of the monetary aggregates. It should be noted nonetheless that, in some countries, monetary aggregates continue to play a role in the conduct of policy because they bring some information to the assessment of the current economic and inflation situation. Even in these countries, however, they are usually only one of a number of variables feeding into the outlook for the economy and inflation.

The second factor behind the lack of success of the monetary aggregate targeting regime in Canada was that the interest rate elasticity of M1 turned out to be too high (and higher than had originally been thought), implying that in response to upward pressure on inflation and hence on M1, the interest rate increase needed to bring M1 back to target was relatively small and indeed was probably insufficient to counter the inflationary pressures over the short to medium run (Thiessen, 1983). Nonetheless, as long as the growth in nominal spending exceeded the target growth rate for M1, interest rates

would have continued to rise, and the monetary tightening would eventually have had an impact on output and inflation. But this might have taken quite a long time.

I would like to make five additional observations regarding the approach to monetary aggregate targeting in Canada. First, the targeted deceleration of M1 was gradual. The logic behind gradualism was to avoid the unduly large effects on output that might have resulted from a much steeper decline in the rate of growth of M1. That is, the authorities were not prepared to base policy on a 'cold turkey' sharp reduction in money growth, an approach that would have been preferable if (and only if) inflation expectations adjusted rapidly to the announced downward path for money growth. In fact, the experience during this period, and during the inflation targeting period of the 1990s, is supportive of the conclusion that inflation expectations adjust only gradually, and with a lag, to declines in the actual rate of inflation, at least in countries where the rate of inflation is not extremely high.

Second, on the downward path for M1 growth, the Bank of Canada announced new money targets on an irregular basis and employed base periods for the measurement of money growth that were as much as six months earlier than the date of the announcement. This approach was aimed at avoiding the problem of 'base drift' that would likely have resulted from a mechanical retargeting every four quarters, an arrangement that plagued the US monetary targeting experience. In contrast to such a mechanical rebasing, the Bank of Canada chose to wait until M1 was back in the middle of its band (adjusted for any shift in money demand that was apparent), and until the data were not likely to be revised in a major way, before announcing a new base for the subsequent period. Unfortunately, at the time the Bank did not explain the motivation for its approach to rebasing.[2] The contrast with the recent approach to policy design, where the policy framework is explained in great detail, could not be more striking. Nor at the time was the Bank willing to publish its M1 equation, also reflecting the lack of transparency among central banks during the period.

Third, the Bank of Canada never exerted direct control over M1. In carrying out its policy, the Bank inverted the estimated demand for money equation to determine the interest rate path needed to achieve the target path for M1, given the past and expected future paths for output and inflation.[3] It then used its techniques for policy implementation (that is, adjusting the supply of bank reserves relative to the demand for them) to bring about the desired interest rate path.

Fourth, it used to be that most academic research treated money (or sometimes base) as the exogenous policy instrument under the control of the central bank. This made such research less useful to economists working in central banks, because the instrument of policy had always been the short-

term interest rate, and because all the monetary aggregates (beyond base) have always been and remain endogenous. In recent years, more and more academics, in specifying their models, have treated the short-term interest rate as the policy instrument, thereby increasing the usefulness of their analyses for central bank thinking about monetary policy and allowing for more cross-fertilization of work done inside and outside central banks (for example, Svensson, 1997; Clarida et al., 1999). That said, even after the acceptance of the view that money is endogenous, there is still room for debate between the proponents of the active money paradigm, in which money plays a causal role in the determination of spending, and the passive money paradigm, in which it does not (Laidler, 1999).

Fifth, while the Bank was aiming at a gradual deceleration of M1 and a resulting slowing of the rate of inflation during this period, the government in its budget projections in the late 1970s and early 1980s assumed a rate of inflation on the order of 9 to 10 per cent over the subsequent five years. Observers wondered which of the two entities responsible for macroeconomic policy they should believe. In contrast, when inflation targeting was introduced in 1991, the announcement was made jointly by the Bank and the government. This made it clear that the government was involved in, and fully committed to, the initiative.

4. INTERMEDIATE PERIOD, 1982–91[4]

Following the withdrawal of the M1 targets in 1982, the Bank of Canada spent a great deal of time and energy searching for an alternative monetary aggregate that could be used as the basis for policy. What it was looking for was an aggregate that bore a stable relationship to output, prices and the interest rate. In 1983 Bank staff actually found an aggregate that was slightly broader than M1, which was called M1A,[5] and that appeared to be stable. While there was pressure both from inside the Bank and from outside commentators to introduce a new money target, those involved in the analysis were more cautious. While the demand for total M1A appeared stable, this was the outcome of large and offsetting errors in its two components, household deposits and business deposits. And, indeed, in the following year, the fortuitous offsetting of errors disappeared and aggregate M1A followed M1 into instability. Staff reservations about introducing M1A as the new monetary aggregate target were clearly vindicated.

The prevailing rate of inflation was about 4 per cent for the five or six years subsequent to the withdrawal of the money targets. While this was much lower than in the 1970s, it was nonetheless viewed as higher than desirable for the long run. The Bank's policy goal during the period was, first and

foremost, to contain inflation and prevent it from increasing, and then, over time, to bring inflation down to more acceptable levels. In the absence of a quantitative nominal anchor, it was not clear to the public exactly what goal the Bank envisaged for inflation and over what time horizon it would try to achieve that goal. Governor Crow (1988) specified in the Hanson lecture that the objective of Canadian monetary policy was the achievement and maintenance of price stability. This was 'probably the strongest commitment to price stability that had ever come from the Bank of Canada' (Thiessen, 2000–2001, p. 44). However, the Governor gave no operational measure in that lecture for price stability, nor a path over which that objective would be achieved.

I want to mention in passing that, in the latter part of the 1980s, Bank staff experimented with nominal spending as the target for policy and it was used in internal analyses, including staff projections (Duguay and Longworth, 1998). Although it never got any further, some of the insights gained from this work proved useful later when the Bank moved to inflation targeting.

5. INFLATION TARGETING, 1991 TO THE PRESENT

Towards the end of the 1980s, as the economy moved back to and beyond potential, there was upward pressure on price and wage inflation. Subsequently, in early 1991, the sharp rise in oil prices in the period leading up to the first Gulf War and the introduction of the Goods and Services Tax (GST) caused CPI inflation to rise to 6.8 per cent. The concern at the time about a resurgence of inflation expectations and a return of the kind of price–wage spiral that prevailed in the 1970s and early 1980s were key factors behind the policy initiative of February 1991, when the Bank and government jointly announced the introduction of inflation targeting (Bank of Canada, 1991a).[6] The background document issued at the same time as the inflation targets were introduced (Bank of Canada, 1991b) noted explicitly that, while the Bank would accommodate the first-round effects of indirect taxes, such as the GST, on the price level, it was not prepared to accommodate any second-round effects on the ongoing rate of inflation. At the same time, the government thought that its decision to hold public service pay increases to 0 and 3 per cent over the following two years would seem more reasonable in the context of a decline in the rate of inflation to 3 per cent in the near future and then even further over time (Thiessen, 2000–2001).

The inflation reduction targets made concrete the way in which the Bank intended to reduce inflation to lower levels and then move to price stability. A number of technical issues had to be addressed in the context of the introduction of the targets, and they were discussed in some detail in the background

document released at the time of the announcement of the targets (Bank of Canada, 1991b).[7] (i) The measure of inflation that was chosen was the CPI because it is the best-known measure, it is never revised, and it is published monthly. The target was based on the 12-month rate of increase of the CPI. (ii) As a guide to policy, the Bank used a core rate of inflation (initially the CPI excluding food and energy prices and the effects of indirect taxes), which served as a way of seeing through short-term fluctuations in inflation and one-off increases in the price level. (iii) The Bank decided to use ranges around the target rate of inflation. These indicated a region of uncertainty, not a region of indifference. I would note in passing that the ranges were soft-edged, not hard-edged, and that the Bank expected to breach the limits of the range from time to time. (iv) The Bank was also explicit that if it failed to achieve one of the targets, it would aim at achieving the subsequent target (18 months later), but it would not take action to get back to the target overly rapidly. The reason for this more gradual return to target was to avoid unnecessary fluctuations in output and interest rates.

A few comments on the inflation-targeting arrangements. First, what the Bank should have emphasized even more than it did at the time was that the objectives of low inflation and then price stability were a means to an end, the end being a well-functioning economy. Second, it was decided to bring down the rate of inflation gradually. But how gradual should the reduction of inflation be? In hindsight, the authorities were perhaps overly cautious (three years to go from 3 per cent to 2 per cent), but recall that it had been many years since inflation had been that low in Canada, and there were many people in both business and government circles who were sceptical of the Bank's ability to achieve even the initial 3 per cent target. Indeed, when senior Bank officials met the financial community in Toronto on the day after the announcement of the targets, this scepticism was very apparent. The gradualism in bringing down the targets, and the gradualism in returning to the targets if the Bank failed to achieve them, as well as the soft-edged nature of the ranges, were all related to the avoidance of unnecessary and excessive fluctuations in output and interest rates. What the Bank of Canada arrived at by good economic intuition, and some small model simulations, was formalized some years later by Lars Svensson (1997). Svensson specified the loss function to be minimized by the central bank as containing two arguments, the variance of inflation from its target and the variance of output from capacity, and he combined this loss function with an IS curve and an augmented Phillips curve that each had a one-period lag. In fact, without realizing it at the time of the original announcement of the inflation targets in 1991, the Bank's approach to conducting policy on the basis of inflation targets effectively involved minimizing this type of loss function, in the context of an economy where lags play a key role. Incidentally, the rapid growth of the

literature on inflation targeting since about 1995 has been very useful to central banks. In 1991, however, all that the Bank had to go on in developing the approach and writing it up was the Policy Targets Agreement between the Governor of the Reserve Bank of New Zealand and the Minister of Finance of New Zealand (Reserve Bank of New Zealand, 1990, Appendix) when New Zealand introduced inflation targets one year earlier. Third, a crucial element of the targeting process was its forward-looking nature. The Bank was targeting inflation six to eight quarters in the future, not the current inflation rate. Indeed, the insight that the Bank had to target future inflation, not the current level, was central in the development of the inflation-targeting framework. And that insight developed from the experience of the Bank staff with a convention used in the internal economic projections during the 1987–90 period. The convention provided for nominal spending six to eight quarters ahead to be set at a prespecified path, and interest rates and the exchange rate in the projection had to adjust to achieve that path for nominal spending (Duguay and Longworth, 1998).

To date, there have been four agreements between the Government of Canada and the Bank of Canada on inflation targets. In the first (Bank of Canada, 1991a), announced in February 1991, the Bank and the government issued a joint statement setting out a target path for inflation reduction – starting at 3 per cent at the end of 1992, and falling gradually to 2 per cent at the end of 1995, with a range of plus or minus 1 percentage point. The joint announcement stipulated that after 1995 there would be further reductions of inflation until price stability was achieved. As he explained in his recent book (Crow, 2002), in late 1993 then-Governor John Crow withdrew his name from consideration for a second term as Governor because the newly elected government was not prepared to agree to a policy in which there would be a decline in the next inflation targets agreement in the direction of price stability.

In the second agreement (Bank of Canada, 1993–94), announced in December 1993 at the time of the appointment of Gordon Thiessen as the new Governor of the Bank of Canada, the Bank and the newly elected government agreed to extend the 1 per cent to 3 per cent range (which was the target for the end of 1995) for three more years, through to the end of 1998. The decision on the definition of price stability was delayed until 1998 for two reasons: first, Canada had not seen such low rates of inflation for a long time, and it was felt that more experience in operating under such conditions would be helpful before an appropriate longer-term objective was determined; and second, Canadians needed more time to adjust to the improved inflation outlook.

In the third agreement (Bank of Canada, 1998), announced in February 1998, the government and the Bank again extended the 1 per cent to 3 per cent target range, this time to the end of 2001. This extension was intended to

enable the authorities to assess the functioning of the target over a full cycle. By the end of that period, the government and the Bank planned to determine a long-run target consistent with price stability.

The most recent agreement (Bank of Canada, 2001a), announced in May 2001, was for a five-year period ending in 2006. It placed increased emphasis on the midpoint of the target, 2 per cent, within the 1 per cent to 3 per cent target range. The Bank and the government also agreed that, before the end of 2006, they would review the experience over the period and determine the appropriate target for the period ahead. It is also worth noting that the agreement did not characterize the 2 per cent target midpoint as price stability. This is consistent with the notion that 2 per cent inflation is better thought of as a very low rate of inflation, rather than price stability. In the background document that it released upon the renewal of the target (Bank of Canada, 2001b), the Bank changed slightly its methodology for calculating core inflation. It also enhanced its reporting arrangements, noting that if inflation persistently deviated from the target, the Bank would give special attention in its Monetary Policy Reports or Updates to explaining why inflation deviated to such an extent from the target midpoint, what steps (if any) were being taken to ensure that inflation moved back to the midpoint, and when inflation was expected to return to the midpoint.

Inflation targets provide a straightforward framework for dealing with aggregate demand shocks (Freedman, 1996). A positive shock to aggregate demand that pushes the economy into excess demand will put upward pressure on future rates of inflation. In such circumstances, the central bank will raise its policy interest rate. The higher policy rate, especially if it is expected to persist for some time, will lead to higher interest rates further out the yield curve and to an appreciation of the exchange rate. In turn, this will lead to an easing of demand pressures and, hence, of inflation pressure. Conversely, a negative demand shock will lead to excess supply and future downward pressure on inflation. In this case, the central bank response will be to reduce the policy rate. The associated reduction in other interest rates and the consequent depreciation of the exchange rate will stimulate the economy and, hence, lessen the downward pressure on inflation. The inflation-targeting framework thus allows for ‘quasi-automatic’ stabilization in response to demand shocks, and operates in a symmetrical fashion (Thiessen, 1998–99; Dodge, 2001).

While central bank actions in response to demand shocks cause both output and inflation to move in the appropriate direction, supply shocks and price shocks pose a more difficult challenge. If the target was not yet fully credible, a sales tax increase or an exchange rate depreciation might require a period of slack in the economy to offset its effects on inflation. And a major oil price shock might by itself lead to both upward inflation pressure and

downward effects on output (that is, stagflation). In such situations, achieving an inflation target might necessitate a rise in interest rates and result in a period in which inflation is above target (although moving back towards target) and output is below capacity.

In the event, inflation targets have turned out to be helpful in dealing with supply shocks (Thiessen, 1998–99). Indeed, there may be circumstances in which the central bank can cope with an unfavourable price shock without having to raise interest rates. If the target is credible, with expected inflation well anchored by the target, and if the central bank has gained widespread understanding and acceptance by the public of its position that it is willing to accommodate the first-round price-level effects of a price shock but not second-round or ongoing effects on inflation, there would be a possibility of absorbing a price shock without output having to move below capacity and, therefore, without interest rates having to rise. Even in the absence of such ideal circumstances, the central bank can lessen the need for higher interest rates and lower output if, by its words and actions, it can minimize the response of the public to the initial price shock.

Two operational elements can potentially help the central bank deal with such price shocks – a core definition of inflation and the use of 'caveats'. As noted earlier, the Bank of Canada has used core inflation as an operational guide to policy, where core inflation excludes the effects of certain kinds of price shocks. This has served as a way of minimizing the effects of such shocks on expectations of future inflation and, hence, on the underlying trend rate of inflation. Empirically, core inflation has been a better predictor of future total CPI inflation than current total CPI inflation (Macklem, 2001). Another way of trying to avoid the deleterious effects of price shocks involves specifying in advance that the authorities will not react to certain kinds of shocks, provided that they affect only the price level and not the momentum of inflation (Reserve Bank of New Zealand, 2002, Appendix 6). While this type of caveat can serve as an alternative to having a core measure of inflation that excludes such shocks and that is used as an operational guide for policy, it can also complement such an operational guide.

The focus on inflation control as the key element of policymaking can also be very helpful to the central bank in dealing with productivity shocks. If there is considerable uncertainty regarding the capacity of the economy to produce goods and services, the behaviour of inflation relative to forecast can be useful in determining whether there has been a productivity shock. Thus, if the rate of inflation persistently turns out to be lower than projected, after allowing for any special factors impinging on inflation, it would indicate that the capacity of the economy is probably greater than estimated by conventional techniques. And, conversely, if inflation persistently turned out to be higher than projected, capacity is probably lower than estimated by

conventional techniques (Thiessen, 1997). Of course, the central bank would also track other leading indicators of capacity and inflation pressures in trying to draw inferences about the level of productive capacity.[8] But actual inflation outcomes relative to projected outcomes would be a key measure in interpreting the changing environment. That said, to the extent that inflation expectations are better anchored and that the short-run effect of the output gap on inflation is lower, it becomes more difficult to use differences of inflation rates from their projected outcomes to draw inferences about the level of the output gap and the level of capacity output.

The Taylor rule, which sets the policy rate of interest as a function of the difference between the current rate of inflation and the target rate of inflation, the current output gap and the equilibrium real interest rate, can be thought of as a way of achieving an inflation target over time (Taylor, 1993, 1999). Perhaps because of its simplicity, this *ad hoc* rule performs reasonably well across a variety of models, while the optimal reaction functions derived in the context of a single model tend not to do well in other models. Given the uncertainty about which model best represents the economy, robustness across models has much to recommend it. That said, empirical research at the Bank of Canada on Taylor rules has not yet found a version that performs particularly well for Canada (Côté et al., 2002), perhaps because of the openness of the Canadian economy. And adding the exchange rate to a simple Taylor-type rule leads to a deterioration in the results.[9]

In practice, the Taylor rule is frequently used by central banks as a cross-check on the more complex reaction functions incorporated in their models. These reaction functions typically focus on the difference between the projected rate of inflation and its target at a horizon of about two years. And while the arguments entering into the Taylor rule, namely the current inflation gap and the current output gap, may be thought of as a predictor of future inflation, in practice central banks use other information, both statistical and anecdotal, as well as judgment, to develop their best possible forecast of future inflation.

A key lesson to be drawn from the work on reaction functions, including the Taylor rule, is the importance of responding strongly to deviations of inflation from target. More specifically, as inflation rises above the target, it is essential that the authorities act to increase the real rate of interest, not just the nominal rate of interest. Similarly, real rates must decline when inflation moves below the target. For demand shocks, such a response will stabilize both output (relative to potential) and inflation (relative to target).

While there is no logically necessary connection between inflation targeting and transparency, it is the case that the countries that have adopted inflation targeting have all increased significantly the transparency of their policymaking. There are two factors behind this development (Jenkins, 2001).

The first is the view that monetary policy is more effective if it is more transparent. The second is the demand for greater accountability as central banks have been given increased independence to carry out their monetary policy responsibilities.[10]

In Canada, over the decade of the 1990s, the Bank made a significant number of changes that enhanced transparency (Freedman, 2002). These included: (i) the announcement of the inflation target; (ii) detailed explanations of its views on the transmission mechanism; (iii) periodic detailed discussions of its views on the economic outlook and inflation, in the Monetary Policy Reports (MPRs) released semi-annually since 1995 and in the Updates released semi-annually since 2000; (iv) the setting in 1994 of an operational target band of 50 basis points for the overnight rate of interest, followed in early 1996 by the issue of a press release (with explanations) when there was a change in the band and then by the linking of the Bank Rate charged by the Bank of Canada on loans to financial institutions to the top of the band, and in 1999 by the setting of the target overnight rate as the midpoint of the band; (v) the move to fixed announcement dates in late 2000, with a press release on each date regardless of whether or not there was a change in the policy rate; and (vi) on the communications front, more frequent speeches by the Governor and Deputy Governors, regular press conferences and appearances before the House of Commons Standing Committee on Finance and the Senate Standing Committee on Banking, Trade, and Commerce following publication of the MPR, and lock-up arrangements for the media with background briefings by senior officials before the release of the MPR.

Let me expand a little on the move to fixed announcement dates or FADs (Bank of Canada, 2000). The idea was under study for quite some time before the decision was made to go ahead. Different disadvantages of the system in place and of the benefits of moving to FADs were prominent at different times in the discussions. Under the pre-FAD system, the policy rate could be changed at 9:00 a.m. on any business day. At times when the Fed had changed or was expected to change the target federal funds rate, the market for overnight funds in Canada froze around the 9:00 a.m. announcement time while the market waited to see if the Bank would or would not make a change in its policy rate. At other times, there was the awkwardness of wanting to reduce the policy interest rate in circumstances when the Canadian dollar was weak, relating to the concern that exchange markets might overreact. In addition, the advantage of having more regular opportunities to comment on ongoing economic and inflation developments and placing them in a medium-term context was seen as an important potential benefit of the FAD arrangements. But the most important factor in leading the Bank to introduce FADs was the tendency through much of 2000 for the press and market

commentators to focus their attention on whether the Bank would follow the Federal Reserve when it changed or did not change the federal funds rate, while largely ignoring the Canadian economic and inflation context in which the Bank makes its decisions.

At the time of the introduction of the FADs, a concern was expressed that in circumstances where the Canadian decision date lagged the US date by a few weeks, financial markets could become excessively volatile. The staff examination of the experience of the UK, Switzerland, Sweden, and the Czech Republic indicated that their markets were not overly volatile in cases where their decision dates lagged those of the European Central Bank (ECB). Moreover, as long as the financial markets understood the framework underlying its actions, the Bank did not think that there would be any significant problems of this sort. And indeed, the movement to FADs has turned out to be very positive, with the attention of media and market commentators now fully focused on the monetary policy actions that are appropriate to the Canadian circumstances.

The Canadian experience with inflation targets has been very successful.[11] The rate of inflation has come down (from relatively high levels) and has remained low, and it has also been less volatile. Movements of inflation have been less persistent, as evidenced by the fact that the autocorrelation coefficient of inflation over the 18- to 24-month period has been much lower. Also, the passthrough from exchange rate movements to the rate of inflation has been much lower over the targeting period than in previous decades. The volatility of output over the 1990s has also been appreciably lower than in previous decades, although there remains considerable debate in the literature as to why this is so.[12] And many of the other benefits anticipated from low inflation, such as low and less variable interest rates, longer terms of wage settlements, fewer cost-of-living adjustment (COLA) clauses, a reduction in the number of working days lost to strikes, a lengthening in the term of financial contracts, and well-anchored inflation expectations, have also been realized.

A large number of countries, both industrialized and developing, now use inflation targets as the basis of their monetary policy framework, and the results to date have been very favourable. Indeed, the only benefit that might have been expected from inflation targeting that was not achieved was a reduction in the sacrifice ratio during the period of disinflation.[13]

But there are some interesting areas currently receiving attention by researchers that could provide challenges to monetary policy going forward. Stock market bubbles, and subsequent reversals, which were seen in the USA in the 1920s, in Japan in the late 1980s and early 1990s, and in the USA and elsewhere more recently, took place in an environment of low rates of inflation of the prices of goods and services. Indeed, it can be argued that low CPI inflation played a role in asset-price inflation by keeping the interest rates on

safe assets low and hence inducing investors to search for yield in riskier assets. And some economists have argued that monetary policy should respond to asset-price movements and other financial imbalances over and above their effects on demand and inflation pressures (for example, Cecchetti et al., 2000; Bordo and Jeanne, 2002). But, at least until the present, it has proved very difficult to find a way of operationalizing these policy proposals in a way that is persuasive to most monetary policymakers.

Another area receiving considerable scrutiny is the possibility that the zero lower bound on interest rates could result in certain cases in a Japan-style outcome (Fuhrer and Sniderman, 2000; Ahearne et al., 2002). The debate here relates to whether the central bank loses its ability to affect the economy in such circumstances, or whether the problem is that the Bank of Japan has been unwilling to take appropriate action, and/or whether the problem is a result of the weakness of the Japanese financial system.

Looking ahead a few years, I can see further debate in Canada and elsewhere about whether to remain at the very low rate of inflation that has been achieved or to go further to price stability (probably just below 1 per cent, given the bias in the CPI measure). This debate will likely focus on the perceived benefits of reducing the target rate of inflation relative to the possible costs of so doing. Among the latter would be the zero lower bound for interest rates, the implications of being in a deflationary environment at times, and the degree of downward rigidity of prices and wages in the economy as well as the implications of any such rigidity.[14]

There may be greater interest in price-level targeting (either with an unchanged target or with one that increases at a fixed pre-announced rate each year) as opposed to inflation targeting (Duguay, 1994; Svensson, 1999). A recent development in the theoretical literature that is noteworthy in this context is the analysis of the possible improvement in performance that might result from introducing an element of price-level targeting (with or without trend growth) into the policy framework and adding a term for the price-level target to the reaction function. Initial results indicate that having a small weight on a price-level term (in a reaction function that contains inflation gap and possibly output gap terms) could lead to the achievement of a better trade-off among the variability of inflation, output, and interest rates – provided that the price-level target carried some credibility and that expectations were at least partly forward-looking (Black et al., 1998).

6. CONCLUDING REMARKS

At the beginning of this chapter I noted that basing monetary policy on a nominal anchor was seen as a way of avoiding systematic policy errors. And

one conclusion that I would draw from the history of the last 30 years is that inflation targeting has by and large been successful in so doing while the targeting of monetary aggregates was not. But some of the same challenges that faced policymakers in the 1970s are still with us. Perhaps most important, shifts in the level and growth of capacity continue to be hard to identify at the time that they are occurring, and this increases the difficulty of conducting a monetary policy that by its nature must be forward-looking. That said, the increased focus on inflation outcomes, and on a sufficiently aggressive response by central banks to inflationary or deflationary situations that are developing, should assist policymakers in avoiding cumulative policy errors in both directions.

NOTES

1. Scholar in Residence, Economics Department, Carleton University, Ottawa, Canada. The author was an official of the Bank of Canada for 30 years until his retirement in September 2003, serving as Deputy Governor for the last 15 years of his career at the Bank.
2. As a result, the approach was criticized in Bernanke and Mishkin (1992).
3. The interest rate track was also a function of the assumed path for the runoff of the error term in the M1 demand equation.
4. For a more detailed discussion of this period, see Thiessen (2000–2001).
5. M1 is equal to the sum of currency and net demand deposits. M1A includes, in addition, daily interest chequable savings deposits and non-personal notice deposits.
6. Recall that there was no monetary aggregate stable enough to serve as the anchor for monetary policy and that Canada was committed to a flexible exchange rate regime. Hence the alternatives of a monetary aggregate target or a fixed exchange rate as anchors for policy were not available to the Canadian authorities.
7. For more detail, see Freedman (1995).
8. The Bank of Canada publishes a variety of such indicators on its web site two days after announcing its interest rate decision.
9. As Côté et al. (2002, p. 23) point out, 'Adding the exchange rate to a simple Taylor-type rule leads to a deterioration in the loss-function value in most models, mainly because the exchange rate is a built-in stabilizer in those models and helps the economy return to equilibrium after a shock. As a result, any attempt by the monetary authority to smooth fluctuations in the exchange rate interferes with that adjustment process.'
10. See Thornton (2002) and Arestis and Chortareas (2003).
11. The statements in this paragraph regarding the Canadian experience over the last decade are based largely on Longworth (2002).
12. See Stock and Watson (2003) for an extensive discussion of this issue.
13. Ball and Sheridan (2003) come to a different conclusion regarding the success of the inflation-targeting framework internationally. They argue that the inflation-targeting countries have not achieved a better rate of inflation than those countries that do not use such a framework. But they give insufficient weight to the fact that the countries that adopted inflation targeting did so because of their difficulty in achieving a satisfactory rate of inflation and that their recent inflation experience might not have been as good as that of traditionally low-inflation countries if they had not adopted inflation targeting. That is, countries like New Zealand and the UK adopted inflation targeting precisely because their inflation experience had been consistently and persistently worse than that of countries like Germany and Japan, and the regression to the mean that Ball and Sheridan emphasize did not seem to apply to them.

14. See the discussion of these issues in Bank of Canada (2001b) and the references cited therein.

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12. The determinants of saving in developing countries, and the impact of financial liberalization

A.P. Thirlwall

A RETROSPECTIVE INTRODUCTION

I have had a long-standing interest in the determinants of savings behaviour in developing countries, particularly in the question of whether inflation is detrimental to saving and growth. I began research on the topic of inflation and growth in the late 1960s/early 1970s when I first started teaching development economics, and looked at some of the data on monetary aggregates and inflation for developing countries in the 1950s and 1960s. Contrary to the popular impression that inflation was endemic in developing economies, I concluded that many countries (particularly in Africa and Asia) were probably too financially conservative. There was hardly any monetary expansion, or rise in the price level, at all in these countries (outside of Latin America), and yet we know that some inflation is to be expected in the process of structural change, and that a limited degree of demand inflation can be beneficial for growth by stimulating investment. Demand inflation raises entrepreneurs' prospective yields, and reduces the real rate of interest, at least in the short run. As Arthur Lewis (1955) once said, 'inflation which is due to the creation of money for the purpose of accelerating capital formation results in accelerated capital formation', or as Keynes (1931) put it, 'it is worse in an impoverished world to provoke unemployment than to disappoint the rentier'.

Taking a sample of 52 developed and developing countries over the period 1958–67, two major conclusions were apparent concerning the cross-section relation between inflation and growth (see Thirlwall and Barton, 1971). The first was that there was no significant bivariate relationship between the two variables taking the sample as a whole, or for the sample of developing countries, but there was a significant positive relation between inflation and growth in the high-income developed countries with inflation rates of less than 10 per cent per annum. The relation is shown in Figure 12.1. The second

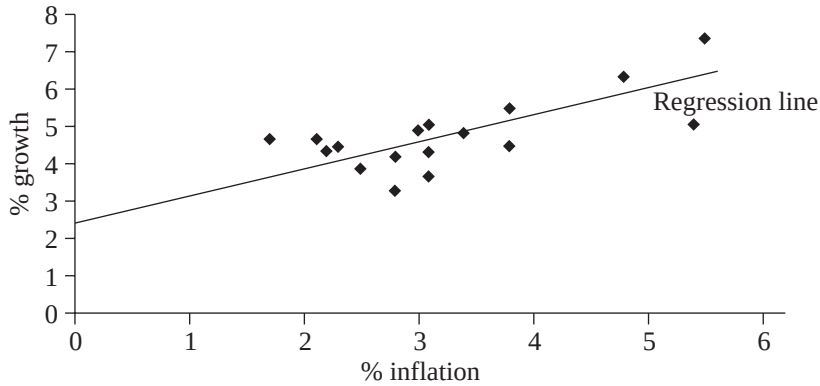


Figure 12.1 Inflation and growth in countries with per capita incomes > $800 p.a. (at 1960s prices)

major finding was that there was a definite negative relation between inflation and growth taking countries with inflation rates in excess of 10 per cent per annum.

This initial work was followed up by a book in 1974 entitled *Inflation, Saving and Growth in Developing Economies* which expanded the sample of countries to 61, and which examined not only the relation between inflation and growth across countries in a more complex model, but also the relation between inflation and saving, inflation and investment, and inflation and the balance of payments using multivariate analysis to control for other variables. What I found with respect to inflation and the domestic savings ratio of countries, and with respect to inflation and growth, was a quadratic relation with the savings ratio and the growth rate of countries first rising with the rate of inflation and then falling, with the savings ratio and output growth maximized at between 5 and 8 per cent inflation, as depicted in Figure 12.2.

This is exactly what has been found in more recent studies by Bruno and Easterly (1996) at the World Bank, and by Sarel (1996) and Ghosh and Phillips (1998) at the IMF. Bruno and Easterly take pooled annual observations for 127 countries over the years 1960–92, giving the pattern depicted in Figure 12.3. Inflation and per capita output growth are positively related up to 5 per cent inflation, and then 'diminishing returns' to inflation set in. Inflation and growth are strongly negatively correlated once inflation rises above 30 per cent.

Sarel takes 87 countries over the period 1970–90 and divides the observations into 12 inflation groupings using the inflation rate of Group 6 as the standard of reference. He then estimates the effect that differential inflation

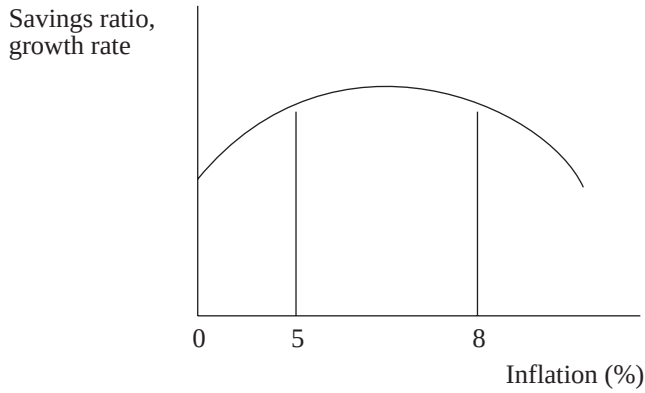
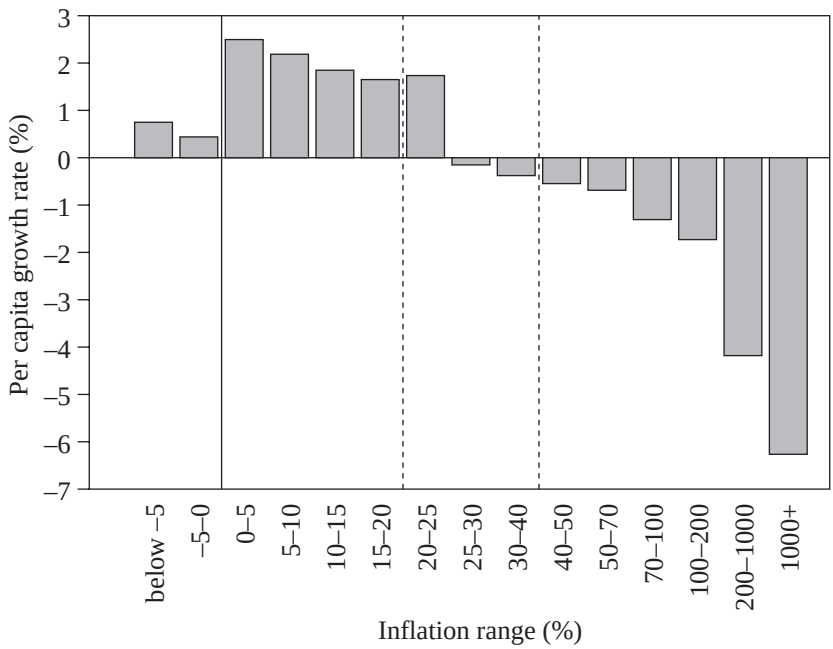
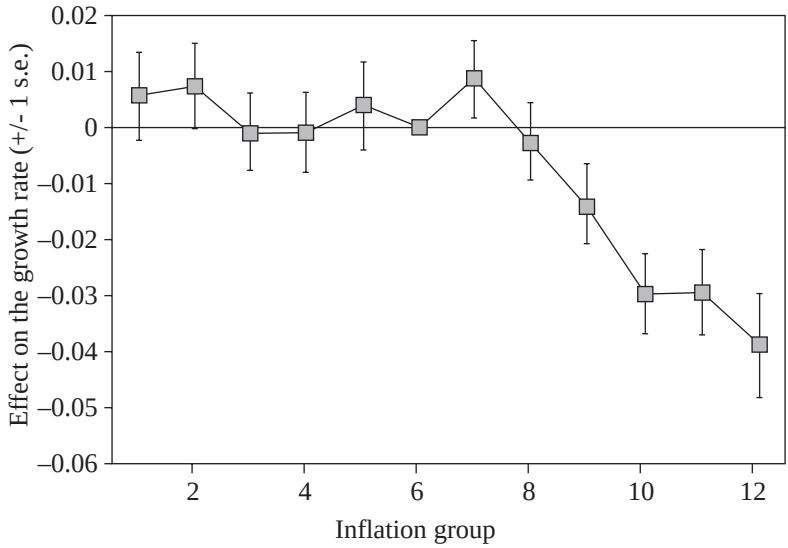


Figure 12.2 The relation between inflation, the savings ratio and growth



Source: Bruno and Easterly (1998).

Figure 12.3 Inflation and per capita growth, 1960–92



Source: Sarel (1996).

Figure 12.4 Effect of inflation on growth (compared with Group 6)

has on the growth of output in the other groups. The results are shown in Figure 12.4. It can be seen that inflation has a generally positive effect on growth up to Group 7, with inflation averaging 8 per cent per annum. Thereafter, inflation and growth are negatively related.

Ghosh and Phillips show that growth of GDP is highest in the range 3–5 per cent inflation for developed countries, and in the range 5–10 per cent for developing countries (no doubt reflecting greater structural inflation).

It is not surprising from this evidence that Levine and Zervos (1993) concluded from their survey of the empirical literature based on 'new' growth theory that

> given the uncharacteristically unified view among economists and policy analysts that countries with high inflation rates should adopt policies to lower inflation in order to promote economic prosperity, the *inability* to find simple cross-country regressions supporting this contention is both surprising and troubling.

Indeed, we can be more categoric and say that there is no scientific evidence to suggest that a necessary condition for the faster growth of countries is that inflation should be as low as possible. The evidence suggests that mild inflation, up to 5–8 per cent, can be positively beneficial for growth. After

that, the effects of inflation can be seriously damaging. The damaging economic effects that ultra-conservative inflation targeting can have are most clearly seen in the EU today. The European Central Bank policy of attempting to keep inflation below 2 per cent per annum is doing enormous harm to the growth of output and employment in Europe, yet the target of price stability has no scientific basis to support it.

THEORIES OF SAVING

In the study of inflation, saving and growth in developing countries, I also looked at traditional theories of the determination of the savings ratio, and revisited this topic in a recent paper with Khaled Hussein (Hussein and Thirlwall, 1999). In the former study, I was particularly interested in the explanatory power of the Keynesian absolute income hypothesis, and the life-cycle hypothesis of saving. In the latter study, Hussein and I also examine explicitly the impact of financial liberalization on saving, controlling for the level of per capita income, the growth of income and other variables.

The Absolute Income, and Life-Cycle, Hypothesis of Saving

Keynes's absolute income hypothesis of saving predicts a non-linear relation between a country's savings ratio (S/Y) and level of per capita income (Y/P) which can be derived as follows:

Let savings per head (S/P) be a linear function of income per head, so that:

$$S/P = -a_1 + b_1(Y/P) \tag{12.1}$$

Now, multiply both sides of equation (12.1) by P, and divide by Y, giving:

$$S/Y = b_1 - a_1(Y/P)^{-1} \tag{12.2}$$

As income per head rises, the savings ratio rises, but at a decreasing rate, to the asymptote, b_1, as depicted in Figure 12.5. This non-linear relation is what we observe in the real world. Poor countries save relatively little of their national income, but as countries get richer the savings ratio rises, but at a diminishing rate.

When I originally fitted this curve across 61 countries for the period 1958–68 (Thirlwall, 1974), the equation estimated was (t-statistics in parentheses):

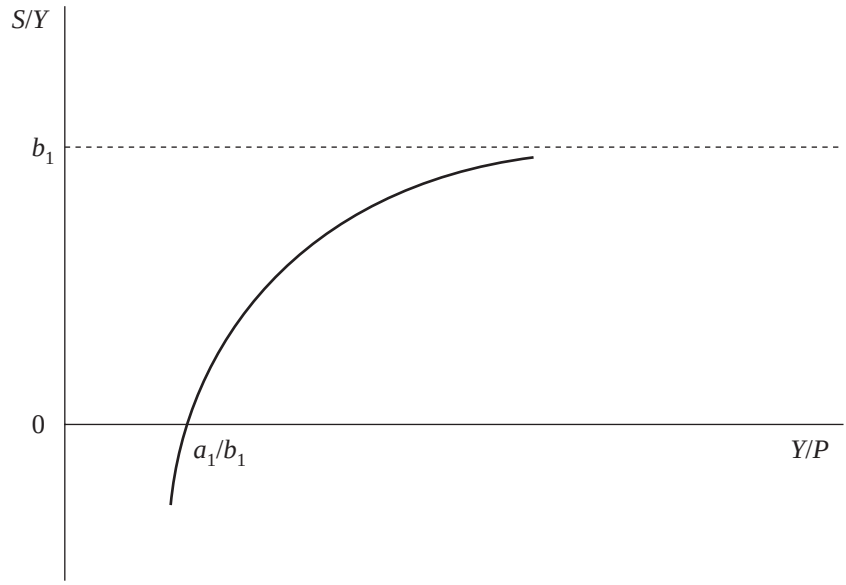


Figure 12.5 The relation between the savings ratio and per capita income

$$S/Y = 20.85 - 993\ (Y/P)^{-1} \qquad r^2 = 0.402 \qquad (12.3)$$
$$(6.4)$$

Fitting this curve to 62 (different) countries over the period 1967–95 (Hussein and Thirlwall, 1999) gave:

$$S/Y = 23.97 - 3665\ (Y/P)^{-1} \qquad r^2 = 0.400 \qquad (12.4)$$
$$(6.3)$$

The similarity of results is quite remarkable. In both samples of countries, 40 per cent of the variance in the savings ratio across countries is accounted for by differences in the level of per capita income, and the *t*-value on the regression coefficient is virtually the same. The only difference between the two equations is the slightly higher asymptote for the later period: 23.97 per cent savings ratio compared to 20.65 for the earlier period.

There are some other recent studies that look at the power of the Keynes absolute income hypothesis to explain differences in the savings ratio across countries. Masson et al. (1998) at the World Bank take a panel of 61 countries over the period 1971–93, using the private savings ratio as the dependent variable. They recognize the non-linearity of the per capita income variable

by using a quadratic specification and find a positive sign on (Y/P) and a negative sign on $(Y/P)^2$.

Edwards (1996), however, in his panel of 36 countries over the period 1970–92, dismisses the level of per capita income as an important determinant of inter-country differences in the savings ratio because he makes the mistake of entering the per capita variable linearly instead of non-linearly.

As far as the life cycle hypothesis of saving is concerned, virtually all empirical studies support it, either taking the growth of total income as the independent variable, or taking the growth of per capita income and the growth of population (or, instead, the dependency ratio) separately. (See some empirical results later from Hussein and Thirlwall, 1999.)

FINANCIAL LIBERALIZATION

The question remains, how much of the variance in savings performance between developing countries can be explained by various indicators of financial liberalization; for example, by differences in the real rate of interest on financial assets, or by differences in the degree of financial deepening. The theory of financial liberalization (McKinnon, 1973; Shaw, 1973) is based on the premise that the higher the real rate of interest, and the greater the degree of financial deepening, the more saving there will be, and financial saving will be allocated and invested more efficiently than if saving is invested directly in the sector in which it takes place, without financial intermediation.

To test the financial liberalization hypothesis, it is possible to take time series for individual countries that have financially liberalized, a cross-section of countries, or a panel of countries (with random or fixed effects). There are two main issues to focus on: first, do real interest rates significantly affect how much countries save, and second, which form of financial deepening seems to be most important? Is it the number of financial institutions relative to the size of the population; is it the volume of financial assets relative to the size of the economy; is it the extent of bank lending to the private sector, or what?

Interest Rates

Most of the studies that examine the effect of financial liberalization on saving in developing countries find an insignificant negative relation between real interest rates and total saving. Giovannini (1983) concludes that the results from his research on eight Asian countries ‘cast serious doubts on the view that the interest elasticity of saving is significantly positive and easy to detect in developing countries’. Gupta (1987) concludes from his analysis of

22 Asian and Latin American countries over the period 1967–76 that 'there is little support for the repressionist hypothesis that the positive substitution effect of real interest rates on savings dominates the negative income effect'. Cho and Khatkhate (1990) of the World Bank, in a study of the financial liberalization experience of five Asian countries, conclude that

> financial reform, whether comprehensive and sweeping, or measured and gradual, does not seem to have made any significant difference to the saving and investment activities in the liberalised countries. It was believed until recently that removal of the repressionist policies would boost saving – [but our survey] lends support to the conclusion that decisions to save are determined by several factors and the relationship between saving and real interest rates is at best ambiguous.

Maxwell Fry (1995), a leading advocate of financial liberalization, has conceded that 'what is agreed – is that if an effect [on saving] exists at all, it is relatively small', and that 'positive effects are easier to find in Asia than in other parts of the world, but even in Asia the effects appear to have diminished over the past two decades'.

Hussein and Thirlwall (1999) consider separately the effect of the real interest rate and various financial variables in a panel of 22 countries over a period of 18 years, giving 396 observations, and compare the significance of the (classical) real interest rate hypothesis with the Keynesian absolute income hypothesis of saving. When the interest rate variable is considered by itself, the coefficient is positive but insignificant in the cross-section, and significantly negative in the panel. When the interest rate is combined with the level of per capita income, the sign is consistently negative. The results are reported in Table 12.1. The same result is obtained when other control variables are added to the equations (*t*-statistics are in parentheses).

At least three possible explanations for the negative or insignificant relation between the savings ratio and interest rates suggest themselves. The first is the theoretical possibility that the positive income effect outweighs the negative substitution effect. The second is that there is a substitution between financial and real assets, leaving total saving unchanged. The third possibility is that higher real interest rates are associated with a higher ratio of foreign capital inflows to GDP, which in accounting terms shows up as a lower domestic savings ratio if part of the capital inflows is consumed. Whatever the explanation, our study confirms the results of other studies that there is no robust evidence that higher real interest rates raise the domestic saving ratio of countries.

This finding only undermines one aspect of the financial liberalization argument, however. There is still the issue of financial deepening. In this respect, it is also important to distinguish between financial saving and total saving because even if total saving does not increase as interest rates are

Table 12.1 The effect of the real interest rate on the savings ratio in a panel of 22 countries

Cross-section

$S/Y = 19.1 + 0.15\ (r)$ $r^2 = 0.01$
(7.2) (0.58)

$S/Y = 27.48 - 5257\ (Y/P)^{-1} - 0.29\ (r)$ $r^2 = 0.12$
(9.0) (3.7) (1.1)

Panel with fixed effects

$S/Y = 20.50 - 0.13\ (r)$ $r^2 = 0.83$
(78.2) (5.1)

$S/Y = 25.59 - 4311\ (Y/P)^{-1} - 0.13\ (r)$ $r^2 = 0.84$
(17.8) (3.6) (5.1)

Source: Hussein and Thirlwall (1999).

liberalized, saving in financial form may increase which may be allocated more productively through financial intermediaries.

In a case study of financial liberalization in Mexico, a research student and I (Warman and Thirlwall, 1994) made this distinction and found that while total saving is insensitive to changes in the rate of interest, financial saving is responsive. (On the other hand, the net effect of a rise in interest rates was to reduce investment.) Any effect of interest rate liberalization on growth, therefore, must come from a higher productivity of capital. In Mexico, we found no relation between interest rates and growth, controlling for other independent variables. In general, evidence that the productivity of capital is higher in countries where the real interest rate is higher is hard to come by. Fry (1997) has examined the relationship between real interest rates and the growth of GDP across countries in search of the 'optimal' rate of interest. The relationship turns out to be quadratic, with the growth of countries peaking at a zero real rate of interest. Countries with negative real rates of interest grow more slowly, and so do countries with real interest rates in the positive quadrant.

FINANCIAL DEEPENING

There are several variables that it is possible to take to test the hypothesis that the savings ratio of countries depends on their degree of financial sophistication. Hussein and Thirlwall (1999) explore the role of four variables: (i) money and quasi-money as a percentage of GDP; (ii) domestic credit provided by the banking system as a percentage of GDP; (iii) the growth of money and quasi-money, and (iv) quasi-liquid liabilities as a percentage of GDP. We take 62 countries and 1798 panel observations. The first three financial-deepening variables all give either insignificant or fragile results (that is, they lose their statistical significance when other independent variables are added to the regression equations). The quasi-liquid liabilities variable (QLL), however, gives strong and robust results. This is not a spurious relation arising from the fact that a proportion of saving takes place in financial form, since the volume of quasi-liquid liabilities is measured as a stock, while saving is a flow. The formal definition of quasi-liquid liabilities from the World Bank Development Indicators is: 'time and savings deposits, foreign currency transferable deposits, certificates of deposit and securities repurchase arrangements, travellers cheques, foreign currency time deposits, commercial paper and shares of mutual funds or market funds held by residents'.

Both in the cross-section of 62 countries and in the panel estimates, there is a strong positive relation between the savings ratio and the QLL ratio. The QLL variable stays robust when per capita income, the growth of income, the growth of per capita income, and population growth are added as independent variables. The results are reported in Table 12.2.

All the results show that a 1 percentage point difference in the QLL ratio is associated with a difference in the savings ratio of countries of between 0.1 and 0.2 percentage points.

The last equation in Table 12.2 also includes inflation (π) as an independent variable entered as a quadratic, so this chapter of reminiscences and reflections spanning 30 years has turned full circle. The conclusion from the empirics here, however, is not the same as before because using the coefficients in the last equation, and solving for the rate of inflation that maximizes the savings ratio, gives an 'optimum' inflation rate of close to zero! The European Central Bank might like this result, but my intuition, as well as other evidence, still tells me that price stability is likely to be costly in terms of saving, investment and growth.

Table 12.2 The impact of financial deepening on the savings ratio

Cross-section:

$S/Y = 13.33 + 0.24\ (QLL)$
(9.9) (4.9)
$R^2 = 0.29^*$ Obs = 62

$S/Y = 19.85 - 2861.70\ (Y/P)^{-1} + 0.14\ (QLL)$
(11.1) (4.8) (3.1)
$R^2 = 0.48^*$ Obs = 62

$S/Y = 16.20 - 2740.24\ (Y/P)^{-1} + 0.11\ (QLL) + 1.14\ (G)$
(7.1) (4.7) (2.4) (2.4)
$R^2 = 0.53^*$ Obs = 62

$S/Y = 10.25 - 2982.3\ (Y/P)^{-1} + 0.17\ (QLL) + 0.90\ (GPCY) + 3.48\ (POPG)$
(3.1) (5.1) (3.1) (1.8) (3.1)
$R^2 = 0.57^*$ Obs = 62

Panel with fixed effects:

$S/Y = 17.52 + 0.18\ (QLL)$
(97.6) (4.1)
$R^2 = 0.66^*$ Obs = 1798

$S/Y = 27.31 - 5848.73\ (Y/P)^{-1} + 0.14\ (QLL)$
(40.3) (14.9) (3.3)
$R^2 = 0.70^*$ Obs = 1798

$S/Y = 25.49 - 5261.36\ (Y/P)^{-1} + 0.15\ (QLL) + 0.23\ (G)$
(35.9) (13.4) (3.5) (7.5)
$R^2 = 0.71^*$ Obs = 1798

$S/Y = 22.42 - 5019.1\ (Y/P)^{-1} + 0.23\ (QLL) + 0.20\ (GPCY) + 1.03\ (POPG)$
(24.9) (12.5) (4.0) (6.2) (5.7)
$R^2 = 0.72^*$ Obs = 1736

$S/Y = 23.68 - 6397.3\ (Y/P)^{-1} + 0.15\ (\pi) - 0.54\ (\pi^2) + 0.22\ (GPCY) + 1.34\ (POPG)$
(20.3) (12.7) (4.1) (3.7) (6.6) (5.8)
$+0.43\ (QLL)$
(2.4)
$R^2 = 0.75^*$ Obs = 1540

Source: Hussein and Thirlwall (1999).

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13. Monetary models and inflation targeting in emerging market economies

Valpy FitzGerald

1. INTRODUCTION

As Mankiw (2003) points out in a recent survey of monetary economics, while traditional approaches to monetary policy relied upon transmission to lower inflation through output (and employment) depression via the Phillips curve, this tradeoff seems to have been overcome in advanced economies through labour market reform, which has allowed low inflation and low inflation to co-exist.[1] Modern scholars now reach a similar conclusion by a different route – that of independent and unpredictable monetary shocks. In a sense, the modern approach to monetary economics in emerging market economies is similar, although the shocks in question are those of international financial markets on the open developing economy: the exchange rate is thus far more important than textbook monetary theory[2] would allow. Moreover, the Phillips curve had never been a convincing model of inflation in developing economies due to the extent of disguised unemployment. None the less, the International Monetary Fund (IMF) strongly holds the view[3] that central bank monetary discretion is inherently inflationary,[4] and thus makes binding monetary rules a condition for official financial assistance to emerging market governments.

The 'new monetary policy' (NMP) is understood to include: a numerical and official inflation target; monetary policy exercised through interest rates; an independent central bank; and no other objectives of monetary policy (Arestis and Sawyer, 2003). The monetary policy rule that generates interest rate responses to inflationary shocks replaces, in effect, the traditional LM curve, while the inter-temporal adjustment of expenditure by representative agents replaces the traditional IS curve. A key feature of the NMP is the reliance on central bank credibility to elicit the required private sector response to official policy. The critique suggests that a nominal anchor will not stabilize output due to the asymmetric effects of interest rates (which act on

asset stocks rather than expenditure flows) and that an active fiscal policy should be combined with an active monetary policy, rather than relying upon a single rule-bound instrument. Further, transparency may not have the strong effect on expectations that the NMP assumes it does, while the cost side of inflation is ignored. Above all, the 'credit channel' for monetary transmission should be explicitly considered in any monetary policy model.

This chapter extends and modifies this critique with reference to stabilization policy in small open economies in general and emerging markets in particular. In section 2, I set out the IMF's 'basic monetary programming framework' – still applied to the low-income developing economies without capital markets (Baqir et al., 2003) – which uses government borrowing and the exchange rate as policy instruments in order to achieve inflation and balance-of-payments targets. This is done following IMF (1987), which then provides the underlying framework I use in the rest of this chapter. I then adapt this standard model in order to include short-term capital flows and the floating exchange rate arising from financial liberalization. In this way, the macroeconomic consequences of the current IMF focus on inflation targeting (see Mason et al., 1997) and the use of a single monetary policy instrument (the interest rate, combined with rigid fiscal and reserve 'rules') in emerging market economies can be demonstrated.

I then encompass the structuralist critique – particularly from Latin America – of the negative effect of inflation targeting on capacity utilization and trade competitiveness in general, and the need for counter-cyclical monetary policy in response to external shocks in particular in section 3. An alternative 'structuralist' model can be constructed in this way within a similar macroeconomic framework in order to permit a rigorous comparison with IMF inflation targeting. Thus I show that a macroeconomic stabilization policy based on real exchange rate targeting, bank credit regulation and an active fiscal stance is more effective in supporting growth and investment than either of the IMF models. Section 4 concludes by suggesting that the emerging market critique of inflation targeting is very different from that for industrialized economies, principally because the balance of payments replaces the NAIRU (non-accelerating inflation rate of unemployment) as the principal macroeconomic constraint.

2. THE TWO IMF MODELS OF MONETARY POLICY: MACROECONOMIC STABILIZATION AND INFLATION TARGETING

2.1 Inflation Targeting in the Canonical IMF Model

The canonical IMF monetary model, derived from an explicitly Keynesian 'adsorption approach' pioneered by Polak (1957)[5] and closely related to the 'monetary approach to the balance of payments', has the following form (IMF, 1987). This is known as the 'Basic Monetary Programming Framework' and has been used since the 1970s (when the IMF began to work systematically with developing countries), and is still used widely by IMF missions, although largely for the poorer countries without a domestic capital market or integration to world financial markets (Agénor, 2000; Agénor and Montiel, 1999 – especially ch. 13).

This model (following IMF, 1987) is constructed as follows, with four endogenous variables, two targets (reserves – reflecting balance of payments solvency – and inflation) and two policy instruments: the nominal exchange rate and the PSBR (public sector borrowing requirement). Note that output in real terms (Q) is assumed fixed in the short run, along with exports (X), and that the exchange rate (E) is set and maintained by the central bank.

Exogenous variables: real GDP (Q), exports (X), foreign liabilities (F), initial price level (P_{-1}).

Endogenous variables: nominal GDP (Y), private domestic financial assets, i.e. bank deposits (B), private domestic liabilities, i.e. bank loans (H), imports (M).

Policy instruments: nominal exchange rate (E), government domestic liabilities (D) – where a change $(\dot{D})$ reflects the fiscal deficit financed by bank borrowing (i.e. the PSBR).

Targets: change in reserves $(\dot{R})$, inflation $(\dot{P})$

Parameters: the inverse-velocity of money circulation (v), credit-demand coefficient (φ), nominal import coefficient (m).

There are four national accounting definitions (identities). For nominal income and inflation

$$Y \equiv Q \cdot P \tag{13.1}$$

$$P \equiv P_{-1} + \dot{P} \tag{13.2}$$

for the balance of payments on current and capital accounts

$$X - M \equiv \dot{R} - F\dot{L} \tag{13.3}$$

and for the domestic monetary balance

$$ER + B \equiv D + H \tag{13.4}$$

The behavioural equations (equalities) are as follows. The private sector demand for money (i.e. for deposits in the banking system) is

$$B = vY \tag{13.5}$$

and the private sector demand for credit from the banking system is

$$H = \varphi Y \tag{13.6}$$

Finally import demand (in local prices) is given by

$$M \cdot E = mY \tag{13.7}$$

We have seven equations and seven variables to solve for (the five endogenous variables and the two targets) so that Walras's Law is satisfied; we also have two targets and two instruments, so Tinbergen's Principle is also satisfied. The model is thus both consistent and complete.

The two 'reduced-form equations' of the model are those for the balance of payments and the monetary balance.[6] The first is derived by substituting (13.1), (13.2) and (13.7) into (13.3) in order to yield the change in reserves in terms of one of the instruments (the exchange rate) and the other target variable (inflation):

$$\dot{R} = [X + \dot{F}] - \frac{m}{E} Q[P_{-1} + \dot{P}] \tag{13.8}$$

The second reduced-form equation is found by substituting (13.1), (13.5) and (13.6) into (13.4) to give inflation as a function of the reserve target and the two policy instruments:

$$\dot{P} = \frac{\dot{D} - E\dot{R}}{(v - \varphi)Q} \tag{13.9}$$

Solving these two equations simultaneously yields the values for the targets (ΔR and ΔP) at equilibrium in terms of the model parameters, the known values of exogenous variables and the set values of the policy instruments (E, ΔD). In principle, therefore, any desired pair of target values can be achieved by setting appropriate values of the two policy variables.

In practice, the IMF suggests that the exchange rate is most useful in reaching the reserves target, and government borrowing (in other words, the budget deficit) in reaching the inflation target.[7] If the required policy measures are not feasible (because both real devaluation and budget cuts have severe distributional – and thus political – implications[8]), then it is always possible for the Fund itself to supply extra resources (i.e. increase ΔF) against further policy conditionality.

In relation to a specific inflation rate (p), this can be found by substituting (13.8) into (13.9) and

$$p = \frac{\dot{P}}{P} = \left[\frac{\dot{D} - E(X + \dot{F})}{Y} + m \right] / [v - \varphi] \tag{13.10}$$

This model can thus be seen as an early form of the IMF inflation targeting (IT) model, but with the PSBR (ΔD) as the key policy instrument to achieve this aim.

The transmission mechanism is apparently simple and clear from (13.10): clearly a lower PSBR as a share of GDP, or higher exports (or foreign borrowing) will all reduce inflation. However, there are two dimensions that are rather more curious. On the one hand, the exchange rate (E) is set to achieve the balance of payments target, but the higher its level (i.e. the more depreciated), the less inflation there is. In other words, there is no pass-through – because inflation is based on monetary imbalance rather than cost structures. None the less, an increase in the import coefficient (m) through trade liberalization will raise inflation in this model. On the other hand, a change in the money demand coefficent (v) through expectations – specifically incipient hyperinflation leading to a sharp rise in the velocity of circulation (v^{-1}) – will have a marked impact on inflation.

However, the following characteristics of the model should also be noted:

- there is a strong implicit assumption that the money supply is endogenous (i.e. bank deposits depend on nominal income) in a Keynesian manner;
- output is fixed in the short run and not affected by the fiscal stance, although if price stability and excess capacity are assumed, output could become a target variable in the IMF model (Khan et al., 1990);[9]
- there is a strong and explicit assumption that all private demand for

bank loans is to be satisfied, thus avoiding 'crowding out' by government borrowing; this can be interpreted as an implicit recognition that bank credit does affect output level, and that this should thus be kept at the capacity level;

- there is no role for the interest rate in this model, as is taken to be fixed by the central bank at below the market-clearing rate (the familiar 'financial repression' notion inspired by McKinnon) – and thus again there is an implicit credit-rationing process taking place;
- the fact that the exchange rate is a policy instrument implies not only that it is actively administered by the central bank but also that it is supported by capital account controls.

3. IMF INFLATION TARGETING WITH A FLOATING EXCHANGE RATE

In the 1990s, of course, the IMF position on exchange rates changed significantly, moving towards an insistence on floating rates. This was accompanied by support for domestic financial liberalization and the suspension of capital controls in order to stimulate foreign portfolio investment. This meant, on the one hand, that the interest rate would become an active policy instrument; and on the other, that the exchange rate would no longer be available as an instrument. The exchange rate would find its own level on a foreign exchange market without central bank intervention.

The exposure of the economy to national and international capital markets also meant that the IMF moved towards a view that the budget deficit should not act as a policy instrument: either because it gave the wrong signals to markets, or because politicians could not be trusted with macroeconomic management. The current position is thus that strict budget balances should be maintained.

In consequence, in terms of the Tinbergen criterion, the policy targets are reduced to one (inflation) and the policy instruments to one (the interest rate). Further, it is recommended that this be entrusted to an independent central bank in order to have the desired credibility. This bank should pre-announce the inflation target in order to create appropriate expectations among economic agents, while wages are de-indexed and the labour market itself is made more 'flexible'.

Here I examine this IMF 'new monetary policy' (NMP) model by setting it out in the same framework as the canonical model set out above. The Fund itself has not issued a new primer equivalent to IMF (1987), but the main elements are to be found in textbooks such as Agénor and Montiel (1999).

Exogenous variables: real GDP (Q), exports (X), initial price level (P_{-1}), and the initial exchange rate (E_{-1}).

Endogenous variables: nominal GDP (Y), private domestic financial assets – bank deposits (B), private domestic liabilities – bank loans (H), nominal exchange rate (E), government domestic liabilities (D), reserves (R), change in foreign liabilities ($\dot{F}$), imports (M), and the current price level (P).

Policy instruments: interest rate (i).

Targets: inflation ($\dot{P}$) where inflation rate (p) is $p = \dot{P}/P$.

Parameters: the demand for money coefficients (v, α), credit-demand coefficients (φ, β), nominal import coefficient (m), capital account response coefficient (γ), and the two 'rules' coefficients for fiscal deficit and reserves respectively (λ, θ).

Definitions (identities) are as follows: for nominal income and inflation we have, as before,

$$Y \equiv Q \cdot P \tag{13.11}$$

$$P \equiv P_{-1} + \dot{P} \tag{13.12}$$

for the balance of payments

$$X - M \equiv \dot{R} - \dot{F} \tag{13.13}$$

and for the domestic monetary balance

$$ER + B \equiv D + H \tag{13.14}$$

The behavioural equations can be modified to include the effect of the interest rate (i) as follows. The private sector demand for money (i.e. for deposits in the banking system) is now

$$B = (v + \alpha i)Y \tag{13.15}$$

and the private sector demand for credit from the banking system is

$$H = (\varphi - \beta i)Y \tag{13.16}$$

Finally, import demand (in local prices) is given as before by

$$M \cdot E = mY \tag{13.17}$$

However now external liabilities (F) are not exogenous, but affected by the interest rate and the change in exchange rates (which we assume to proxy for expectations), so that we can write (risk premium and world interest rates can be seen as reflected in γ)

$$\dot{F} = \gamma\left(i - \frac{E - E_{-1}}{E_{-1}}\right) = \gamma\left(i - \frac{\dot{E}}{E}\right) \tag{13.18}$$

Two new macroeconomic 'rules' are now added which reflect the increasingly limited nature of IMF policy constraints on developing country governments in the name of 'sound fundamentals'. First, in pursuance of long-run budgetary stability,[10] net borrowing must be limited to a fixed proportion (λ) of GDP, such that

$$\dot{D} = \lambda Y \tag{13.19}$$

In other words, there is no longer an independent fiscal policy as a macroeconomic instrument; and the central bank does not intervene in the foreign exchange market, leaving the exchange rate (E) to act as an automatic balance. Instead, the central bank maintains a reserve level fixed as a certain proportion of imports.[11] We can represent this rule by

$$R = \theta M \tag{13.20}$$

With nine variables (eight endogenous and one target) and nine equations, Walras's Law is satisfied, while with one target (inflation) and one policy instrument (the interest rate) the Tinbergen criterion is met. The model is thus both consistent and complete.

This means that we have again two reduced-form equations that can be derived as before by substituting (13.17), (13.18) and (13.20) into (13.13) in order to yield the balance of payments situation in terms of domestic prices (P), the interest rate (i) and the exchange rate (E):

$$\frac{m}{E}\theta Q\dot{P} = \left[X\gamma\left(i - \frac{\dot{E}}{E}\right)\right] - \frac{m}{E}QP \tag{13.21}$$

The second reduced-form equation is found by substituting (13.15), (13.16), (13.19) and (13.20) into (13.14) in order to obtain the domestic monetary balance in terms of the same three variables (P, i, E):

$$\frac{EmQ\dot{P}}{E} + (v + \alpha i)\dot{P}Q = (\varphi - \beta i)\dot{P}Q + \lambda PQ \tag{13.22}$$

Because of the 'reserves rule' (13.20), rearranging (13.22) and then dividing through by P yields an expression for the rate of inflation in terms of the interest rate (i) alone:

$$p = \frac{\lambda}{m + (v - \varphi) + (\alpha + \beta)i} \tag{13.23}$$

This result encapsulates the Fund's current inflation-targeting regime for emerging market economies. It is combined with binding rules for the PSBR and for the level of foreign reserves to be maintained irrespective of the point in the business cycle – or, more importantly to emerging markets – of the conditions on international financial markets. With the abandonment of capital controls and managed exchange rates, the floating exchange rate is supposed to take care of external adjustment automatically.

This transmission mechanism is clearly modified with respect to the first 'canonical' model. The demand and supply of bank deposits is intermediated by the interest rate, which thus serves to moderate domestic monetary imbalances, but it also serves to modify capital inflows and thus achieve the desired balance of payments position. The fiscal deficit is constrained by the intertemporal budget solvency condition (λ) so that an increased interest rate reduces inflation in (13.23) by stimulating bank deposits and reducing the demand for credit. Thus the shortcoming of the first Fund model of not including interest rates is apparently overcome; but the assumption of fixed output (or more precisely that the interest rate has no effect on output) now seems even more untenable[12] – particularly because at least in the first model the policy set-up ensured that all the credit requirements of the private sector (i.e. producers) were met.

Note, moreover, that an increase in the import coefficient (m) arising from trade liberalization will also increase inflation and require even higher interest rates in order to restore the economy to its monetary target. The model also implies that financial liberalization itself will have the effect of increasing inflationary pressures and thus increasing the interest rate required to meet a specific inflation target: specifically, new financial instruments and increased competition between intermediaries will tend to both increase the velocity of circulation of money (i.e. reduce v) and increase the income elasticity of demand for credit (i.e. raise φ).

However, the most serious shortcoming of this approach is not clear from (13.23) itself. From (13.21) it is evident that the exchange rate must then adjust (i.e. 'float') in response to the target inflation rate (p^*) and the corre-

sponding interest rate (i^*), with increased interest rates leading to an appreciation (i.e. reduction) of E. However, of particular interest to us is the real exchange rate (e). It is easy to show by substituting (13.23) back into (13.21) and rearranging that

$$e = \frac{mQ}{X + \gamma i^*}\left[1 + \frac{\lambda(1+\theta)}{m + (\nu - \varphi) + (\alpha + \beta)i^*}\right] \tag{13.24}$$

In other words, lower inflation targets (p^*) and thus higher interest rates (i^*) not only unambiguously lead to appreciation of the real exchange rate (e) but also mean that this effect is 'explosive'.[13] There will thus be a built-in bias towards over-valuation of the exchange rate (and loss of export competitiveness and thus less growth) from inflation targeting. Further, and even more seriously, external capital market shocks (i.e sharp movements in γ) arising from shifts in the asset demand schedule[14] on the part of foreign investors have major effects on emerging market macroeconomies.[15] The response to the exchange rate appreciation (i.e. e falling) as the result of a capital surge (i.e. γ increasing) evident in (13.24) should be to depreciate the real exchange rate by lowering the interest rate. Instead, maintaining high interest rates will just provoke further inflows and exacerbate the shock. Much the same story obtains for a negative shock (e.g. from contagion), except that the impact on domestic credit supply is even stronger on the downswing.

Moreover, as Eichengreen (2003) points out, in practice balance of payments shocks (whether from trade or capital flows) will cause inflation through devaluation, but an interest rate response by the central bank will be ineffective because the imported inflationary effects are very large in comparison to the required demand reduction and the output gap consequences would be far too serious if the real interest rate were really raised sufficiently.

In sum, inflation targeting in emerging economies – even if domestic output were unaffected – is still highly undesirable because it exposes the macroeconomy to exogenous capital account shocks with no feasible means of countering them. This, rather than the employment effect identified in the critique of IT for G7 economies, is the major weakness of the IMF approach even within its own assumptions about macroeconomic behaviour. However, these assumptions themselves – particularly about output determination, fiscal response and central banking – are also unrealistic, as we shall see in the next section.

4. AN ALTERNATIVE STUCTURALIST (OR 'PERIPHERAL KEYNESIAN') APPROACH

4.1 The Structuralist Critique

The central issue in monetary policy for emerging markets is not inflation as such (particularly at the low levels regarded as problematic in industrialized countries), but rather 'managing the pro-cyclical effects of externally generated boom–bust cycles' (Ocampo, 2000, p. 1). These external shocks are essentially asymmetric, in the sense that emerging markets are 'cycle-takers' rather than 'cycle-makers',[16] and they are exacerbated by inherited debt positions. Exchange rates are subject to two conflicting demands: first, the stability of trade, prices and capital flows; and second, the flexibility required in order to adjust current and capital accounts to exogenous changes. Hard pegs serve to anchor the price level but lead to real exchange rate problems and eventually speculative crises. Floating rates lead to instability in domestic prices and expenditure that undermines investment and growth. Moreover, 'given the reduced effectiveness of some traditional policy instruments – particularly monetary policy – the exchange rate plays an essential role in helping adsorb such shocks' (Ocampo, 2000, p. 16).

This ineffectiveness of monetary policy is the result of uncovered interest parity once capital controls are removed and short-term capital can move freely.[17] In the upswing of a cycle (the 'boom'), the interest rate declines and the exchange rate appreciates, but any attempt to counter the boom attracts still more funds and the exchange rate appreciates still further. In the downswing ('bust'), markets push for devaluation but this forces up interest rates and exacerbates production declines. Underlying this behaviour are a number of structural factors, including: (a) purchasing power parity does not obtain and thus there is no 'natural' exchange rate for market expectations to converge upon; (b) the thin and narrow local financial markets reduce the advantages of a free float by failing to provide a buffer for domestic firms; and (c) the dependence of public finances on foreign borrowing makes the fiscal stance automatically pro-cyclical. Thus,

> generally speaking, authorities have found it difficult to undertake anti-cyclical monetary policies under all [exchange rate] regimes. Broadly speaking, interest rate movements follow the external cycle in all countries. … True episodes of 'monetary autonomy' have been rare, but have been more frequent in Colombia and Chile, the two countries that have used more actively capital account regulation as a complement to exchange rate policy. (Ocampo, 2000, p. 19)

In sum, the structuralist critique is double: on the one hand, that the macroeconomy works in a different way from that which the Fund supposes

– the role of credit rationing and capacity utilization being crucial; and on the other hand, that multiple policy targets are not only institutionally feasible but socially necessary – rather than relying upon the central bank targeting inflation through the interest rate.

4.2 An Alternative Model for Monetary Programming

We set up the model in a similar formal framework to the two Fund models discussed above, except that on the one hand we allow for output (Q) to be below capacity (K), and that this can be adjusted by means of the level of credit to the private sector – in effect this can be seen as reflecting direct intervention via (say) reserve requirements in the traditional manner, or else prudential controls over bank lending in view of maturity or currency mismatch.[18] On the other, we return to multiple targets and thus policy instruments, in recognition of the multidimensional nature of exogenous shocks and the need to reduce the fluctuations in the real exchange rate that undermine investment in the export sector.[19]

Exogenous variables: exports (X), production capacity (K), initial price level (P_{-1}), initial exchange rate level (E_{-1}), initial public debt level (D_{-1}), initial reserves level (R_{-1}).

Endogenous variables: nominal GDP (Y), private domestic financial assets (B), imports (M), change in foreign liabilities ($\dot{F}$), nominal exchange rate (E), reserves (R), the current price level (P) and change in government debt ($\dot{D}$).

Policy instruments: primary fiscal deficit (Z), private domestic liabilities (H) – that is, bank lending – and interest rate (i).

Targets: level of real output (Q) – that is, capacity utilization, the real exchange rate (e) – that is, export competitiveness, and rate of inflation (p).

Parameters: the demand for money coefficients (v, α), credit coefficients (φ, β), nominal import coefficient (m), capital account response coefficient (γ), and the 'rule' coefficient for reserves (π).

Definitions (identities) are as follows. For nominal income we have, as before,

$$Y \equiv Q \cdot P \tag{13.25}$$

while inflation is

$$p \equiv \{P - P_{-1}\}/P_{-1} \tag{13.26}$$

and the real exchange rate is

$$e \equiv E/P \tag{13.27}$$

For the balance of payments on current and capital accounts we have, as before,

$$X - M \equiv \dot{R} - \dot{F} \tag{13.28}$$

and for the domestic monetary balance

$$ER + B \equiv D + H \tag{13.29}$$

The behavioural equations have similar forms to previously, but rather different meanings. The private sector demand for money (i.e. for deposits in the banking system) is, as before,

$$B = (v + \alpha i)Y \tag{13.30}$$

but the private sector demand for credit from the banking system in (13.16) is rearranged to provide an expression for the effect of controlled bank lending on real output within the limit of capacity (K), this being credit rationing at the macroeconomic level:[20]

$$Q = \frac{H}{P\{\varphi - \beta i\}} \leq K \tag{13.31}$$

Import demand (in local prices) is given as before by[21]

$$M \cdot E = mY \tag{13.32}$$

and external liabilities (F) – remembering that risk premium and world interest rates (reflected in γ) can shift suddenly and this is a frequent and major source of external shocks – are given, as before, by

$$\dot{F} = \gamma\left(i - \frac{\dot{E}}{E}\right) \tag{13.33}$$

However, the macroeconomic 'rules' are now rather different. First, the long-run importance of debt solvency is maintained; but this now relates to the

'structural' budget deficit,[22] while the deficit in any one year can vary so long as the overall balance is maintained in the long run.[23] Moreover, the policy instrument itself is the primary deficit (Z) so as to take into account the major effect of interest rates (i) on debt service in emerging economies:[24]

$$D = Z + (1+i)D_{-1} \tag{13.34}$$

In other words, there is an independent fiscal policy as a short-run macroeconomic instrument again, although in the long run the debt solvency rule is maintained.

Second, while the central bank does not intervene directly in the foreign exchange market, it does use the interest rate (i.e. intervention in the bond market) to target the real exchange rate. It maintains a reserve level adapted to the short-term external debt position (F) as a form of insurance against external shock – a process usually known as 'sterilization'. This means that if capital flows out, reserves can be run down with an expansionary effect on the economy through import provision as another form of counter-cyclical policy.[25] We can represent this new rule by

$$R = \pi F \tag{13.35}$$

Walras's Law is satisfied because we have 11 equations and 11 variables (eight endogenous and three targets); while Tinbergen's criterion is met by the three targets (p, e and Q) and the three instruments (Z, H, and i).

Our three reduced-form equations are now as follows. The new addition is of course the credit supply function (13.31), which for notational simplicity we express in terms of real credit to the private sector ($\overline{H} = H/P$):

$$Q = \frac{\overline{H}}{\varphi - \beta i} \tag{13.36}$$

Note that it is not suggested that this is a growth mechanism as such (which depends on the accumulation of physical and human capital) but rather a means of adjusting output within capacity as a counter-cyclical stabilization mechanism.

The capital account identity (13.28) is as before, and is expressed in terms of the exchange rate, interest rates and output by substituting in equations (13.25), (13.32), (13.33) and (13.35):

$$\begin{aligned} X - M &= \dot{R} - \dot{F} \\ X - \frac{mPQ}{E} &= (\pi - 1)\gamma\left(i - \frac{\dot{E}}{E}\right) \end{aligned} \tag{13.37}$$

Assuming that the target of stabilizing the real exchange rate is in fact achieved (and thus that $\dot{e} = 0$) and plugging in expressions for the real exchange rate (13.27) and inflation (13.26), this gives us an expression for the real exchange rate, the second of our targets:

$$e = \frac{mQ}{X - \gamma(\pi - 1)(i - p)} \tag{13.38}$$

The role of the interest rate is thus essentially to set the real exchange rate: quite different from the IMF's IT model. Note also that if this results in an undesirably high interest rate – in response (say) to a sudden upsurge in capital flows generated by the G3 economies (i.e. a rise in γ) – then the reserve ratio (π) can be used instead, a process of active central bank intervention usually known as 'sterilization'.

And finally for the monetary balance, which is related to the inflation process itself: this balance is defined as before from (13.29), but substituting in (13.25), (13.30), (13.34) and (13.35) yields a solution for the price level (P) as a function of the other targets and instruments:

$$\begin{gathered} ER + B \equiv D + H \\ (v + \alpha i)QP + E\pi\left\{R_{-1} + \gamma\left(i - \frac{\dot{E}}{E}\right)\right\} = \{Z + (1+i)D_{-1}\} + H \end{gathered} \tag{13.39}$$

We can assume that at equilibrium the real exchange rate is stable ($\dot{e} = 0$) and that the long-run debt ratio rule holds approximately for the domestic debt stock ($D = \lambda Y$) in order to simplify the result. We continue to write some variables in real terms (e.g. $\bar{Z}$), and plugging (13.26) and (13.27) into (13.39) gives a solution for the determination of the rate of inflation (p):

$$p = i - \frac{1}{\gamma}\left[\frac{(\bar{Z} + \bar{H}) - Q\{(v + \alpha i) - \lambda(1+i)\}}{e\pi} + F_{-1}\right] \tag{13.40}$$

The transmission mechanism in this model is quite different from those in the Fund model:

- first, and most strikingly, higher interest rates actually increase inflation due to the resulting increase in the PSBR and the reduction in output as well as the impact on capital flows;[26]
- second, given that credit management (H) has already been used to set output (Q) and the interest rate to ensure a competitive real exchange rate (e), so the primary budget deficit (Z) is used for inflation control;

- third, there is no reason to believe that a primary budget balance (i.e. $Z = 0$) is compatible with low (or even zero) inflation – rather the appropriate balance depends upon the other factors in (13.40) such as the output and real exchange rate targets on the one hand and particular parameter valued on the other.

In sum, monetary policy in the structuralist model integrates exchange rate management and capacity utilization into the process of inflation control by using multiple policy instruments – in marked contrast to the Fund approach with a single target and a single instrument.

5. SUMMARY AND CONCLUSIONS

This chapter has extended and modified the critique of 'new monetary policy' (in the form of inflation targeting) with reference to stabilization policy in small open economies in general and emerging markets in particular. The IMF 'basic monetary programming framework' uses government borrowing and the exchange rate as policy instruments in order to achieve specific inflation and balance of payments targets. This chapter adapted this standard model in order to include short-term capital flows and the floating exchange rate arising from financial liberalization. In this way, the macroeconomic consequences of the current Fund focus on inflation targeting and the use of a single monetary policy instrument (the interest rate, combined with rigid fiscal and reserve 'rules') in emerging market economies were demonstrated. Second, the chapter encompassed the structuralist critique of the negative effect of inflation targeting on capacity utilization and trade competitiveness, leading to the argument for counter-cyclical monetary policy in response to external shocks. An alternative model was constructed within a comparable macroeconomic framework to that of the IMF in order to demonstrate the shortcomings of inflation targeting.

The main conclusion of this chapter is that a macroeconomic stabilization policy based on real exchange rate targeting, bank credit regulation and an active fiscal stance can be effective in supporting growth and investment. However, there is also a central institutional issue left unresolved. A central – albeit tacit – objection (by the Fund among others) is that central banks and finance ministries in emerging market economies are simply incapable of constructing an active monetary policy. This incapacity may spring from three sources: (i) lack of technical capacity and/or control over the economy; (ii) particular political or rent-seeking tendencies of governments; or (iii) accumulated crises and incompetencies in the past which undermine credibility. This is not only a rather patronizing attitude towards major regional

states, but does not allow for substantive learning from past incidents on the part of central banks and finance ministries in emerging markets. One such lesson is that 'to avoid credibility issues, and thus guarantee effectiveness, capital account regulation should be in place *throughout* the business cycle' (Ocampo, 2000, p. 18).

NOTES

1. Inertial inflation remains a theoretical mystery. It is worth noting that there is a long tradition of analysing (and coping with) inertial inflation in emerging markets, although this is not discussed in this chapter (see Agénor and Montiel, 1999).
2. Based implicitly on the USA but by implication applicable to the euro zone if not to the UK itself – which is now a 'small open economy'.
3. Only that of 'some economists', according to Mankiw (2003).
4. This is of course an institutional argument, not an economic one: 'monetary policy makers often claim that their aim is price stability, but once expectations are formed they are tempted to renege on this announcement and take advantage of the short-run tradeoff between inflation and unemployment. The only way to avoid this time-inconsistency, it is argued, is to commit the central bank to a policy rule' (Mankiw, 2003, p. 4).
5. The current account balance (*CAB*) is given by the difference between domestic output (*Y*) and 'domestic adsorption' (*A*) – the sum of private consumption (*C*), government expenditure (*G*) and investment (*I*).

$$Y + M \equiv C + G + I + X$$

$$CAB \equiv X - M \equiv Y - [C + G + I] = Y - A$$

   Aggregate *nominal* income (*Y*) depends on the level of domestic prices (*P*) and real output (*Q*); while the resulting 'peso value' of the current account balance in dollars (*B*) depends on the nominal exchange rate (*E*):

$$B \cdot E \equiv Y - A$$

$$Y \equiv Q \cdot P$$

$$B \equiv (Q \cdot P - A)/E$$

   In the 'adsorption approach' it is assumed that output (*Q*) is given in the short run, so that for a given target level of prices (*P*), the current account (im)balance (*B*) is controlled either by changing the level of nominal adsorption through one of the aggregate expenditure categories (e.g. government expenditure cuts) or by varying them all proportionately in real terms through an alteration in the exchange rate (e.g. devaluation). Note that the effect of devaluation is through the income effect on aggregate demand, not through relative prices as such.
6. It is no coincidence, of course, that these are the major concerns of the IMF and are indeed the categories with most detail in the *International Financial Statistics*.
7. See also Dornbusch and Helmers (1988).
8. See FitzGerald (1993, ch. 4) for further discussion.
9. Alternatively, growth in the medium term can be seen as the responsibility of the World Bank, which employs its own proprietary model 'RMSM' (see Addison, 1989), where there is a savings constraint on investment which in turn implies a strong crowding-out

assumption with fiscal deficits reducing growth and increase external assistance raising it. For an endogenous critique, see Easterly (1999).

10. This ratio (λ) is of course derived from the familiar budgetary rule required to keep the ratio between debt (D) and income (Y) at a stable ratio (δ) for a given long-term GDP growth rate (y):

$$\delta \geq \frac{D_t}{Y_t} = \frac{D_{t-1} + \Delta D_t}{Y_t} = \frac{D_{t-1}}{Y_{t-1}(1+y)} + \frac{\Delta D}{Y_t} = \delta(1-y) + \lambda$$

$$\lambda = y\delta$$

11. This could be easily extended to include current account debt service obligations (i.e. international interest charges) as well.
12. This is a key element of Stiglitz's critique of Fund programmes which were a condition for international liquidity provision in the Asian crisis of 1997 – see Stiglitz and Greenwald (2003, ch. 13).
13. That is, not only $e'(i) < 0$, but also $e''(i) > 0$.
14. For the causes of this, see FitzGerald (2003b) and FitzGerald and Krolzig (2003).
15. For a model of the transmission of these shocks into the emerging market economy via rationed bank lending along Blinder lines, see FitzGerald (2003b).
16. Just as there are price-takers rather than price-makers in international trade.
17. That is, without intervention, the domestic interest rate will be the sum of the world interest rate plus expected devaluation plus the risk premium (ρ):

$$i_d = i_d + \dot{E}/E + \rho$$

18. See FitzGerald (2005).
19. For a rigorous case in support of REER targeting in order to limit volatility, see Branson (2001). Joshi (2003) suggests that this must be supported by capital controls, and that the volatility reduction justifies their inevitable efficiency costs.
20. See Blinder (1987) and Bernanke and Blinder (1988), as well as Tobin (1970), of course.
21. Ideally, we should allow for the real exchange rate (e) affecting exports (X) – this is not difficult to do but it complicates the exposition unnecessarily as the result only strengthens the results below.
22. As defined by the OECD – see *OECD Historical Statistics 1970–1999* (Paris, 2001) for how the period (n) is determined and deviations from the trend are measured.
23. In effect we are saying that over the whole cycle the original rule must hold, but not within it, as the key aspect of counter-cyclical fiscal policy – see Ocampo (2000).

$$\frac{1}{n}\sum_{t=1}^{n}\frac{D_t}{Y_t} = \lambda$$

24. See Bacha (1990), who also allows for the effect of the exchange rate on the PSBR through the burden of external debt service – an aspect ignored here but which could easily be included.
25. It is notorious that the East Asian economies have been successful in building up large reserves since the 1987 crisis, by running large current account surpluses and paying off the 'bailout' loans rapidly, unlike Latin America, which remains with low reserves and high short-term indebtedness.
26. Moreover, a strong structuralist case can be made for interest rates affecting prices through the cost of working capital in production (Taylor, 1988); although in the model discussed in this chapter, of course, there is no cost-based pricing function.

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14. International aspects of current monetary policy

L. Randall Wray

1. INTRODUCTION

This chapter will examine monetary policy appropriate for an open economy operating with a floating exchange rate. It will be shown that most of the conventional wisdom regarding each of the following issues is flawed: interest rate determination; ability of the central bank to 'pump liquidity' into an economy to fight deflation; central bank 'monetization' of budget deficits; central bank 'sterilization'; the relation between the 'twin deficits' and their impacts on exchange rates.

Briefly, the central bank sets the overnight interest rate target and then supplies or drains reserves to ensure banks have the quantity desired and/or required. The central bank can always 'pump' excess reserves into the system, but this will simply result in a zero-bid condition in the overnight market, causing overnight rates to fall to zero (or to the support rate if the central bank pays interest on reserves). The treasury spends by crediting bank accounts and taxes by debiting them – deficits simply mean that bank accounts have been net-credited; hence reserves have increased. If this has created a position of excess reserves, the central bank or treasury must sell bonds or the overnight rate will fall. Hence there is no operational meaning to be attached to the notion of central bank 'monetization' of deficits.

Central bank operations are always defensive, and if international payments cause actual reserves to deviate from desired/required reserve positions, the central bank has no choice but to 'sterilize' (accommodate) by supplying or draining reserves if it has a non-zero overnight rate target. While it is supposed that budget deficits raise interest rates and thereby cause currency appreciation and hence the 'twin' trade deficit, in reality budget deficits create excess reserve positions that would lower overnight interest rates if bond sales were not undertaken. Hence any correlation between budget deficits and trade deficits is more likely to arise from the stimulative effect of budget deficits on non-government sector spending.

Finally, it is commonly believed that the central bank should take actions to affect exchange rates to manipulate trade balances. We will argue this results mostly from a misunderstanding of the costs and benefits of trade and of the process of 'financing' trade deficits. Our analysis will support floating rates and offer an alternative view of the finance process.

Throughout the following exposition, it will be necessary to keep in mind that all of the arguments are predicated on the assumption that we are analyzing a country with a sovereign currency on a floating exchange rate – that is, a country like the UK, Japan, or the USA. Some of the arguments would have to be revised for the case of a European nation operating with the euro (which is in some respects a 'foreign' currency from the perspective of the individual member states); the modifications would likely be even greater for a nation operating with a fixed exchange rate or currency board.

2. INTEREST RATE DETERMINATION

A few years ago, textbooks traditionally presented monetary policy as a choice between targeting the quantity of money or the interest rate. It was supposed that control of monetary aggregates could be achieved through control over the quantity of reserves, given a relatively stable 'money multiplier' (Brunner, 1968; Balbach, 1981). This even led to some real-world attempts to hit monetary growth targets – particularly in the USA and the UK during the early 1980s. However, the results proved to be so dismal that almost all economists have come to the conclusion that at least in practice, it is not possible to hit money targets (B. Friedman, 1988). These real-world results appear to have validated the arguments of those like Goodhart (1989) in the UK and Moore (1988) in the USA that central banks have no choice but to set an interest rate target and then accommodate the demand for reserves at that target. Hence, if the central bank can indeed hit a reserve target, it does so only through its decision to raise or lower the interest rate to lower or raise the demand for reserves. Thus the supply of reserves is best thought of as wholly accommodating the demand, but at the central bank's interest rate target.

Why does the central bank necessarily accommodate the demand for reserves? There are at least four different answers. In the USA, banks are required to hold reserves as a ratio against deposits, according to a fairly complex calculation. In the 1980s, the method used was changed from lagged to contemporaneous reserve accounting on the belief that this would tighten central bank control over loan and deposit expansion. As it turns out, however, both methods result in a backward-looking reserve requirement: the reserves that must be held today depend to a greater or lesser degree on

deposits held in the fairly distant past. As banks cannot go backward in time, there is nothing they can do about historical deposits. Even if a short settlement period is provided to meet reserve requirements, the required portfolio adjustment could be too great – especially when one considers that many bank assets are not liquid. Hence, in practice, the central bank automatically provides an overdraft – the only question is over the 'price', that is, the discount rate charged on reserves. In many nations, such as Canada and Australia, the promise of an overdraft is explicitly given; hence there can be no question about central bank accommodation.

A second, less satisfying, answer is often given, which is that the central bank must operate as a lender of last resort, meaning that it provides reserves in order to preserve stability of the financial system. The problem with this explanation is that while it is undoubtedly true, it applies to a different time dimension. The central bank accommodates the demand for reserves day by day, even hour by hour. It would presumably take some time before refusal to accommodate the demand for reserves would be likely to generate the conditions in which bank runs and financial crises begin to occur. Once these occurred, the central bank would surely enter as a lender of last resort, but this is a different matter from the daily 'horizontal' accommodation.

The third explanation is that the central bank accommodates reserve demand in order to ensure an orderly payments system. This might be seen as being closely related to the lender of last resort argument, but I think it can be more plausibly applied to the time frame over which accommodation takes place. Par clearing among banks, and more importantly par clearing with the government, requires that banks have access to reserves for clearing. (Note that deposit insurance ultimately makes the government responsible for check clearing, in any event.)

The final argument is that because the demand for reserves is highly inelastic, and because the private sector cannot increase the supply, the overnight interest rate would be highly unstable without central bank accommodation. Hence relative stability of overnight rates requires 'horizontal' accommodation by the central bank. In practice, empirical evidence of relatively stable overnight interest rates over even very short periods of time supports the belief that the central bank is accommodating horizontally.

We can conclude that the overnight rate is exogenously administered by the central bank. Short-term sovereign debt is a very good substitute asset for overnight reserve lending; hence its interest rate will closely track the overnight interbank rate. Longer-term sovereign rates will depend on expectations of future short-term rates, largely determined by expectations of future monetary policy targets. Thus we can take those to be mostly controlled by the central bank as well, as it could announce targets far into the future and thereby affect the spectrum of rates on sovereign debt.

3. PUMPING LIQUIDITY TO FIGHT DEFLATION

In recent years there have been numerous calls on the central banks to 'pump' liquidity into the system to fight deflationary pressures, first in Japan and more recently in the USA (Bernanke, 2003). Years ago, M. Friedman (1969) had joked about helicopters dropping bags of money as a way to increase the money supply. If this practice were adopted, it probably would be an effective means of reversing deflationary pressures – if a sufficient number of bags were dropped. There are two problems with such a policy recommendation, however. First, of course, no central bank would even consider such a policy. Second, and more importantly, this would not really be a monetary policy operation, but rather a fiscal policy operation akin to welfare spending. In practice, central banks are more or less limited to providing reserves at the discount window or in open market operations. In both cases, the central bank increases its liabilities (reserves) and gains an asset (mostly sovereign debt or private bank liabilities, although the central bank could also buy gold, foreign currencies and other private assets). Helicopter money drops are quite different because they increase private sector wealth; in contrast central bank operations do not (except to the extent that adoption of a lower interest rate target increases prices of financial assets).

From the previous section, it should be clear that the central bank cannot choose to increase reserves beyond the level desired/required by the banking system if it wishes to maintain positive overnight rates. If private banks have all the reserves they need/want, then they will not borrow more from the central bank. Open market purchases would simply result in excess reserve holdings; banks with excessive reserves would offer them in the overnight market, causing the interbank interest rate to decline. Once the overnight rate reached the bottom of the central bank's target range, an open market sale would be triggered to drain excess reserves. This would return the overnight rate to the target, and the central bank would find that it had drained an amount of reserves more or less equivalent to the reserves it had 'pumped' into the system to fight deflation. Fortunately, no central bank with a positive overnight interest rate target would be so foolish as to follow the advice that they ought to 'pump liquidity' to fight deflation.

Japan presents a somewhat different case, because it operates with a zero overnight rate target. This is maintained by keeping some excess reserves in the banking system. The Bank of Japan can always add more excess reserves to the system since it is satisfied with a zero rate. However, from the perspective of banks, all that 'pumping liquidity' into the system means is that they hold more non-earning reserves and fewer low-earning sovereign bills and bonds. There is no reason to believe that this helps to fight deflation, and Japan's long experience with zero overnight rates even in the presence of

deflation provides empirical evidence that even where 'pumping liquidity' is possible, it has no discernible positive impact. (The USA had a similar experience with discount rates at 1 per cent during the Great Depression.) And, to repeat, 'pumping liquidity' is not even a policy option for any nation that operates with positive overnight rates.

Can the central bank do anything about deflation? As the overnight interest rate is a policy variable, the central bank is free to adjust the target to fight deflation. However, both theory and empirical evidence provide ambiguous advice, at best. It is commonly believed that a lower interest rate target will stimulate private borrowing and spending – although many years of zero rates in Japan with chronic deflation provide counter-evidence. There is little empirical evidence in support of the common belief that low rates stimulate investment. This could be for a variety of reasons: the central bank can lower the overnight rate, but the relevant longer-term rates are more difficult to reduce; most evidence suggests that investment is interest-inelastic; and in a downturn, the expected returns to investment fall farther and faster than market interest rates can be brought down.

Evidence is more conclusive regarding effects of low rates on housing and consumer durables; indeed, recent lower mortgage rates in the USA have undoubtedly spurred a refinancing boom that fueled spending on home remodeling and consumer purchases. Still, this effect must run its course once all the potentially refinanceable mortgages are turned over. Further, it must be remembered that for every payment of interest there is an interest receipt. Lower rates reduce interest income. It is generally assumed that debtors have higher spending propensities than creditors; hence the net effect is presumed to be positive. As populations age, it is probable that a greater proportion of the 'rentier' class is retired and at least somewhat dependent upon interest income. This could reverse those marginal propensities.

More importantly, if national government debt is a large proportion of outstanding debt, and if the government debt-to-GDP ratio is sufficiently high, the net effect of interest rate reductions could well be deflationary. This is because the reduction of interest income provided by government could reduce private spending more than lower rates stimulated private sector borrowing. In sum, the central bank can lower overnight rate targets to fight deflation, but it is not clear that this will have a significant effect.

4. 'MONETIZATION' OF BUDGET DEFICITS

It is commonly believed that government faces a budget constraint according to which its spending must be 'financed' by taxes, borrowing (bond sales), or 'money creation'. Since many modern economies actually prohibit direct

'money creation' by the government's treasury, it is supposed that the last option is possible only through complicity of the central bank – which could buy the government's bonds, and hence finance deficit spending by 'printing money'.

Actually, in a floating rate regime, the government that issues the currency spends by crediting bank accounts. Tax payments result in debits to bank accounts. Deficit spending by government takes the form of net credits to bank accounts. Operationally, the entities receiving net payments from government hold banking system liabilities while banks hold reserves in the form of central bank liabilities (we can ignore leakages from deposits – and reserves – into cash held by the non-bank public as a simple complication that changes nothing of substance). Many economists find the coordinating activities between the central bank and the treasury quite confusing. I want to leave those issues mostly to the side and simply proceed from the logical point that deficit spending by the treasury results in net credits to banking system reserves, and that these fiscal operations can be huge (see Bell, 2000; Bell and Wray, 2003; Wray, 2003/4).

If these net credits lead to excess reserve positions, overnight interest rates will be bid down by banks offering the excess in the overnight interbank lending market. Unless the central bank is operating with a zero interest rate target, declining overnight rates trigger open market bond sales to drain excess reserves. Hence, on a day-to-day basis, the central bank intervenes to offset undesired impacts of fiscal policy on reserves when they cause the overnight rate to move away from target. The process operates in reverse if the treasury runs a surplus, which results in net debits of reserves from the banking system and puts upward pressure on overnight rates – relieved by open market purchases. If fiscal policy were biased to run deficits (or surpluses) on a sustained basis, the central bank would run out of bonds to sell (or would accumulate too many bonds, offset on its balance sheet by a treasury deposit exceeding operating limits). Hence policy is coordinated between the central bank and the treasury to ensure that the treasury will begin to issue new securities as it runs deficits (or retire old issues in the case of a budget surplus). Again, these coordinating activities can be varied and complicated, but they are not important to our analysis here. When all is said and done, a budget deficit that creates excess reserves leads to bond sales by the central bank (open market) and the treasury (new issues) to drain all excess reserves; a budget surplus causes the reverse to take place when the banking system is short of reserves.

Bond sales (or purchases) by the treasury and central bank are, then, ultimately triggered by deviation of reserves from the position desired (or required) by the banking system, which causes the overnight rate to move away from target (if the target is above zero). Bond sales by either the central

bank or the treasury are properly seen as part of monetary policy designed to allow the central bank to hit its target. This target is exogenously 'administered' by the central bank. Obviously, the central bank sets its target as a result of its belief about the impact of this rate on a range of economic variables that are included in its policy objectives. In other words, setting of this rate 'exogenously' does not imply that the central bank is oblivious to economic and political constraints it believes to reign (whether these constraints and relationships actually exist is a different matter).

In conclusion, the notion of a 'government budget constraint' only applies *ex post*, as a statement of an identity that has no significance as an economic constraint. When all is said and done, it is certainly true that any increase of government spending will be matched by an increase of taxes, an increase of high-powered money (reserves and cash), and/or an increase of sovereign debt held. But this does not mean that taxes or bonds actually 'financed' the government spending. Government might well enact provisions that dictate relations between changes to spending and changes to taxes revenues (a balanced budget, for example); it might require that bonds are issued before deficit spending actually takes place; it might require that the treasury have 'money in the bank' (deposits at the central bank) before it can cut a check; and so on. These provisions might constrain government's ability to spend at the desired level. Belief that these provisions are 'right' and 'just' and even 'necessary' can make them politically popular and difficult to overturn. However, economic analysis shows that they are self-imposed and are not economically necessary – although they may well be politically necessary. From the vantage point of economic analysis, government can spend by crediting accounts in private banks, creating banking system reserves. Any number of operating procedures can be adopted to allow this to occur even in a system in which responsibilities are sharply divided between a central bank and a treasury. For example, in the USA, complex procedures have been adopted to ensure that the treasury can spend by cutting checks; that treasury checks never 'bounce'; that deficit spending by the treasury leads to net credits to banking system reserves; and that excess reserves are drained through new issues by treasury and open market sales by the Fed. That this all operates exceedingly smoothly is evidenced by a relatively stable overnight interbank interest rate – even with rather wild fluctuations of the treasury's budget positions. If there were significant hitches in these operations, the Fed funds rate would be unstable.

5. CENTRAL BANK STERILIZATION

There is a great deal of confusion over international 'flows' of currency, reserves and finance, much of which results from failure to distinguish between a floating versus a fixed exchange rate. For example, it is often claimed that the USA needs 'foreign savings' in order to 'finance' its persistent trade deficit that results from 'profligate US consumers' who are said to be 'living beyond their means'. Such a statement makes no sense for a sovereign nation operating on a flexible exchange rate. In a nation like the USA, when viewed from the vantage point of the economy as a whole, a trade deficit results when the rest of the world (ROW) wishes to net save in the form of dollar assets. The ROW exports to the USA reflect the 'cost' imposed on citizens of the ROW to obtain the 'benefit' of accumulating dollar-denominated assets. From the perspective of America as a whole, the 'net benefit' of the trade deficit consists of the net imports that are enjoyed. In contrast to the conventional view, it is more revealing to think of the US trade deficit as 'financing' the net dollar saving of the ROW – rather than thinking of the ROW as 'financing' the US trade deficit. If and when the ROW decides it has a sufficient stock of dollar assets, the US trade deficit will disappear.

It is sometimes argued that when the USA experiences a capital account surplus, the dollars 'flowing in' will increase private bank reserves and hence can lead to an expansion of private loan-and-deposit-making activity through the 'money multiplier'. However, if the Fed 'sterilizes' this inflow through open market sales, the expansionary benefits are dissipated. Hence, if the central bank can be persuaded to avoid this sterilization, the USA can enjoy the stimulative effects.

Previous analysis should make it clear that sterilization is not a discretionary activity. First it is necessary to understand that a trade deficit mostly shifts ownership of dollar deposits from a domestic account holder to a non-resident account holder. Often, reserves do not even shift banks as deposits are transferred from an account at a US branch to an account at a foreign branch of the same bank. Even if reserves are shifted, this merely means that the Fed debits the accounts of one bank and credits the accounts of another. These operations will be tallied as a deficit on current account and a surplus on capital account. If treasury or central bank actions result in excess reserve holdings (by the foreign branch or bank), the holder will seek earning dollar-denominated assets – perhaps US sovereign debt. US bond dealers or US banks can exchange sovereign debt for reserve deposits at the Fed. If the net result of these operations is to create excess dollar reserves, there will be downward pressure on the US overnight interbank lending rate. From the analysis above, it will be obvious that this is relieved by central bank open market sales to drain the excess reserves. This 'sterilization' is not discretion-

ary if the central bank wishes to maintain a positive overnight rate target. Conversely, if the net impact of international operations is to result in a deficit dollar reserve position, the Fed will engage in an open market purchase to inject reserves and thereby relieve upward pressure that threatens to move the overnight rate above target.

6. THE TWIN DEFICITS AND FOREIGN EXCHANGE RATES

During the mid-1980s it was argued that the US federal budget deficit caused a trade deficit. The transmission mechanism from budget deficit to trade deficit was supposed to operate through interest rates and dollar appreciation. First, borrowing by government was supposed to have raised domestic interest rates as the budget deficit 'soaked up' domestic saving. Rising interest rates increased the foreign demand for the dollar, causing dollar appreciation, thus generating a trade deficit. Further, maintenance of high interest rates would be necessary to maintain the 'capital flow' required to finance the trade deficit and the budget deficit, depressing long-term economic growth. Again, the understanding developed in previous sections allows us to critically examine such claims.

First, budget deficits do not 'absorb' private saving and do not put upward pressure on interest rates (and crowd out private spending). Indeed, in the absence of central bank intervention (to drain excess reserves), a budget deficit places downward pressure on overnight rates because it leads to a net credit of banking system reserves. As already discussed, a sovereign nation on a floating rate does not really 'borrow'; hence it cannot absorb private saving when it deficit spends. Rather, deficits allow for positive net saving by the non-government sector. This is initially in the form of net credits to banking system reserves, but sovereign debt will be sold to drain excess reserves (either sold by the Fed in open market operations or by the treasury in the new issue market). If a budget deficit is associated with rising overnight rates, this is only because the central bank has decided to raise its overnight interest rate target – a not infrequent, but discretionary, response to budget deficits.

Second, the effect of budget deficits on the foreign exchange value of the domestic currency is not unambiguous. If budget deficits allow the domestic economy to grow faster than the ROW, it is possible that a trade deficit will result and this could lower exchange rates. (Thirlwall's Law states that if price elasticities are small enough so that substitution effects can be ignored, then a country's growth rate relative to that of the rest of the world cannot exceed the ratio of the relevant income elasticities of demand without creating a balance of

payment deficit. See Davidson, 1994.) However, this depends on the relative foreign demand for dollar-denominated assets. Expectations can play a role: if it is believed that a budget deficit will induce the central bank to raise interest rates, then the currency could appreciate in anticipation of future central bank action. Note that there is little evidence to support the common belief that exchange rates are affected by central bank interest rate targets, by budget deficits, or by trade balances; indeed, the Japanese yen has risen and fallen substantially with constant, zero, interest rates and persistent trade surpluses and budget deficits, while the American dollar rose with the budget surplus and then fell as the budget moved sharply to deficit – all in the face of a persistent trade deficit that did not fluctuate nearly so much as the budget balance.

It appears that the most likely transmission mechanism from a budget deficit to a trade deficit operates through the positive impact a fiscal relaxation can have on economic growth. Even if one believes that a trade deficit is 'bad', this does not necessarily indicate that a budget deficit and economic growth should be foregone to avoid a trade deficit. Further, if one sees a trade deficit as a 'benefit' to the domestic economy, it becomes even harder to argue that policy should be geared toward avoiding a trade deficit. Finally, if one understands that a trade deficit results from a ROW desire to accumulate net savings in the form of assets denominated in the currency of the net importer, one has a different view of the 'financing' of the trade deficit. In this case, it is not necessary to avoid budget deficits or to keep domestic interest rates high, or to keep the exchange rate up, all in order to attract 'foreign financing' of the trade deficit. Rather, a trade deficit should be seen as the mechanism that 'finances' the ROW desire to net save in dollar assets.

There is, thus, a symmetry to the 'twin deficits', although it is not the connection that is usually made between the two. A government budget deficit occurs when the non-government sector desires to net save in the form of sovereign debt (broadly defined to include both interest-paying bills and bonds as well as non-interest-earning currency and reserves). A current account deficit occurs when the ROW wants to net save dollar-denominated assets, including dollar-denominated sovereign debt. The common view that this net saving of the non-government and ROW sectors, respectively, 'finances' the government and trade deficits, respectively, has confused an identity with causation.

There has recently been a great deal of concern over the possibility of a collapse of the dollar, occasioned by persistent and even growing US trade deficits. This is unlikely. Much of the world looks to the USA as the primary market for excess production. A large number of countries have adopted currency boards based on the dollar or operate exchange rate pegs to the dollar. Such nations have an almost insatiable demand for dollars as reserves against their currencies. Private and public portfolios around the world are

heavily weighted to dollar assets. Private and public borrowers have contractual commitments in dollars. Those who argue that a sudden global sale of dollars could lead to a collapse do not appear to take these factors into account. Of course, this does not mean that the dollar cannot fall relative to one or more currencies – as it did until recently, and as is the nature of a floating currency.

7. SMALL OPEN ECONOMIES

This is probably not too controversial for most economists. The US dollar is seen as a 'special case', with perhaps a handful of other hard currencies in a similar situation. What about the world's other floating currencies? Surely small open economies like Australia and Canada must manage their government budgets and trade accounts to keep up the value of their currencies? It is probably true that trade deficits and budget deficits have impacts on currency values; it appears to be less certain that the interest rate targets of monetary authorities have predictable effects on exchange rates.

Assuming that budget and trade deficits do lead to devaluation of a currency, the question is whether policy ought to try to avoid this. Recall from above that a trade deficit means the ROW wants to net save domestic currency assets, and that the real national cost of enjoying imports consists of the exports that must be delivered. As a trade deficit increases, the per unit real cost of imports is declining in the sense that relatively fewer exports have been demanded by the ROW per unit of import. Even if this is accompanied by depreciation of the currency, net real benefits have increased. This is not to deny that depreciation of the currency can impose real and financial costs on individuals and sectors of the economy. Domestic policy can and probably should be used to relieve these individual and sectoral costs. However, using policy to prevent trade deficits in order to forestall currency depreciation means foregoing the net real benefits.

Let us take the worst case – a small open economy subject to Thirlwall Law constraints and where Marshall–Lerner conditions do not hold. In other words, this country's price elasticity of demand for imports is quite low, such that its sum with the price elasticity of demand by the ROW for its exports is less than unity (Davidson, 1994). In addition, the country's income elasticity of demand for imports is high, so that unless it grows substantially slower than the ROW, a trade deficit results. Further, it is a price-taker in international markets and its scale of production and demand is so low that it has no impact on international prices. Finally, let us assume that a trade deficit causes its currency to depreciate – but price elasticities are such that depreciation will not wipe out the deficit.

When the country begins to grow, a trade imbalance results. Before its currency depreciates, it clearly enjoys an improvement in its terms of trade – as its exports have not changed but its imports have risen. As its currency depreciates, import prices rise in terms of its currency. (This will have an additional impact on the home-currency-denominated trade deficit, which, by assumption, can cause additional depreciation.) In addition, assuming competitive markets, the home currency prices of all the commodities it exports also rise. The foreign currency prices of import and export commodities, however, are not affected. By assumption, rising domestic currency prices of imports do not affect purchases of imports, and exports are not affected because foreign currency prices have not changed. So depreciation does not directly affect the improved terms of trade. If rising prices of the types of commodities exported do reduce domestic purchases of these, more are available for export – which could reduce the trade deficit and worsen the terms of trade somewhat. However, when all is said and done, the country has experienced economic growth and improved terms of trade (if not, there would be no currency depreciation). On the other hand, the currency depreciation will cause imports to rise in price and will directly increase domestic prices of exported commodities; there could be further price effects rippling through the economy. The 'cost' of the trade deficit, economic growth and improved terms of trade is higher prices for some commodities in the consumer basket. Of course, many would also point to the 'financing' costs of the trade deficit, itself, and the 'burden' of rising external indebtedness – an argument covered in the next section.

8. BURDEN OF THE DEBT

One of the primary arguments against running 'twin deficits' is the belief that this burdens the nation by increasing indebtedness. In large part, this belief results from a confusion of a fixed exchange rate system with a floating rate system. If a nation operates with a gold standard, a government deficit commits the government to delivery of gold – a true 'debt burden'. However, with a floating rate 'fiat' money, government only promises to service its debts by delivering 'fiat' money. This does not mean that a government deficit can never be too big – inflationary – but it does mean that deficits do not 'burden' government in the usual sense of the term. Nor do deficits 'burden' current or future taxpayers; rather, as discussed above, deficits allow the non-government sector (including foreigners) to net save.

Another claim frequently made is that trade deficits lead to national indebtedness, which represents a national burden – perhaps one to be 'paid off' by future generations. Here, the problem is that analysis begins at too high a

level. We need to examine the process of 'financing' imports in more detail, distinguishing between purchases of foreign-produced goods and services by government and by private importers.

Within any sovereign nation that operates with a domestic currency and a floating rate regime, only the state has the power to impose tax liabilities. This is a critical component of sovereign power – although by no means is it the only power claimed by the sovereign. By imposing taxes, the state can move resources to itself. All modern states rely heavily on a monetary system, first imposing taxes to create a demand for the currency, then issuing the currency to buy desired resources. All other economic agents in the sovereign nation must use income or issue debt or rely on charitable giving (including that of the state) or engage in petty production to obtain resources. No other economic agent can issue liabilities that represent final means of payment for itself.

When a US non-sovereign consumer purchases an imported Toyota, she either gives up income or sells an asset or issues a liability to finance the purchase. The Japanese exporter holds a dollar claim on a US bank that will probably be converted to a yen claim on a Japanese bank, which in turn will convert a dollar reserve to a yen reserve at the Bank of Japan (although total yen reserves at the Bank of Japan will rise only if required/desired reserves rise – otherwise, the BOJ 'sterilizes' or 'accommodates' by an offsetting action). Alternatively, the Japanese bank could keep dollar reserves, or could convert them to US Treasury debt – which is essentially just interest-earning reserves. When all is said and done, the American holds a new auto, and she used her income, or sold an asset, or committed herself to payments on debt. As economists are fond of saying, there is no free lunch for the individual consumer – and a trade deficit can be associated with rising indebtedness of consumers. However, increased American purchases of domestically produced output have exactly the same result, as they are financed in exactly the same way: consumer debt can rise.

By contrast, if the US government chooses to import a Toyota, it truly can 'get something for nothing' – issuing dollar reserves that eventually find their way to the Bank of Japan. Is this due to 'dollar hegemony'? Any sovereign state obtains 'something for nothing' by imposing a tax liability and then issuing the currency used by those with tax liabilities to meet the obligation. The only difference in our example is that the US government has obtained output produced outside the USA, by those who are not subject to its sovereign power – in other words, by those not subject to US taxes. However, even within any nation there can be individuals who avoid and evade taxes imposed by the sovereign power, but who are still willing to offer their output to obtain the sovereign's currency. Why? Because those who are not able to avoid and evade taxes need the currency, and hence are willing to offer their

own output to obtain the currency. The US dollar has value outside the USA because US taxpayers need the currency. By this I do not mean to imply that US currency is only used to pay taxes, or that those who hold US currency or reserve deposits at the Fed do so on the knowledge that US taxpayers want high-powered money to pay taxes. Analytically, however, it is the taxing power of the US government that allows it to issue currency and reserves that are demanded domestically and abroad.

9. SEIGNIORAGE AND HEGEMONIC POWER VERSUS SOVEREIGNTY AND FLOATING RATES

The question is whether the US government is alone in its ability to issue sovereign currency accepted by those who are not subject to the sovereign's taxes. Obviously, it is not – other sovereign states operating on a floating rate regime and with a domestic currency are able to obtain the same 'seigniorage income' that the US government can obtain. And, just as in the case of the USA, the ability to obtain 'seigniorage income' is at bottom related to ability to impose taxes in the domestic currency – only the state has this power. Surely this cannot be controversial. Even the government of a small open economy can purchase imports using its own currency. Still, it can be argued that the USA reaps far more 'seigniorage income' than other nations, because dollar reserves (including US Treasury debt) relative to the size of the US economy are larger than the relative size of foreign holdings of sovereign debt for many other nations. Here we should distinguish between sovereign purchases and non-sovereign purchases. While 'seigniorage income' is sometimes equated to the total quantity of net imports, as we have shown above imports purchased by the non-sovereign population do not provide any 'free lunch' to those individual consumers. It is only the portion of a trade deficit that is due to sovereign purchases that can be said to provide a free lunch and seigniorage income. (Still, as discussed above, the USA as a whole does receive net benefits from a trade deficit, in the 'real' sense that it provides fewer goods and services than it receives. This is true for any nation that runs a trade deficit. So, one could see the entire trade deficit as a source of national seigniorage income, even though private purchases do not provide free lunches to individuals.)

The remaining question is whether this results from US hegemonic power, or whether it results mostly from self-imposed rules adopted by other nations. ROW preference for dollars is probably due, in part, to the sheer size of the US economy. However, the desire to hold dollar reserves could never be satisfied if the USA did not run trade deficits (particularly given the low levels of official aid offered by the USA). US trade deficits, in turn, require

that the rest of the world, taken as a whole, desires to sell more output to the USA than it is willing to buy from the USA. Given the rest of the world's desire to accumulate dollar reserves and its lack of desire to consume US output, the USA is 'forced' to reap 'seigniorage income' (again, with the caveat that, strictly speaking, only sovereign governments receive seigniorage, although any net importer receives net benefits). If, say, Japan and Euroland decided to pump up their economies sufficiently to eliminate their trade surpluses, they, too, would be 'forced' to reap some 'seigniorage income' – and US 'seigniorage income' would probably decline as exports to those nations rose.

The counter-argument is that only the USA can run persistent trade deficits without causing exchange rate depreciation. Perhaps, but that, too, requires 'two to tango'. So long as the rest of the world wants more dollar reserves, the dollar will remain strong even in the presence of a US trade deficit. Under the current 'rules of the game' adopted by most nations of the world, national economic success is measured by the quantity of dollar reserves accumulated – just as mercantilist nations measured success by gold inflows. Such behavior is perfectly justified for fixed exchange rate regimes, and it severely constrains domestic fiscal (and monetary) policy in such nations. However, analysis for countries on flexible exchange rate regimes requires a 'paradigmatic shift'. Further, accumulating evidence demonstrates the costs of fixed exchange rate regimes – high unemployment, low economic growth, fiscal and monetary policy constraints – and the advantages of floating rate regimes.

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