Inflation targets

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In June, the Government updated its inflation target: the authorities will continue to aim at a target for RPIX inflation of 2¹/₂% or less beyond the end of the present parliament.

Earlier this year, the Bank organised a conference attended by representatives of the central banks of countries using inflation targets as the basis for their monetary policy framework. This article summarises a number of the main issues—both conceptual and technical—raised by the use of inflation targets, which were discussed at that conference.

Introduction

In his Mansion House speech on 14 June, the Chancellor updated the Government's inflation target. The authorities will continue to aim at a target for RPIX inflation—the twelve-month change in the retail prices index excluding mortgage interest payments—of 2¹/₂% or less beyond the end of the present parliament (when the earlier target expires). This is in line with inflation objectives in the rest of Europe. And its attainment would mark a considerable improvement in the United Kingdom's inflation performance compared with the average during the post-war period. The Chancellor added that setting interest rates consistently at the level judged necessary to achieve the inflation target of 2¹/₂% or less should ensure that inflation will remain in a range of 1%–4%.

In March of this year, the Bank of England held a conference of central banks from those countries currently using inflation targets. Apart from the Bank of England and the Treasury, there were representatives from the Reserve Bank of Australia, the Bank of Canada, the Bank of Finland, the Bank of Israel, the Reserve Bank of New Zealand, the Bank of Spain and the Sveriges Riksbank. The aim of the conference was to discuss the main issues raised by inflation targets as a monetary policy framework, and to share experiences on their operation to date.[1]

This article discusses the historical backdrop to the adoption of inflation targets and some of the main issues raised by their use; it draws in places on contributions made at the conference. Some of these issues are conceptual and some narrowly technical: the article looks at each in turn.

The origin of inflation targets

Inflation targets are not a new concept. Their intellectual history can be traced back at least to the last century.

Writing in 1887, the British economist, Alfred Marshall, advocated a monetary system which 'adjusted to fix the purchasing power of each unit of the currency closely to an absolute standard'.[2] And later, in 1898, the Swedish economist, Knut Wicksell, advocated an explicit price-level standard for monetary policy.[3] Thirty years on, Sweden operated with such a price-level target during the early part of the 1930s.

As now, support for such a framework was far from universal. But the American economist, Irving Fisher, was one prominent proponent. Foreshadowing the Swedish experiment, he wrote in 1922:[4]

> 'For a hundred years the world has been suffering from periodic changes in the level of prices, producing alternate crises and depressions of trade. . . . It is not too much to say that the evils of a variable monetary standard are among the most serious economic evils with which civilisation has to deal; and the practical problem of finding a solution of the difficulty is of international extent and importance.'

That practical problem was not widely accepted—much less acted upon—in the decades following the Second World War, when monetary policy was instead geared principally to demand management. But the intellectual climate changed in the 1970s. Monetarism—domestic or international—took centre-stage. And attention gradually refocused on price stability as the appropriate medium-term objective of monetary policy.

At first, this objective was generally pursued using *intermediate* policy targets, whether for money or the exchange rate. The idea was that by regulating the intermediate variable, the ultimate objective—price stability—could be attained indirectly. It is only recently

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(1) The proceedings of the conference, including a record of the discussions, will be published by the Bank later in the year.
(2) See Marshall, A (1887), 'Remedies for fluctuation in general prices', *The Contemporary Review*.
(3) See Wicksell, K (1898), *Interest and prices*, MacMillan.
(4) See Fisher, I (1922), *The purchasing power of money*, MacMillan.

Inflation objectives in selected countries

Country	Price index	Quantitative objective (for annual inflation)	Time-specific?	Exemptions and caveats
Countries with inflation targets				
Australia	CPI	Average of 2%–3%	No: medium-term.	Mortgage interest payments, government-controlled prices and energy prices.
Canada	CPI	1%–3% between 1995 and 1998	Yes	Indirect taxes, food and energy prices (operational exemption).
Finland	CPI	About 2% from 1995	No	Housing capital costs, indirect taxes and government subsidies.
Israel	CPI	8%–11% for 1995	Yes: updated annually.	None.
New Zealand	CPI	0%–2%	Yes: updated annually.	Commodity prices, government-controlled prices, interest and credit charges.
Spain	CPI	Below 3% by 1997	Yes	Mortgage interest payments.
Sweden	CPI	2% +/-1% from 1995	No	None.
United Kingdom	RPIX	2$\frac{1}{2}$% or less	No	Mortgage interest payments.
Countries with medium-term inflation objectives				
France	CPI	Upper limit of 2%	In part: for 1995 and the medium term.	None.
Germany	CPI	Upper limit of 2%	No: medium term.	None.

that the possibility of targeting inflation *directly* has come to the policy forefront.

To date during the 1990s, a number of countries have adopted a monetary policy framework centred on explicit inflation targets. Such a framework was first adopted in New Zealand in 1990, under the Policy Targets Agreement. This followed the 1989 Reserve Bank of New Zealand Act, which had established a statutory commitment to price stability. Canada followed in February 1991—by introducing inflation-reduction targets, in a joint declaration by the Bank of Canada and the Canadian government. Since then, inflation targets have been adopted in Israel in December 1991; in the United Kingdom in October 1992; in Sweden and Finland in the early part of 1993; in Mexico in September 1994; and, most recently, in Spain in November of last year.[1]

Almost all the inflation-target countries represented at the Bank's conference had used some form of intermediate target at an earlier stage. The adoption of a final-target strategy had, in part at least, been the result either of disillusionment with monetary aggregates as a nominal anchor (as, for example, in Canada); or of problems in maintaining an exchange rate peg (for example in Sweden and Finland); or of a combination of the two (as, for example, in the United Kingdom). In some cases, the adoption of an inflation target had not led to the complete abandonment of other, intermediate targets. Israel and Spain, for example, continue to pursue an exchange rate objective in tandem with their inflation targets.

A number of the countries that continue to use intermediate targets have found it useful also to state their medium-term price-stability objectives explicitly: Germany and France are two European examples. The table above summarises

the inflation targets used in those countries that have adopted them, and also identifies price-stability objectives in some countries not using inflation targets. As it shows, even among those countries with inflation targets, some inflation objectives are more specific than others. Indeed, because almost all central banks now identify price stability as the primary objective of monetary policy, in classifying policy frameworks it is probably more helpful to look at how specific a country's inflation objective is, rather than to distinguish between intermediate and final-target countries. The next section considers this latter distinction further.

Conceptual issues in inflation targeting

Intermediate and final targets

It is now widely accepted that price stability should be the primary objective of monetary policy. As a theoretical matter, this focus follows from the proposition that in the long run the level of real activity is invariant to monetary policy: money is *neutral*. Money-neutrality has wide— though by no means universal—academic support. And it implies that, in equilibrium, the most that monetary policy can achieve is a desired rate of inflation or price level. Because the end-product of monetary policy actions are inflation outcomes, countries with inflation targets are often said to pursue *final-target* strategies. They are thereby distinguished from countries pursuing *intermediate-target* strategies—using either the exchange rate, or some measure of money or credit.

Ultimately, however, the distinction is probably more semantic than economic. Any country adhering to a monetary target, for example, must implicitly have a price objective embedded within this target, just as implicit assumptions have to be made about trends in the velocity of circulation of money and in real activity. And likewise

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[1] It is difficult to date precisely the introduction of an inflation objective in Australia; it has gradually increased in importance over the past couple of years.

within a managed exchange rate regime, where the aim of monetary policy is to import the inflation performance of the 'anchor' currency. So, in terms of the objectives of policy, final and intermediate-target approaches have clear similarities.

The two approaches might differ in the method by which monetary policy is steered towards these objectives. But again, in practice this difference is easily exaggerated. The rationale for intermediate targets rests on the lags in the transmission of monetary policy impulses through to final demand and to prices; given these lags, intermediate indicators may be useful as guideposts for monetary policy decisions, provided they can offer accurate early-warning signals of incipient inflationary pressures. To serve this role, an intermediate indicator must satisfy three criteria: it must be *controllable,* using the available monetary policy instruments; the relationship between it and the final objective must be *predictable*; and it must be a *leading indicator* of future nominal variables.

But it would be wrong to think that final-target approaches dispense with the need for intermediate variables. Indeed, the United Kingdom's inflation-target approach has them at its centre.[1] These intermediate variables are manifold. One influential example is the Bank's inflation projection—published quarterly in the *Inflation Report*. Because the projection offers advance warnings of inflationary pressures which then serve as a guidepost for monetary policy decisions, it is plainly an intermediate variable. And it is clearly also actively used by the UK monetary authorities. Moreover, because it is a forecast conditional on monetary policy instrument settings,[2] is unbiased and is explicitly forward-looking, the Bank's inflation projection satisfies all three criteria required of any robust intermediate variable.

The Bank's inflation projection—when taken alongside the other intermediate variables which make up the inflationary assessment—influences monetary policy decisions in much the same way as does any other intermediate variable. If expected inflation is thought to lie above target, then the presumption is that the Bank should advise that monetary policy ought to be tightened; and conversely when the projection lies below the target. In practice, the risks on either side of the central projection also have a bearing on the advice the Bank offers. These risks may sometimes be asymmetric, in which case the Bank might advise a change in monetary policy despite the central projection being in line with the inflation target.

Conducting monetary policy in this way is equivalent to following a monetary policy *feedback* rule: judgments on monetary policy depend on—or feed back from—the deviation between expected inflation and the inflation target.

There is a substantial literature, both theoretical and empirical, on the performance of feedback rules of this type. Most of it points to the superiority of feedback rules over more mechanistic formulations, such as a fixed *k*% money-growth rule or a rigidly fixed exchange rate regime.[3] Feedback rules are, in general, welfare-improving. Whether any particular rule is 'optimal'—or welfare-maximising—depends on the variables used in it and the weights applied to them. This issue is discussed below.

To summarise, the differences between intermediate and final-target approaches may be more apparent than real. The approaches have the same (or similar) goals. And both actively use intermediate information variables. The differences between them relate mainly to the different weights they place on the indicators feeding into the forward-looking inflation assessment. A country pursuing a strict intermediate monetary target will place a large—possibly 100%—weight on money growth relative to its target. What weights do inflation-target countries place on monetary and other information variables?

Policy-making using information variables

In the United Kingdom's monetary framework, a wide array of real and monetary indicators—or *information variables*—are used to gauge incipient price and spending patterns. The latest Financial Statement and Budget Report refers to monetary aggregates (broad and narrow), the exchange rate and other asset prices, inflation expectations, measures of activity, fiscal policy, and prices and costs as among the indicators routinely assessed when setting monetary policy. And this eclectic approach is evident too from the detailed disaggregated analysis included in the Bank's *Inflation Report*, and from the discussions at the monthly meetings between the Chancellor and Governor, the minutes of which are now published. This 'look-at-everything' approach is not unique to inflation-target countries: most countries make explicit reference to a range of indicators when forming their inflation assessment; and in the United Kingdom, it has been standard practice from as early as the 1970s to look at a wide range of information variables.

The Bank's inflation projection provides one of a number of useful summary statistics of the inflationary information content of these myriad indicators: it draws the disparate set of information into a consistent, and easily monitored, whole. But the inflation projection is not derived mechanistically; it is not simply extracted from a model of the economy. Nor—even in theory—should it be. For when monetary policy is set, there is a premium on using *all* useful indicators, irrespective of their causal significance and so irrespective of whether or not they have a role to play in such a model.[4] As a consequence, the inflation projection draws in other (than model) information—including from

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(1) For the genesis, technical details and history of the United Kingdom's inflation target, see Bowen, A (1995), 'Inflation targetry in the United Kingdom', *mimeo*, Bank of England.
(2) It is conditional, in particular, on short-term official interest rates remaining unchanged.
(3) See, for example, Friedman, B M (1975), 'Targets, instruments and indicators of monetary policy', *Journal of Monetary Economics*, *1*, pages 443–73; Buiter, W H (1981), 'The superiority of contingent rules over fixed rules in models with rational expectations', *Economic Journal*, *91*, pages 647–70; Dotsey, M and King, R G (1986), 'Informational implications of interest rate rules', *American Economic Review*, *76*, pages 33–42; and Haldane, A G (1995), 'Rules, discretion and the United Kingdom's new monetary framework', *mimeo*, Bank of England, for a summary.
(4) Friedman (*op. cit.*) illustrates how structural causality between indicator and target variables is irrelevant when using an information-variable approach.

time-series leading-indicator models, from surveys of various sorts, from economic theory and from information received from the Bank's agents around the country. Judgment also plays a crucial role in arriving at the projection.

In addition, the focus in the *Inflation Report* has increasingly shifted from the Bank's central inflation projection towards looking at the *distribution* of likely inflation outcomes around this projection. The confidence intervals included in the chart in the *Inflation Report* that gives the inflation projection are the clearest indication of this. These offer some information on the likely scale of the risks surrounding the central projection, based on past forecast errors. Other information—and judgment—also help when weighing up the balance of inflation risks around the central projection, especially when these risks are thought to be asymmetric.[1]

At the inflation-targets conference, it was clear that most of the other central banks pursuing inflation targets use information variables in a similar way to the United Kingdom. Initially, the introduction of an inflation target seems to have had a limited impact on the mechanics of monetary policy formulation. But slowly, the inflation target has grown in importance—not least by focusing attention on the inflation outlook two years ahead.

In many countries, the most important mechanical change resulting from the adoption of inflation targets is the increased emphasis on inflation projections. Making such projections, it was argued, is inescapable. Monetary policy-making—however conducted—requires a forward-looking assessment of inflationary trends. Indeed, by underlining this, inflation targets had, in the view of most countries, fulfilled an invaluable educational role. Policy discussions no longer sought to answer the question: 'What is the desirable point on the short-run output/inflation trade-off?' Instead, they centred more often on: 'Where is inflation going to be two years hence?'

For most inflation-target countries, the central bank's model-based extrapolations provide the starting-point in the information-assimilation process: they provide a baseline, ensuring consistency in the projection (in an accounting sense) and serving to highlight the key structural factors impinging on the projection. To this baseline is then added further information, including from leading-indicator models, economic theory and judgment—as in the United Kingdom.

But projections bring their own problems. There was universal acknowledgement at the conference of the significant degree of uncertainty surrounding inflation projections. More than one representative noted that, in practice, projections do little better than a random walk—a 'no-change' forecast—in predicting inflation over the short run. But some of this uncertainty is simply intrinsic—the product of unpredictable shocks to behavioural variables or

relationships. And encouragingly, there is evidence from some countries that the errors in inflation projections may themselves have diminished recently in a low-inflation environment. This would be consistent with the stylised fact that the variability of inflation is lower at low rates of inflation.

Because of these uncertainties, most of those at the conference believed that an awareness of the balance of inflation risks was as important as the central projection. They were thus shifting—implicitly or explicitly—towards a probabilistic approach towards monetary policy formulation. Off-model information in general, and judgment in particular, was judged to play a significant role in pinpointing the balance and scale of risks around the central projection. To summarise, there appear to be some striking similarities between the mechanics of monetary policy formulation among inflation-target countries: in particular, the emphasis placed on inflation projections as a summary statistic of the information contained in the various indicators which are monitored; and the heightened focus on the distribution of inflation outcomes around this projection.

So how does this 'look-at-everything' and probabilistic final-target approach compare with the alternatives, such as single-variable intermediate targeting? In the limit, intermediate variable approaches can be thought to place a 100% weight on a single indicator. But according to economic theory, the 'optimal' feedback rule will typically take account not of a single variable—whether broad money or anything else—but of a whole set of information variables. To do otherwise is unnecessarily and arbitrarily to restrict the arguments, and so the information, entering the authorities' feedback rule. Moreover, a 'look-at-everything' approach can act as an insurance policy against the type of model uncertainties that policy-makers routinely face. An analogy can be drawn with a standard portfolio choice problem to illustrate this.[2]

Monetary policy-makers, like investors, are risk-averse utility-maximisers. They are obliged to make a difficult choice among assets (information variables) yielding uncertain future returns (information). In an uncertain world, the optimal asset portfolio will typically be a diversified one—for the reason that it normally does not pay to put all your eggs in one basket. The same logic applies to the optimal policy portfolio. For example, a diversified policy portfolio helps, in part at least, to insulate the policy-maker from money velocity shocks; whereas clearly if money growth is used as a single intermediate variable, such insulation is not possible. Even if money embodied all useful information on future inflation, inflation-targeting would still be at least as good as money-targeting: both would simply place 100% weight on money outcomes. If, as seems more realistic, money is not information-encompassing, however, inflation-targeting will mean looking at a full range of information variables,

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(1) The risks implied by forecast error bands are, by construction, symmetric.
(2) Brainard was one of the first to liken optimal policy decision-making to optimal portfolio choice theory; see Brainard, W (1967), 'Uncertainty and the effectiveness of policy', *American Economic Review*, 57, pages 411–25.

suitably weighted, when framing monetary policy decisions. And this is then a preferred—diversified—policy portfolio.

Viewing policy as a portfolio problem—with similar uncertainties and unknowables—lends strong support to 'look-at-everything' monetary policy strategies. Inflation projections serve as a portmanteau for this mass of information. They thereby allow simple monitoring of policy assessments and actions—especially when the projection is published, as in the United Kingdom. Such transparency about policy actions and intentions can itself enhance monetary policy credibility, for reasons discussed below.

The institutional setting for monetary policy

Following the adoption of inflation targets, a number of countries appear to have altered significantly—if gradually—their *internal* process of monetary policy formulation. At the same time, there has been a discernible shift towards greater openness and transparency in the policy process in many countries; the United Kingdom has itself made significant strides towards greater monetary policy transparency over the past few years. So recent changes in the monetary policy framework both in the United Kingdom and overseas may have an *external* dimension as well. Economic theory helps explain the benefits such transparency confers.

Many economists have identified a potential problem of 'inflation bias' when policy-makers are given complete discretion over monetary policy decisions.[1] This bias emerges when policy-makers have an incentive to spring inflationary surprises on private sector agents so as to reap the transient output rewards these might bring. As agents come to build the risk of such surprises into their expectations when setting prices, a higher equilibrium inflation rate obtains. In short, discretion in monetary policy imparts an endemic inflation bias, in the absence of some way of 'tying policy-makers' hands'.

A number of theoretical resolutions to this inflation bias problem have been put forward. These serve as a useful counterpoint to recent changes in the institutional setting for monetary policy in many countries—not least those countries with inflation targets.

One way of eliminating inflation bias is to increase the authorities' incentives to invest in a *reputation* for monetary rectitude: fears of damaged long-term reputation may dissuade policy-makers from pursuing short-term objectives. Just how great these incentives are will depend on the authorities' rate of time preference: the more they favour jam today over jam tomorrow, the less likely it is that fears of a diminished reputation will curtail inflation biases.

A second way is to *delegate* responsibility for monetary policy to a body with an explicit mandate to pursue price stability—a 'conservative' central banker.[2] Like reputation, delegation serves to lengthen the policy-makers' effective planning horizon, so lessening inflation bias.

A third solution is to write a *contract* for the central bank. Suitably designed, such a contract could provide the central bank with the right incentives not to pursue inflation-biased policies, by penalising it if the inflation target was breached.[3] A number of researchers have shown that, under certain assumptions, a linear tax levied on the central bank when inflation is above target could secure just such an optimal outcome.

The adoption of inflation targets—and the greater policy transparency that has accompanied them—can be seen as one practical response to the inflation bias problem: these developments can be likened to the reputation or delegation solutions. The existence of the target increases the importance placed on inflation stabilisation by the authorities, so reducing the relative attraction of the short-run output gains from surprise inflation. Monetary policy myopia is thus reduced. And as agents learn about the authorities' longer-term policy preferences, inflation biases are reduced too. Several central banks at the conference commented on exactly this behavioural shift: private sector agents had begun to lower their inflation expectations as it became clear that the focus of policy debate had shifted towards meeting the inflation target.

Greater transparency about monetary policy-making can assist in this process. By making clear the nature of internal policy debate and the incentives that drive monetary policy decisions, transparency defuses inflation biases. The scope for surprising the public—by inflating and gaining the short-run output rewards—is severely constrained if the monetary policy process is highly transparent. Private sector agents will quickly detect any myopic monetary policy strategy. And they will penalise the authorities for it by raising their inflation expectations, so that monetary policy credibility is instantly sacrificed. With this at stake, the authorities have less incentive to inflate in the first place—thereby diminishing inflation biases.

In the United Kingdom, the publication of the Bank's *Inflation Report* and of the minutes of the monthly meetings between the Chancellor and the Governor have made clear the focus and orientation of monetary policy decisions. They have also made the Bank more accountable for its advice on monetary policy—as has the decision to give the Bank discretion over the timing of interest rate changes. To borrow a term from the banking literature, the Bank has over the last few years become a 'delegated monitor' of inflation: it has been given the explicit task of monitoring inflationary

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(1) This was first established formally in Kydland, F E and Prescott, E C (1977), 'Rules rather than discretion: the inconsistency of optimal plans', *Journal of Political Economy*, 85, pages 473–91. It has subsequently been popularised in the monetary policy game of Barro, R J and Gordon, D (1983), 'A positive theory of monetary policy in a natural rate model', *Journal of Political Economy*, 91, pages 589–610.
(2) The notion of a 'conservative' central banker is Rogoff's; he discusses solutions such as this to the inflation bias problem in Rogoff, K (1985), 'The optimal degree of commitment to an intermediate target', *Quarterly Journal of Economics*, 100, pages 1,169–89.
(3) For discussions of contractual solutions of this sort, see Walsh, C E (1993), 'Optimal contracts for independent central bankers: private information, performance measures and reappointment', *mimeo*, University of California, and Persson, T and Tabellini, G (1993), 'Designing institutions for monetary stability', *Carnegie-Rochester Conference Series on Public Policy*, 39, pages 53–84.

trends in the United Kingdom and offering independent advice on monetary policy; and recently this advice has been made fully transparent to private sector agents.

But if the Bank is to serve as an effective monitor, some method of monitoring its advice is also necessary. The *Inflation Report* has again been central in ensuring effective monitoring here. The publication of the Bank's inflation projection, and its accompanying analysis, allows its analytical competence and advice to be monitored—and, if necessary, questioned. This, in turn, increases the incentive for the Bank to ensure its analysis is of high quality.

Among other countries with inflation targets, there is a spectrum of positions on policy transparency. There has, however, been a general shift in recent years towards greater openness. New Zealand is at one end of the spectrum (with the United Kingdom). It publishes both inflation projections and forecasts for other variables. No inflation-target country other than the United Kingdom publishes the minutes of the regular meetings of its monetary policy council.[1]

Most inflation-target countries at the conference were in the process of reviewing publication and transparency issues. Some had plans to publish an *Inflation Report* or something similar. For example, the Bank of Spain began publishing its *Inflation Report* in March of this year; and the Bank of Canada published its first twice-yearly *Monetary Policy Report* in May. These countries have joined the United Kingdom, New Zealand and Sweden, which began publishing reports of this kind following their adoption of inflation targets.

But greater policy transparency is not costless. It is perceived by many inflation-target countries to carry risks, not least heightened market sensitivity to policy announcements and publications. These costs—allied with the recognition that, once secured, greater transparency is difficult to reverse—have led many central banks to move cautiously. But, on the basis of experience to date, the benefits of greater openness are perceived by most countries to have far outweighed the costs. This is all the more encouraging given the substantial differences in legislative status and degree of autonomy among inflation-target central banks.

Few countries have explicitly pursued the contractual solution to the inflation bias problem. But New Zealand's Policy Targets Agreement is one notable exception, since it contains a provision for the dismissal of the central bank governor in the event of the inflation target being breached. This provides the central bank with a statutory incentive not to pursue inflation-biased policies—even though it is not

strictly a *linear* tax on above-target inflation outcomes. The fixing of the Reserve Bank of New Zealand's budget in nominal terms *is* akin to such a linear tax, however, even though it was not expressly designed with that intention.[2]

Technical issues in inflation targeting

Although price stability has assumed pre-eminence among monetary policy objectives in recent years, precise definitions of price stability have remained rather elusive.[3] The issue is by no means trivial. It touches on a number of technical questions: which price index to target? what mid-point to aim for? whether to have a range or exemptions? Existing theory and empirical evidence is able to provide only tentative answers to these.

Choice of price index and exemptions

Virtually all countries with inflation targets define them over a basket of retail, or consumer, goods—a retail prices index (RPI) or consumer price index (CPI). Such indices are well understood, timely and subject to little revision. The only major alternative as a target price index would be the GDP deflator. This has the advantage of wider coverage but is less well understood, available only with a lag and often subject to substantial revision. The differences between the competing price indices may, in any case, be fairly small over a long horizon.[4]

For operational purposes, countries with inflation targets often focus on measures of 'underlying' inflation; that is, targeted price indices are frequently qualified with exemptions or escape clauses—explicit or implicit—for certain types of price shock which, it is believed, monetary policy may legitimately accommodate. In the United Kingdom, for example, the inflation target is expressed in terms of RPIX inflation—retail prices excluding mortgage interest payments. Use of this index prevents monetary policy actions—changes in short-term interest rates—having an initially perverse impact in relation to their final objective.[5]

Whether to exclude an economic shock from a price index—and so 'excuse' it when setting monetary policy—is, however, far from clear cut. It depends critically on the shock's origin and its expected persistence. For example, no countries seek to exempt the effect of *demand* shocks—such as shocks to government expenditure or changes in the 'animal spirits' of private sector agents. The inflationary influence of these types of shock is legitimately offset by monetary policy actions.

The case for exemption is perhaps strongest for *supply* shocks, such as indirect tax changes and exogenous terms of

(1) In Canada, however, the central bank governor's comments to the Board of Directors on monetary policy are published following the subsequent Board meeting.
(2) See Canzoneri, M B, Nolan, C and Yates, A (1995), 'Mechanisms for achieving monetary stability: inflation targeting versus the ERM', *mimeo*, Bank of England.
(3) See Goodhart, C A E and Vinals, J (1994), 'Strategy and tactics of monetary policy: examples from Europe and the Antipodes', *Banco de Espana Documento de Trabajo No 9,425*.
(4) Bank research has found that the price indices most often used in the United Kingdom cointegrate with one another, that is they share similar long-term trends; see Yates, A (1995), 'Room for manoeuvre? The problem of designing inflation targets', *mimeo*, Bank of England.
(5) Excluding mortgage interest payments excludes at least their *first-round* effects. But if, for example, nominal wages are set on the basis of headline inflation, then there is a *second-round* effect on prices from an interest rate change, and therefore still scope for a perverse impact on 'underlying' inflation measures.

trade shocks. These generate a once-and-for-all change in the equilibrium price *level* but, of themselves, should not affect *inflation* over the longer run.[1] Because they do have a temporary effect on measured headline inflation, however, this effect might legitimately be excluded from targeted price indices. For example, suppose there is an adverse terms of trade shift, induced by a one-off rise in oil prices. The price level will shift upwards and activity will contract. If monetary policy attempts to offset—rather than exempt—the transient effect of this shock on measured inflation, then activity will be depressed further, worsening the impact on output of the initial shock.[2]

So should all supply shocks be excluded from price indices? Again, there are no simple rules. Indirect tax changes provide perhaps the easiest case. It is straightforward to identify these when they occur. And it is also relatively easy to adjust price indices to take account of their first-round effects.[3] Reflecting this, indirect tax changes are excluded from the price indices used for operational purposes in, among other countries, Finland, New Zealand and Canada. In the United Kingdom, an RPIY measure of inflation— which excludes indirect taxes as well as mortgage interest payments—has been published and analysed by the Bank for some time. Responsibility for constructing this measure has recently passed to the Central Statistical Office.

Despite the attractions of the RPIY measure, in practice it is unclear whether an explicit quantitative (rather than implicit qualitative) exemption of indirect tax effects is actually necessary—either for the authorities when gauging underlying inflationary pressures, or for private sector agents when monitoring inflation performance. And if price indices are meant to capture the prices people actually pay for goods, then excluding indirect taxes may be inappropriate, since these constitute a genuine cost to consumers.

Partly for these reasons, there was no clear consensus among representatives at the conference whether indirect taxes should be excluded from targeted price indices. The choice is finely balanced. The United Kingdom's inflation target is defined in terms of RPIX inflation, which includes indirect taxes. As in other countries, however, the UK authorities monitor a range of inflation indices when gauging underlying inflationary pressures.

The picture is still less clear in the case of terms of trade exemptions. At a practical level, the identification of one-off terms of trade shocks is far harder than with indirect tax changes. The exclusion of their first-round effects from price indices is also more problematic, because these effects show up to differing degrees across a range of goods and services. And from a theoretical perspective, it is by no means clear that all terms of trade shocks should be excluded *equally.* For example, equal and offsetting changes in export and import prices may have the same substitution (price)

effect on demand; but their income effects may well work in opposite directions—which may, in turn, call for different treatment. For these reasons, most countries have—if anything—preferred *qualitative* exemptions for external price shocks.

There is a third class of supply shocks—those deriving from changes in domestic private sector behaviour—which no country has sought to exempt. For example, the recent effects of increased competition within the UK retail sector are not exempted. Because such supply-side influences are rooted in private sector behaviour, the effects are usually difficult to identify and may be spread over a long period rather than being one-off. It seems to be for these practical reasons that explicit exemptions have not been sought—even though, in principle, the effect of these supply shocks is the same as any other.

Looking across inflation-target countries, other criteria have also often been used to justify exemptions. In some countries, the most volatile or seasonal components of price indices are sometimes excluded: for example, food and energy prices are excluded from the operational measure of inflation used by the Bank of Canada. And in New Zealand, government-administered prices outside the control of the central bank are exempted.

It is difficult to judge where best to draw the line in exempting shocks. There is clearly a balance to be struck between having a genuine underlying (fully state-contingent) inflation measure on the one hand, and having a measure which adequately captures the costs of inflation on the other. Some measures of underlying inflation may not pick up the true cost of inflationary fluctuations—which would defeat the purpose of targeting inflation in the first place. For example, excluding terms of trade changes from price indices in small, very open economies may not be sensible, because many of the costs of inflation in these countries derive precisely from external fluctuations. It was clear from the conference that there is no universally agreed criterion by which to judge which shocks should be excluded. Further empirical and theoretical work on the costs of inflation is needed, since ultimately it is these costs which should decide inflation target exemptions.

Mid-point of a target range

The question of the appropriate mid-point for an inflation target turns on two issues—one theoretical and one statistical.

The *theoretical* issue is: what is the 'optimal rate of inflation'? A number of arguments have been put forward to suggest that it may be positive. One of these centres on the so-called 'Summers effect'. Nominal interest rates cannot in normal circumstances be negative, which may in turn

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(1) Again, this should be understood in relation to the first-round effects of a terms of trade shock, and not to any induced second-round effects via a wage-price spiral.
(2) See, for example, Bean, C R (1983), 'Targeting nominal income: an appraisal', *Economic Journal*, *93*, pages 806–19, which shows that nominal income targets may induce a preferred monetary policy response to supply disturbances.
(3) Adjustment does, however, typically involve an assumption of full and immediate pass-through of the tax change into retail prices. And the validity of this assumption varies both across time and across goods, depending upon the microstructure of the goods market and prevailing demand conditions.

circumscribe the monetary authorities' ability to secure *negative* real interest rates if inflation is targeted at zero.[1] A second argument, owing originally to Tobin, is that inflation may serve as a lubricant for the price mechanism. If there are downward rigidities in nominal wages, then positive inflation may be an easier—and less costly—way of engineering the real-wage adjustments often necessary for efficient factor reallocation. These downward nominal rigidities may result in a higher short-run trade-off between output and inflation at low rates of inflation: reducing inflation by a further percentage point will be increasingly costly in terms of output forgone.[2]

Identifying these arguments for a positive rate of inflation is one thing, quantifying them empirically quite another. The empirical evidence is often equivocal. For example, work on the United Kingdom, United States and Canada has often failed to find evidence of sizable downward rigidities in nominal wage behaviour.[3] And evidence of downward rigidities in nominal prices is also mixed. Further, even if these rigidities were shown to be important, it is arguable whether monetary accommodation would be a better way of dealing with them than remedying the source of the rigidity in the first place.

Likewise on the Summers effect, it is questionable whether negative—rather than just below-equilibrium—real interest rates are actually ever necessary to boost output. And monetary accommodation may in any case be a less effective solution than, say, fiscal accommodation. From all of this, it is quite difficult to mount a wholly convincing case for an 'optimal rate of inflation' very different from zero.

The *statistical* issue is: how large are the biases in measured inflation? There are a number of sources of bias. One is 'substitution bias', which arises because the fixed weights used in CPIs may fail fully to capture product substitution, in favour either of cheaper goods or cheaper retail outlets. A second results from CPIs' inability fully to reflect improvements over time in the quality of goods and services: today's television is not that of ten years ago. Estimates of these various biases have been calculated in North America. They vary, but most central estimates do not exceed one percentage point a year. Estimates in Canada, for example, have put an upper bound of around 0.6 percentage points a year on measurement biases.[4] Preliminary work in the United Kingdom has suggested estimates of the same magnitude. And representatives at the conference reported similar results for their countries.

An inflation target mid-point of around 1%—to allow for estimated bias in measured inflation—is somewhat lower than the current mid-point in most countries (see the table above); New Zealand's 0%–2% range is the only exception. But for many countries, inflation targets are still at an early

stage. And it is crucial then that the targets are realistic (given the starting-point for inflation) and are met, so that credibility can begin to be acquired.

A number of those at the conference argued that the mid-point of the inflation target should be stated explicitly, irrespective of whether or not there is a range around it. This would make the target for forward-looking monetary policy decisions fully transparent. Regardless of where inflation was within the band, the expectation would be that monetary policy is aiming at the inflation target mid-point. The danger of announcing only a target band, without a mid-point, is that agents will come to believe that the authorities are content with inflation at its upper limit: the range becomes a 'range of indifference'.

The United Kingdom's new inflation target aims explicitly at inflation of $2^1/_2$% or less. It thus makes clear the *ex ante* focus for forward-looking monetary policy decisions. Making the point target for inflation fully transparent should prevent inflation expectations becoming lodged at the upper end of a range—provided monetary policy is expected to be aimed at achieving this target.

Width of a range

Although the focus for monetary policy decisions should clearly be the inflation target mid-point, hitting this mid-point exactly is very unlikely because of the uncertainties which surround any forward-looking inflation assessment. For this reason, ranges have a role to play. They offer a means of quantifying the likely variation in inflation outturns arising as a result of uncertainties. For example, a range of x% might be specified, which was expected to encompass y% of the likely variation in inflation outcomes. In this way, ranges serve a monitoring or transparency role: they inform private sector agents of the probable range of inflation outcomes—even when monetary policy is consistently well-directed—so that deviant outturns are not immediately interpreted as inflationary surprises.

In choosing an appropriate range, there is a trade-off between credibility and flexibility. A narrow range improves policy credibility, by helping to pin down the price expectations of private sector agents and the inflation preferences of the monetary authorities. But it does so at the expense of flexibility. There is less latitude for inflation to fluctuate as the economy is buffeted by shocks. And a narrow band may therefore carry a credibility cost, if target ranges are breached too frequently.

Clearly, a key factor affecting the appropriate width of the range is the degree of uncertainty regarding the target variable. This determines the likelihood that a given range will be breached. There are many sources of such

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(1) See Summers, L H (1991), 'How should long-term monetary policy be determined?', *Journal of Money, Credit and Banking*, *23*, pages 625–31.
(2) Downward nominal rigidities may disappear in a low-inflation regime, however, in which case there is no reason then to expect the short-run Phillips curve to flatten at low rates of inflation. New Keynesian models are unclear about which of these scenarios is more likely.
(3) See, for example, Lebow, D E, Roberts, J M and Stockton, D J (1992), 'Economic performance under price stability', *United States Board of Governors of the Federal Reserve System, Working Paper No 125*, for the United States; Crawford, A and Dupasquier, C (1994), 'Can inflation serve as a lubricant for market equilibrium?', in *Economic Behaviour and Policy Choice Under Price Stability*, Bank of Canada, for Canada; and Yates *(op. cit.)*, for the United Kingdom.
(4) See Crawford, A (1993), 'Measurement biases in the Canadian CPI', *Technical Report No 64*, Bank of Canada.

uncertainty: unpredictable macroeconomic shocks; uncertainty surrounding the empirically estimated model of the economy; and the 'long and variable lags' in the effects of monetary policy changes upon prices. Quantifying these uncertainties is difficult.

Historical experience can offer some guide. In the past, a range of two to three percentage points—the typical range of an inflation target—would have been insufficient to encompass inflation uncertainties in the United Kingdom with even a 50% probability. Nor have such uncertainties been unique to the United Kingdom. A two percentage point range (around its mean value) would have covered only around a half of inflation outcomes in Germany in the period since the Bundesbank was set up in 1957. Forecast errors— in the United Kingdom and elsewhere—also point towards a fairly substantial lump of inflation uncertainty.

But this historical experience was, of course, in part the product of the authorities' prevailing inflation preferences. If the authorities' preferences are now for lower inflation, then history may be an unreliable guide to the future. Counterfactual simulations studies can go some way towards overcoming this problem, by 're-running history' under the assumption that an inflation-target regime had been in place throughout the period. But simulation studies such as these, if anything, add weight to the view that existing band widths may accommodate inflation uncertainties less than fully.[1]

All of this evidence presupposes that unpredictable shocks to the economy in the past are a good guide to those in the future. This may not be the case. A low-inflation regime may itself help dampen inflation uncertainties. For example, there is a large body of empirical evidence which suggests that inflation variability may be lower at low rates of inflation. And having guided inflation down to within its 0%–2% range, the authorities in New Zealand have largely succeeded in keeping inflation within this range over the past two or three years. The monetary policy framework in New Zealand—as in all other inflation-target countries—is, however, yet to be tested over a full cycle. So experience of operating within a low-inflation environment is too limited to be conclusive about the extent of likely inflation uncertainties.

Among inflation-target countries, there are clear differences of view on the appropriate width of the range. These are reflected in operational practice: some (Australia, Finland and Spain, for example) have opted for point targets or upper limits; some (including Canada, Israel and New Zealand) for target bands; and others (Sweden and the United Kingdom) for a target with a range around it.

Band width clearly cannot be viewed in isolation from other aspects of inflation target design. A wide range is a possible alternative to including exemptions in the inflation target. And both band width and exemptions are possible alternatives to fixing the inflation objective over a longer horizon, which would allow the short-run effect of temporary shocks to wash away. So, for example, Canada excludes volatile components from its operational target and New Zealand has caveats for certain shocks, both of which permit a narrower range. At the other end of the spectrum, France and Germany have no ranges or exemptions, but define their inflation objectives over a sufficiently lengthy— medium-term—horizon that the effect of temporary shocks can average out.

Inflation or price-level targets?

Against the inflationary backdrop of the 1970s and 1980s, the notion of targeting a price *level*—rather than a rate of inflation—seems rather fanciful. But those decades were not typical. The level of the UK RPI has *fallen* in almost a third of the years since 1800—despite having fallen in only one since the Great Depression.[2] Moreover, for much the greater part of the last century the United Kingdom and other countries adhered to a fixed exchange rate regime—a regime which *de facto* imposes a price-level target if the anchor currency country is targeting zero inflation on average. Recently, work at the Bank of Canada has revived interest in price-level targeting.[3] This and other research suggests a number of advantages and disadvantages of price-level targets.

The major benefit is reduced low-frequency, long-run uncertainty about the future price level. All shocks to the price level are (eventually) reversed—rather than accommodated—under a price level target, eliminating 'base drift'. Inflation targets, by contrast, accommodate one-off price shocks, introducing a trend into the price level: there is 'base drift'. As a result, with an inflation target uncertainty about the price level builds up over time.

As an example of the scale of this, simulations of the UK economy (covering the period between 1960 and 1994) suggest that inflation targets would increase price-level uncertainty by a factor of at least four compared with a price-level target. Such price-level uncertainty might be thought especially harmful to those entering into longer-term, non-indexed contracts—for example, by inducing front-end loading of debt repayments. And more generally, it would clearly undermine money's role as a unit of account—and so impose an external cost on all users of the currency.

The major costs of price-level targeting seem to be twofold. First, it leads to greater high-frequency, short-run inflation variability. This can be seen intuitively from the fact that, with a price-level target, every bout of above-target inflation

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(1) See Fillion, J-F and Tetlow, R (1994), 'Zero-inflation or price level targeting? Some answers from stochastic simulation on a small open-economy macro model', in *Economic behaviour and policy choice under price stability*, Bank of Canada, for Canada; Debelle, G and Stevens, G (1995), 'Monetary policy goals for inflation in Australia', *mimeo*, Reserve Bank of Australia, for Australia; and Haldane, A G and Salmon, C K (1995), 'Three issues on inflation targets', *mimeo*, Bank of England, for the United Kingdom.
(2) Price indices for the last century are not comparable with today's retail prices index, however.
(3) See Fillion and Tetlow (*op. cit.*), Duguay, P (1994), 'Some thoughts on price stability versus zero inflation', *mimeo*, Bank of Canada, for some Canadian evidence; and Lebow *et al* (*op. cit.*) for the United States. The Bank has also done some preliminary work in this area: see Haldane and Salmon (*op. cit.*).

needs to be counterbalanced by a bout of below-target inflation at a later date. Estimates for the United Kingdom suggest that a price-level target may more than double the variability of year-to-year price-level changes compared with an inflation target.[1]

Second, price-level targets may heighten output variability. In the event of an adverse supply shock, for example, the aim with a price-level target is to offset—rather than accommodate—the shock by disinflating the economy. And this may in turn have an output cost, which will supplement the negative effect on output of the initial shock. Inflation targeting, by contrast, accommodates some of the price shock, resulting in fewer output costs.

The choice is therefore between low-frequency price-level uncertainty on the one hand, and high-frequency variability in inflation—and perhaps output—on the other. The relative cost of these outcomes then determines the choice between price-level and inflation targets. Unfortunately, theory and empirical evidence are largely mute when it comes to quantifying such costs. Resolution of this issue again calls for further research on the costs of inflation.

Among the conference representatives, most viewed price-level targets as a distant possibility. Inflation targets were a possible staging-post. But whether countries ended up with a price-level target would first depend on their experiences with an inflation target; at the moment, it was too early to say. Unlike the adoption of inflation targets, price-level targets could be approached gradually in the light of experience. For example, the policy weight given to correcting deviations of the price level from its target could be increased slowly through time. In that way, the likely costs of adhering to a price-level target—short-run output and inflation variability—would be ameliorated.

Conclusions

Inflation targets pose a new set of issues for those countries pursuing them—some conceptual, others technical. They also increase the focus on a number of rather older issues. Foremost among these is finding a definition of price stability that is both theoretically meaningful and operationally workable. For countries with inflation targets, this definitional issue is central. They need to supplement the working definition suggested by Federal Reserve Chairman, Alan Greenspan—that 'price stability means that expected changes in the average price level are small enough and gradual enough that they do not materially enter business and household decisions'—to produce a concept that is sufficiently precise that it can form the basis for monetary policy actions month by month and quarter by quarter.

The inflation-targets conference was a useful step towards clarifying some of these issues. No central bank has yet settled on a definitive statement of price stability—though some have made real progress towards pinning it down. It is encouraging to see that there are many clear similarities in the mechanics of monetary policy implementation across inflation-target countries—and, probably, more widely: the increased focus on the need to form a forward-looking inflation assessment is a notable common theme. Yet at the same time, it was accepted that the true tests of the new frameworks lie ahead.

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(1) See also Fischer, S (1994), 'Modern central banking', in Capie, F, Goodhart, C A E, Fischer, S and Schnadt, N, *The future of central banking*, Cambridge University Press.