

The Whys and Wherefores of Controlling Inflation

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The paper develops a case that if inflation targeting is to be adopted then monetary authority should move away from one year to longer target period for inflation. Three years is the interval of time over which the inflation effects of monetary policy decisions are almost complete. It is suggested that an annual inflation target of 4 % with the proviso that this should be achieved over successive three years period could be set by allowing a deviation of 2% around the target at the end of each three years.

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1. Introduction

There are two types of animal conflated in the word “inflation.” One is *predicted* inflation. This is an insidious snake that is so often lurking in the grass. If it is high enough, it usually does considerable but subtle forms of general damage; and it must do so when conditions are otherwise ideal. The second is *surprise* inflation. This is like a bird that can soar in the air or dive deep into the water. It can be positive or negative, and typically it just redistributes the rewards from work or saving, in one direction or the other. This paper looks at both creatures, the snake and the bird, and at their implications for monetary policy. It starts with some remarks on the snake, and then moves on to the bird.

2. Predicted Inflation

Predicted inflation, in the long run, must refer to actual inflation. Under simple conditions, at least, it will also be characterized by constant inflation. What kind of long run trend should we ideally see in our price level?

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There are two unambiguous answers, both controversial. One is based on the premises that our economy is free of all distortions, and that money consists of fiat currency, bearing zero nominal return, which it is costless at the margin to create. The other rests on the supposition that the only relevant distortion in our economy is the fact that some industries generate products which are less than perfect substitutes for each other, and are manufactured by firms usually unable to alter their selling prices and sold under the conditions of imperfect competition.

The first was sketched out initially by Milton Friedman (1969). It is known as the doctrine of the Optimum Quantity of Money. Optimum monetary policy sets the nominal rate of interest, the opportunity cost of holding real cash, to zero. With the nominal rate equal to the sum of a given real rate of interest and the rate of expected – and in the long run, actual – inflation, that means that prices should on average be expected to *fall* at a speed equal to the real interest rate. So we should see not inflation, but deflation. This implication of Friedman's theory has been supported by much recent analysis, including, in particular, the elegant models of Rocheteau and Wright (2005) and Lagos and Wright (2005).

The second is due to Woodford (2003b). He argues that industries are typified by monopolistic competition. There is a given set of firms, each making a somewhat different product. Firms' prices are apt to stay stuck in nominal terms. Occasionally, and randomly, a firm gets the chance to reset its nominal price, for a period of similarly random length. Otherwise everything is symmetric. If inflation is zero, and stays zero, prices are identical. If inflation is positive or negative, wasteful discrepancies occur, which can only reduce the sum of human happiness. Friedman's argument is side-stepped; elsewhere at one important part of his book, Woodford takes the magnitude of real fiat money to be arbitrarily small, and this may be his justification (though it is not stated as such).

To portray Woodford's assumption about temporary price stickiness, which is imported from Calvo (1983), we could imagine that changing nominal prices requires official permission. The politician or civil servant in question awakes each morning to see an immense crowd of managers of firms seeking that permission, thronging his path to his work. The official has time to talk to only a handful of the lobbying managers, who are picked at random from the queue.

What ought to be is often linked to what is, or what has been. Episodes of price deflation are generally rare, rather brief, and often fraught with impressions of macroeconomic misfortune (the US after 1930; Japan after 1991). But long periods with broad stationarity in price levels are quite common, and often much admired in retrospect (England/Britain from 1625 to 1914; Constantinople for

many centuries). Nostalgia may be a poor guide to wisdom in economics, but this suggests that Woodford's recommendation may more apposite, even if his reasoning is open to question. And the basis of Woodford's hypothesis, Calvo's (1983) model, has rivals as an explanation of temporary nominal stickiness of individual prices¹ and, although sometimes found consistent with evidence², does not always score a perfect bill of health when tested empirically³.

What really renders Friedman's case for making fiat money free so questionable is his assumption that the economy is free of distortions. Distortions elsewhere need no direct implications for optimum inflation; but, if ineradicable by other means, they tend to point in one direction – upwards. Not necessarily, that is, to positive inflation, but at least to less negative inflation, and possibly to inflation at strictly positive rate). One is that individual nominal prices are often seen to adjust more swiftly to excess demand than to excess supply – or that inflation is only noticed and translated into expectations when it passes a threshold value. Another is that revenues from a sufficiently modest tax on the monetary base, distortionary though that is, may permit greater benefits from lowering other distortionary taxes. A third stresses that commercial banks, for reasons of increasing returns, sunk costs and asymmetric information, are apt to behave as less than perfect competitors, or, as potential entrants, ineffectual market contesters. That leads on to the idea that bank deposits (for which fiat money is not a bad substitute) tends to be underprovided – and hence that a low enough tax on it could add on balance to social welfare, while possibly at the same time improving⁴ the prospects for financial stability. Then there is the idea, based on menu costs and first adumbrated by Diamond (1993)⁵, that price setting firms with monopoly power may be induced to set slightly real prices lower average, when real interest rates

¹ Most notably, menu costs, recently explored empirically for example by Dhyne *et al.* (2007). Another rival, in the author's view distinctly less appealing, is Rotemberg's (1982) quadratic cost-of-price-change model. Lombardo and Vestin (2007) show that the Calvo and Rotemberg models will yield different measures of the cost of inflation outside a first-best steady state. Recent empirical work, much of it testifying to rather greater flexibility of many prices than is commonly assumed, includes Bils and Klenow (2004), Ellis (2008), Fabiani *et al.* (2006), Kehoe and Madigan (2007) and Krystsov and Klenow, 2008).

² Gali and Gertler (1999), for instance.

³ For example, Eichenbaum and Fisher (2004), who question his assumption that demand displays constant elasticity and that capital can be reallocated costlessly across firms and show that, if these effects are allowed for, Calvo's hypothesis is less well supported by data.

⁴ If incumbent banks' profits are increased, balance sheets should eventually shield them more effectively against insolvency risks, while at the same time reducing moral hazard effects to take risks.

⁵ Diamond (1993).

and inflation are both positive. Finally, the fact that we have yet to invent ways of making policy nominal interest rates negative, and the observation that the general method of stimulating an economy in the doldrums is to cut them, means that Friedman's optimum may, in bad times, lock us into a trap of weak aggregate demand. This becomes all the more sinister when one realizes – as did Keynes in chapter 19 of the *General Theory* – that expected price deflation inhibits aggregate spending anyway.

These second best arguments against Friedman's position are reviewed and explored in Sinclair (2003). Together, the five arguments (which should not be seen as rivals, but rather, as mutually reinforcing) may incline us to conclude that the optimum rate of inflation in a contemporary economy is probably slightly positive. If so, they would justify setting inflation targets with a mean above zero. This is a practice followed by all inflation targeting countries thus far. Alternatively, for a country that opts instead for a fixed exchange rate regime, this would entail picking a numeraire or basket of numeraire currencies where monetary policy, implicitly or explicitly, follows such principles, assuming that their "desired" inflation trends display a close enough match.

Are actual or optimal inflation trends higher in emerging economies than developed ones? In other words, was a country like Pakistan to adopt inflation targeting, should the central numbers be similar to those prevailing in OECD inflation-targeters (typically 2% per year)? Some arguments point to higher ones. And others to lower ones.

Right at the front of the former category, perhaps, comes the Balassa-Samuelson effect. If national labor markets imply an economy-wide path for labor of certain characteristics, irrespective of where it works, the tendency for traded goods industries to display relatively high labor productivity growth means that non-traded goods should drift up faster in developing countries than in developed ones – given that their economies will tend to grow faster anyway. So if nominal exchange rates are tied, we should anticipate relatively fast inflation. But this begs the question: should their nominal exchange rates be tied to richer countries? Strict inflation targeting calls for clean floating, especially – but not necessarily – if capital controls have been removed. All else equal, then, developing countries in this position could well aim, if they wished, for the same overall inflation rates as rich ones, and witness a gradual (but, as convergence proceeds, diminishing) upward trend in their nominal exchange rate. The exchange rate drift would mean a slightly lower local rate of inflation for the traded goods, neutralized, as far as the local price index was concerned, by faster upward drift in the nominal local prices for non-traded goods and services.

Another argument for faster inflation is the idea that developing countries may have larger agricultural sectors, where income (much of it in practice auto consumption) is harder to tax than elsewhere. The greater the cost of raising revenue by any tax, the higher, all else equal, other tax rates need to be (including, possibly, the tax on fiat money represented by inflation). Furthermore, the traditional theory of the demand for money points strongly to the idea that the source of seignorage, base money, will represent a higher ratio to annual national income in poor countries than in rich ones. Then comes the observation that the ideal of an economy free of distortions, the foundation of Friedman's arguments, may well be at somewhat greater variance with the facts for a poorer country than a richer one. This matters because Friedman's case for price deflation at the real rate of interest is not robust in the face of extensions from the ideal economy to the second-best one. It is noticeable in this context that among inflation targeting countries, there is some tendency for the target rate of inflation to be associated negatively with the level of income per head.

We might conclude then, that if the snake of predicted, annual average targeted inflation is of the order of 2 % in advanced countries, a typical middle-income, fast-growing emerging economy, with a sizeable agricultural sector and public finances in less than perfect order, might therefore reasonably opt for a target in the 3% to 5% range if it seeks to target inflation too.

3. Surprise Inflation

The tyranny of the seasons still casts a long shadow over us today. We think of financial and economic performance being measured in the span of a year. A company's profits are audited for a year. Bonuses for staff are typically annual. However regrettable as this may be (Sinclair, Spier and Skinner, 2008). Growth, interest and inflation rates are expressed in percentages per annum. But should a central bank's objective function be captured by minus the sum of squares of *annual* deviations from targets – whether framed in broad or base money, or rates of inflation?

There is surely a strong case for setting targets, and measuring performance, over a somewhat longer interval. The smaller the average mean error over a spell of consecutive years, the closer the price level at the end of this longer period will be to its endpoint target that had been set implicitly at the start. Parties that entered unindexed financial contracts in local currency over a broader horizon like that are exposed to inflation deviation risk – in the borrower's case, to the risk that inflation will be below target on average, and for the lender, that it will be above target on average. The potential damage that this random redistribution could

wreak goes beyond the redistribution: either the borrower or the lender may go bankrupt, for example, possibly with severe repercussions on third parties.

More often than not, labor contracts are specified for a year. Though we can observe some trend towards performance-related pay today, especially in the higher echelons of organizations, this annual pattern is still discernible in almost all countries. And the performance, when relevant, may well be gauged over twelve month intervals, too. And pay makes up two thirds of national income. So do these observations argue for focusing monetary policy on twelve month periods? At first sight it may seem so. But closer investigation suggests it may not.

If inflation is unexpectedly quick over the year, faster than had been anticipated by employers and employees when the contract was agreed, workers' real wage rates turn out low. Profits, employment and output may jump briefly (so long as the firm can react quickly to its temporary good fortune, spare labor can be found to meet increased demand, and adjustment costs are trivial). Unexpectedly slow inflation raises real wage rates by an unexpectedly large amount; profits, production and jobs are all vulnerable to temporary cuts. But a temporary surprise jump in real wage rates, up or down, by perhaps 2 or 3%, is very unlikely to drive many firms or many workers into real financial distress.

Furthermore, there will surely be opportunities to correct the mistake, if mistake it be, in the next pay round. Or indeed earlier. If all prices have drifted up unexpectedly rapidly, and wage contracts are unindexed and unsynchronized, the employer should fear losing staff to other firms if he is seen to underpay them in real terms. In the opposite circumstances, a seriously beleaguered firm will surely attempt to renegotiate nominal pay downwards; and employees may well acquiesce in this, once the employer has convinced them, if he can, that he is telling the truth. The picture is more complicated when the firm's product price moves out of line with the generality of other product prices. If this is because of changes in technology, persistent changes in the company's scale of operations may ensue. It might have to close. But if it faces menu costs, and happens to have held its nominal product price constant in a period where economy-wide average inflation turned out higher than expected, it will surely seek to react by raising its nominal product price sooner than expected; and will only be unable to do this if committed to (and unable to renegotiate) long term nominal contracts of some kind. The menu cost explanation for nominal price rigidities and discontinuities

never forces firms to hold on to old nominal prices if faced by large enough shocks⁶.

We should also be wary of thinking that real wage rates ought to grow at a constant pace, attributing much of the unevenness in their evolution to inflation miscalculations in an environment without indexing. The distribution of detrended real wage rates should not always be strictly flat, either at the aggregate level or, still less, within any single sector or firm. Pay contains rent for specialized skills and dedicated experience, which should fluctuate to some degree with market conditions. Tastes, technology and resources may all register unanticipated jumps or swings. A country's terms of trade can alter quickly and even violently. If pay bargaining leads to a particular pattern of apportioning such risks between the parties, all well and good. But there is, in general, no sound case for so shaping the monetary system that the minimization of ex post real wage volatility, whatever its source, is treated as the prime objective⁷.

This said, surprise inflation, negative or positive, is not just redistributive: it may do real damage. It was Hayek's view that "bankruptcy does not destroy capital: it merely improves the quality of its ownership." Sometimes Hayek may be right: some bankruptcies are due to injudicious management decisions, and a failed company's assets may be bought by others more able to deploy them better. But when bankruptcy is simply down to past debt structure timing decisions, to the bad luck of misjudging the course of inflation, and when it is followed by a fire-sale of assets, the new owners may well make far less good use of them. And the fear of bankruptcy in the future may warp investment decisions today. So bankruptcies due to mistaken guesses about interest rates and inflation do not tend to fertilize the economy's soil, but rather to poison it. How much damage actually arises depends critically on the size of the prediction error. An inflation prediction error of two or three per cent is minor. Ten per cent will have far more serious repercussions. One would expect the left tail of the distribution linking the probability of a given company's financial stress against the modulus of the annual rate of unanticipated inflation to exhibit a pronounced upward slope in this region.

But still of more importance is the rather intricate issue of compounding. Consider a standard four year loan contract, with a fixed rate of discount, agreed at outset,

⁶ Unlike Calvo pricing structures, for example.

⁷ There is a close analogy here with the theory of price stabilization. It has long been thought that stabilizing primary commodity prices is especially desirable. Newbery and Stiglitz (1981) show that many of the arguments for doing this are spurious, or, at the least, seriously incomplete.

of $x\%$ per annum nominal interest. There is no coupon, so the loan is like a treasury bill in this respect. So if the loan is to mature at R100000, it will have been issued at a price of $(1 + x)^{-4}$ R100000. Invoke Fisher's equation and suppose that x is the sum of two elements, a real interest rate of $y\%$ per annum over this horizon, incorporating any allowances for risk and tax, and a pure inflation point-expectations term (on which both parties agree) of $z\%$ per annum over this horizon. If it turns out that inflation averages $z\%$ per year over the four years, there is no surprise redistribution, and both lender and borrower emerge unscathed. It does not matter if the annual inflation rate bobbed up and down over the four years, nor how much it did so. What matters is that the terminal price index, four years later, equals the initial value, multiplied by $(1 + z)^4$, as both sides had expected. The mean rate of inflation over the whole interval is the key variable of interest, and not its modulus, or second moment, on an annual basis.

Economists used to the traditional quadratic loss function, which is often calibrated on annual intervals, think very differently. It is as bad to have actual annual outturns for inflation successively overshooting and undershooting a target rate by equal amounts, as to have it persistently above or below target by that same amount. If the target is 3%, a four year inflation sequence of 1.5%, 4.5%, 1.5% and 4.5% (call this sequence A) is quite as bad for the sum of squares as the sequence 4.5%, 4.5%, 4.5% and 4.5% (sequence B, call it) or, for that matter, a run of four annual inflation rates of 1.5% (sequence C).

In a world with unindexed contracts extending over several years, this feature of our traditional approach just has to be wrong. Sequence A may not be perfect but it must dominate B or C. Persistently one-sided inflation prediction errors are inevitably more injurious and imperil more companies and portfolios and livelihoods than symmetric inflation prediction errors that cancel out to nothing. And the longer the time span of nominal contracts, the more serious the likely damage – one sided prediction errors compound.

The extent of this possible injury turns critically on three things. One is the maturity structure of firms' debts. This will presumably be related to the "period of production" – the interval between input and fruition in a capital project. Risk-averse owners of firms will wish to match the maturity structure of debts with the maturity structure of the real assets they finance. (Clearly this becomes rather less straightforward when the firm's activities are "flow-input, flow-output" rather than "point-input, point-output" of the kind depicted by Boehm-Bawerk and his

successors who pioneered the Austrian approach to capital⁸, since the firm will prefer to offer a distribution of maturities on its debts). There would be some suggestion here that longer bond or loan maturities would be expected for relatively mature developed economies, than in emerging ones. But even in emerging economies, the growing importance of manufacturing underlines the point that “the tyranny of the year”, so typical of the production frequency in agriculture, is becoming less and less appropriate. For many industrial sectors, the mean interval between a project’s inception and financing on the one side, and the sale of its product on the other, is far longer than a single year. One need only think of films, pharmaceuticals, shipbuilding, publishing, vehicle building, steel, and computer software. The stream of costs precedes the stream of revenues for all these products, on average for at least a year or two.

A second is the extent to which firms issue unindexed, as opposed to indexed debt. Fully indexed debt is immune to inflation surprises, positive or negative. Many economists find it extraordinarily puzzling that, while government indexed debt has become far more common in recent years, indexed debt issued by the private sector is virtually unknown. Still, whatever the explanation, this is a fact, and it means that one natural way of sheltering companies from a particular risk so many of them face has not been developed. The case for avoiding persistent one-sided surprise inflation is only strengthened as a result.

The third is the fact that firms may borrow (or issue loans) at *variable* rather than fixed interest. In contrast to the fixed interest borrowing, this can give a measure of insurance. Unexpectedly slow inflation may be followed swiftly by policy rate cuts. Indeed one of the key lessons from the Taylor Rule is that when inflation strays from its target by a certain amount, the policy rate must be raised by an absolutely larger amount, in order to stabilize the system. Yet changes in the policy rate could be staggered, in lots of little steps, as Woodford (2003) recommends; the policy rate may react not to actual but to future predicted inflation, possibly beyond the relevant bond horizon; and if monetary policy were fully forward looking, and expectations of inflation remained firmly anchored on the target throughout, we presumably wouldn’t see any policy rate changes at all. So the extent to which short loans, rolled over at variable interest, give *ex post* cover for inflation mispredictions, is almost impossible to identify on *a priori* grounds. And there can be no guarantee that it is even approximately complete.

What implications follow for monetary policy? One is that if we are thinking of setting up a new monetary policy framework, which might or might not be one of

⁸ Hicks (1973) is a classic reference here.

inflation targeting, considering a move from a one-year measuring rod to something longer may have much to commend it. Another one, related to the first, is that a policy maker should be penalized for positive high frequency serial correlation (and hence, in comparison, rewarded, or indeed commended, for sequences like A that keep the longer term average inflation on track).

A further point, reinforcing these two, is the idea that local harvest vicissitudes should make the disturbances in the time paths of the “soft” primary commodity prices (in real terms) approximately IID⁹ in character. We should not expect random walks; unlike the “hard” primary commodities, price innovations (due to supply shocks, at least) should display little if any tendency to persist¹⁰. This is comforting, because it implies that taking a longer time span, “taking one year with the next” as it were, might allow policy makers to focus on headline as opposed to “core” inflation measures. Ideally, the rate of inflation is that hypothetical proportionate rise in a representative agent’s money income that she would need to protect utility in the face of the actual pattern of changes in the prices of all goods and services she buys. She will be a buyer of seasonal and other foodstuffs, and especially so in an emerging economy where food purchases may represent a third or more of most families’ budgets. So the omission of some or all foodstuffs, as is common in measures of core inflation, exposes the central bank to the accusation that its way its actions and performance are gauged are, to a large extent, irrelevant for ordinary folk. Far better to go for a broader price index, much closer to the realities of people’s purchases, and extend the period over which price changes are measured to exploit the (at least partly) mean-reverting features of food prices. Furthermore, core inflation tends to follow headline inflation rates associated with a broad price index, not to lead it.

In addition, if the central bank monitors the general public’s expectations and perceptions of inflation closely and regularly, as it clearly should, these will be most naturally related to broad inflation measures, and not to some much narrower and usually less turbulent indicator. Headline inflation is a challenging taskmaster for inflation targeters to be judged against, and greater latitude should be accorded for transgressions, especially in circumstances when international primary product prices surge or collapse. But it really is the only appropriate one.

⁹ Identically and individually distributed random shocks, with next to no carry-over from one period to the next.

¹⁰ See Lee, List and Strazicich (2005) for some illuminating research findings on these non-renewable prices.

Another monetary policy implication is that, with a longer horizon, the central bank gets more flexibility in one way but less in another. It need not worry excessively about inflation in any single twelve month period. Shocks are inevitable. In a really brief span of time, the evolution of a price index is, in normal circumstances, surely nearly all luck, and it is as absurd for policy makers to be castigated for misses as lauded for what can really only be accidental hits.

The longer the interval of time over which the target is framed, the more the central bank can focus on getting the average inflation path right, untrammelled by very high frequency disturbances that longer period averages should wash away. And it can look with greater confidence and single mindedness at the future – a span of time that will, incidentally, match the phased impact of its policy instruments more closely. Raising the policy rate today will typically have almost negligible effect on inflation for three months or more, but, as time goes on and the various channels of the transmission mechanism begin to pass on their effects on the components of aggregate spending, the cumulative impact on the price index builds up. Evidence on this varies, and is open to dispute; but conventional wisdom asserts that the half life of the total effect might often be about ten to sixteen months, with very little further impact after two and a half or three years.

This year's inflation is therefore partly a matter of chance, and partly down to policy decisions taken one or indeed two years earlier. It is barely affected by decisions taken during the year in question. And being held to account for off-target wobbles on a year by year basis could even risk tempting central bankers to destabilize the macro economy, by encouraging them to make excessive, exaggerated policy rate changes to exploit such limited short-run traction as they have on the relevant price index. This danger may be greatest when the government has given the Bank's top officials cause to fear that their period of office may not last the year unless there is very swift progress in bringing inflation back to target. Such very swift progress may be exactly what is wanted if the economy is suffering from hyperinflation, but in more normal conditions, it will store up serious trouble later on, and is almost bound to increase the volatility of aggregate output and employment. It may also lead to big swings in exchange rates, completely unjustified by changing perceptions of "real" fundamentals, and thereby, potentially, undermine the growth of foreign trade. Yet a further drawback is that when such policy decisions surprise the markets, as they would be almost bound to do, the dependability of the economy's responses to future policy actions is compromised and subverted. Monetary policy works best when the private sector's financial market participants are good at predicting it at least a short while ahead.

So a broader time interval can bring many benefits. But it does not just free central bankers from an unreasonably narrow focus, and enable them to take better decisions with a better chance of being judged more fairly. In another way, it narrows their choices somewhat. And it can generate what look like inconsistencies. Suppose the central bank is subject to an obligation to try to keep annual average inflation at $z\%$ over the successive, rolling three year periods 2010-2012 inclusive, 2011-2013 inclusive and 2012-2014 inclusive. January 1 constitutes the start. If z is low, the inflation target translates into a price index *level* target for January 1, 2013 is $100(1+z)^3$ if based at 100 on January 1, 2010. If the start of 2011 sees the price index at $100(1+z)$, exactly on track, there is no problem. But suppose it is a bit above that. Meeting the 2010-2012 target calls for inflation averaging below $z\%$ in calendar years 2011 and 2012. But if the next three-year rolling target, 2011-2013, is to be obeyed, inflation in calendar year 2013 must be raised a little, above $z\%$. And the same will be true of 2016, 2019, and so on. These persistent little waves cannot be helpful, given that steady inflation is all else equal, desirable in its own right.

Suppose there has been an inflation overrun in year 1. Inflation was targeted at $z\%$, with a tolerance range of $w\%$ above and below it. Unfortunately, inflation in year 1 turned out to be $(z+w+q)\%$. What possible reactions might the rules of the targeting system entail? Essentially, seven.

First, A, the IT system could be purely forward looking and fully forgiving. The *price level* base for the end of year two would be scaled up by $w+q$, the “gross” target overrun in year 1 (the net overrun is q). The *inflation* target for year 2 would remain unchanged: $z\%$, give or take a range of w . Future years’ inflation targets would be unchanged, too. The implicit price level targets for the end of years 3, 4 and beyond would all be multiplied by $(1+w+q)$.

Second, B, the rules might prescribe full “punishment” for the net overrun, q , over some interval of T years. That would mean reduced inflation targets for a while (for example, $z-q/2$ for each of two years, with the unchanged tolerance of w either side. The most stringent would be to set $T=1$. All future implicit price level targets beyond year $2+T$ would be multiplied by $(1+w)$ only.

Third, C. C is more lenient than B but tougher than A. There would be partial punishment for the net overrun, so inflation targets would be lowered by a total of less than q spread over T years. For instance, they might be cut to $z-q/6$ for each of 3 years. Implicit targets for the future price level would be raised as a result of the net overrun, but only a little. They would be multiplied by something less than $(1+w+q)$, but more than $(1+w)$.

A fourth possibility, D, is considerably tougher than B. This would involve full punishment for the gross overrun. Inflation targets would be lowered for a total of $q+w$ spread over T years (e.g. to $z - (q+w)/3$) for 3 years. This would mean that after year 1+T, all implicit price level targets were completely unaffected by year 1's overrun.

Just as C was softer than B, a fifth possible reaction, E, would be more forgiving than D, but less than B. After year 1, for a period of T years, inflation targets would be cut by a total of w plus a fraction, say one half, of the net overrun. Implicit price level targets for years after T+1 would be raised by some proportion of year 1's net overrun, but nothing more.

The sixth type of automatic response, F, to year 1's overrun is the most draconian of all – it would prescribe a *reduction* in implicit price level targets beyond some horizon, to be achieved by reducing annual inflation targets from year 2 to year T+1 by a total of more than $w+q$. Inflation targets would be adjusted so as to overcompensate, in time, for the initial “miss” in year 1.

To counterpoint F's brutality, G would be the gentlest. It would *raise* future inflation targets, by some fraction of q (or $w+q$), presumably on the ground that experience in year 1 had shown that z was proved unrealistically low. Future implicit price level targets would all go up by more than $(w+q)$, and by more and more as one looks further out.

Current IT systems are almost all of type A. There are exceptions, because some countries' inflation targets are open to annual revision, as a result of discussions between the finance ministry, the central bank and possibly others, and thus may sometimes function rather more as “forecasts” than “aspirations.” Experience in many Asian inflation targeting countries, including Korea, the Philippines, Thailand and now Indonesia, provides an example here. Mauritius, with its system of “inflation targeting light”, may be considered another¹¹. If this kind of targeting reflects a shifting compromise between what is assumed to be desirable and what is assumed to be feasible, it may evolve into a system of responses of type G.

Many of these seven types of response are not fully specified. With B to F, you need to select the period over which the “punishment” is levied. It could be uniform, operating from year 2 to year T+1 inclusive, as in the examples mentioned. But it might not be uniform; and it might not start at once. And with C, E and F, the exact extent of the total punishment was bounded only by inequality

¹¹ See Porter and Yao (2005).

constraints. Then there is the issue of asymmetry: whether in principle or in practice, punishment may be greater or smaller for positive than negative misses. And even A contains ambiguity. This is because it is possible, on the one side, that annual inflation sticks at one of the two outer tolerance limits permitted ($z-w$ or $z+w$), which means that the future implicit price level target at the end of year t may range from $P_0(1+z+w)^t$ to $P_0(1+z-w)^t$, without infringing the rules at all, where P_0 is the price level at the end of year 0. In that case, with w significantly non-zero, distant future price levels could vary enormously and still be legitimate outcomes under the rules. Alternatively, the tolerance interval $\pm w$ may be constructed so as to exhibit a form of *subadditivity* over time. This would mean a specific ban on a long string of positive (or negative) values for w , especially if the deviations were large. An example of this would be that the price level at the end of year t might be allowed to lie within the range given by $P_0(1+z)^t(1+tw) \geq P_t \geq P_0(1+z)^t(1-tw)$. When t is small, the second range stays close to the first. But for large t , the difference between these two could be really vast.

The main case against A is twofold: first, that full forgiveness may interfere with and erode credibility; and second, that some degree predictability of future price levels has merit for its own sake. Woodford (2000) offers a trenchant discussion of these points. We have already seen how unindexed longer term loan contracts, coupled with the consequences of possible bankruptcy, provide a basis for the second argument. The credibility issue is no less important. Any targeting framework for monetary policy will tend to fail if people do not expect it to last. It stands a good chance of lasting, though, when it is expected to persist. If inflation targeting presents substantial or continuing *evidence* of failure, how could we possibly believe that rational agents would retain confidence in it? However problematic the concept of rational expectations may be in practice, it is surely reasonable to accept that indefinitely persistent one-sided forecasting errors are not going to be compatible with a policy regime built on the aspiration that they will average out at zero.

4. Conclusion

What does this brief study of the snake of predicted inflation, and the bird of surprise inflation, imply for policy? One implication is that if inflation targeting is to be adopted, there is a rather powerful case for moving away from a one year to a longer target period. Overlapping triennia have considerable appeal. Three years is the interval of time over which the inflation effects of monetary policy decisions are typically almost complete. A longer span offers greater flexibility for adjusting

actual inflation within a reasonable period in response to any threat of a miss, while at the same time suggesting that past misses should not be simply ignored. A specific illustration of this might be to set an *annual average* inflation target of 4 %, with the proviso that this should be achieved over successive three year periods, and that the chosen price index, ideally a broad one, should not normally stray by more than 2 % from its target value at the end of each three year period (unless blown off course briefly by international surges or collapses in the prices of primary commodities).

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Comments

The paper investigates monetary policy implications of decomposing inflation into predicted and surprise inflation, especially in case of inflation targeting. The author concludes that middle-income growing economies may opt for an average inflation target of 3 to 5 percent as against 2 percent in advanced economies. The paper argues in favor of targeting headline inflation as opposed to core inflation; and of longer target period, preferably rolling three year horizon compared to generally existing arrangements of one-year period. These conclusions are of vital importance for the conduct of monetary policy, even if a country is not in an inflation targeting environment. All this suggests that the paper is an important contribution to the literature dealing with issues related to inflation targeting.

My comments on the paper primarily seek more empirical evidence on the key findings of the paper and are in no way disputing the theoretical arguments of the author. The author relies heavily on theoretical arguments and makes use of literature on the subject to support his arguments. The major weakness of the paper seems to be lack of empirical evidence to support various conclusions drawn in the paper.

In case of predicted inflation, the author concludes that optimal annual average inflation target for a typical middle income should be higher than the inflation target of advanced economies. Besides theoretical arguments, the only reference provided on the subject is author's own paper on the subject. In case of appropriate measure of inflation, the author argues in favor of headline inflation and concludes that "it really is the only appropriate one." It makes sense that central banks should focus on headline inflation in determining monetary policy stance, especially in the medium term. And the general public, too, is concerned about the headline inflation. There is, however rather powerful case in favor of core inflation from operational point of view. The author himself has talked about transitory component of (surprise) inflation, which "can soar in the air like a bird or dive deep into the water." This component has substantial effect on headline inflation in the short run. Mishkin (2007) noted that "headline measures of inflation are inherently noisy and often do not reflect changes in the underlying rate of inflation." Despite limitations of core inflation measures, it seems that the central banks should focus on core inflation, which will help in preventing a central bank from responding too strongly to transitory movements in inflation.

Without providing any solid evidence, the author also claimed that "core inflation tend to follow headline inflation rates associated with a broad price index, not to lead it." Empirical literature on this issue suggests that this may not always be the

case. Laflèche and Armour (2006) evaluated measures of core inflation for Canada. They found that core inflation measures used at Bank of Canada are unbiased predictors of total inflation and contain more information about the future trend of inflation than total inflation itself. Another study by Armour, (2006) also supports these findings in case of Canada. Lodhi (2007) evaluated nine different series of core inflation for Pakistan and found that core inflation series are co-integrated with headline inflation. Only one series failed to pass the test that “core inflation is an attractor of headline inflation.”

Finally, the author builds a strong case in favor of longer target horizon as it provides central banks more flexibility in the presence of time lag involved between change in policy rate and its ultimate impact on inflation. This has strong practical implications as the central bank can purposefully deviate from its inflation target temporarily, which can have negative implications for the credibility of the central bank. In practice, the design of monetary policy framework, among other considerations, depends on balancing trade-off between flexibility and credibility. Moreover, flexibility helps in dealing with one-off or temporary shocks to the economy. Its ability to deal with unique shocks like asset boom and/or challenges arising from globalization process is open to question (Carney, 2008). It can also be argued that flexibility may be preferable, once a certain degree of credibility is achieved.

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Comments

The is a descriptive essay about two types of inflation, i.e., predicted inflation and surprise inflation, and their effects on the economy and what sort of policies will be more suitable for making the economy stable. The essay is well structured, first explaining the Friedman and New Keynesian point of views on predicted inflation and then what problems surprise inflation can cause for the policy makers and how to control it effectively.

Predicted inflation is the same as actual or constant inflation in the long run and according to the Friedman doctrine of the sixties and seventies, it should be zero. The reason being that supply of new money can be injected whenever needed to meet the demand and that would clear the markets bringing inflation level to zero in the long run without changing the dynamics of the real sector. This is as controversial as it can get because empirically even countries where inflation targeting is the practice, targets are low but are never zero. The other part of the same doctrine rests on deflation, i.e., as the real interest rate falls prices should fall by the same ratio, and that has empirical backing as well. There is however, some lacking in the explanation, addition of super-neutrality of money in which most of the economists of that era believed has not been empirically proven to exist. Empirically, economies are subject to monetary distortions in the short run and attaining neutrality of money in each period of time may not be possible which is required for super-neutrality to exist. However neutrality in the long run is what economists of the present age believe in and has good degree of acceptance based on empirics.

The nominal rigidities, i.e., stickiness in prices and wages, which have good empirical foundations, are the causes for real distortions in the short run and occur due to the existence of nature of assumptions of the New Keynesian synthesis. The key assumptions are monopolistic competition, product differentiation and menu costs. Due to these, firms are not spontaneous to change prices if inputs become expensive or average inflation rises but rather change systematically in relation to their profit margins. The economy wide price adjustment speed thus is positively related to the inflation target. Inflation targeting is of so much appeal due to the ease of its understanding and implementation because by doing so the monetary authority can alter the price adjustment speed and given the degree of predictability probability of achieving the target always remains very high.

The author could be more comprehensive explaining the New Keynesians idea of staggering prices. There is a good explanation that these models, in general, talk about inflation and not disinflation which might be on list of an authority's target

if real interest rates are negative and a stimulus to an economy to boost up weak aggregate demand are needed. However, an issue is not talked about much and has not been talked much either in the literature overall, i.e., the simple New Keynesian models based on stickiness of prices or wages tend not to have neutral money even in the long run. This lacking in the literature has sometimes been covered with simulations of the models and the good results their forecasts provide. One observation is such that adding menu cost into these models does have positive results in closing the gap between neutrality and non-neutrality of money but still strict neutrality of money has not been proved to exist in this class of models. However, we economists do believe in neutrality of money in the long run and use the above said models for the reason of their objectivity.

The section on predicted inflation closes with a suggestion of having relatively higher inflation target for the developing countries because most of their output is related to the non-taxable agriculture sector and need of generating more tax revenues favor more inflation as the later results in more taxes. This is a very balanced suggestion and there would be less doubt if actually any of the developing countries adopt inflation targeting and won't keep the target above 2 percent, i.e., a rough average for developed economies. However, one aspect still remains unclear which is very relevant in context to Pakistan. If the real interest rate is below the inflation rate then how to target some positive level of optimum inflation?

The second part of the paper talks about surprise inflation in the context that firms review their performance on annual basis as well as wages are indexed annually, then it is very right that a sudden inflation shock of higher than normal magnitude of 2-3 percent can destabilize the firm. However, if wages are inflation indexed then nothing much would change but since they are not, it provides an opportunity for a short while for some firms to extract extra profits till wages get adjusted. The author is right that targeting a longer period of time to attain a certain level of inflation would be an optimal policy in this regard because it is over longer period of time, firms would average out the peaks caused by surprise inflation and would have had adjusted to the real targeted level of it. If there is political pressure on the monetary authority to act instantly to a sudden bout of high inflation, the act may not be fruitful since most of the empirical evidence suggests that any such action can start having some effect on the dependent variables at least after a quarter of an year and that too not fully. So the present inflation may be a result, partially, of policy actions taken about 2 years ago.

Another idea of maintaining a longer horizon for targeting inflation is that if due to excessive policy actions resulting due to shocks of high inflation and political

pressure, firms start adjusting prices and wages with greater frequency that would not only initiate an upward trend in predicted inflation but would make the surprise inflation shocks more vulnerable for an economy where expectations are unreasonably high. This could lead to stagflation if the cycle continues and leads to stagnation of economic growth. This is very relevant to what Pakistan's economy is facing at the moment.

Another point of interest is the resultant bankruptcies and mergers of firms due to sudden big inflation shocks when firms face very big prediction errors in terms of future inflation. This leads to redistribution of resources to those who can use them better but when bankruptcy is just to pass down bad debt, the result could be more serious and dangerous for an economy as a whole, if it triggers similar impact on other firms as well. The start of present recession worldwide has similar dynamics as well as bank runs are feared for due to the same reason. So looking upon a longer period as a baseline would help in curtailing the prediction error significantly and would not only be beneficial for the monetary authority to maintain focus but will also be useful for the firms at the micro level.

The paper finally discusses how policy makers should counter surprise inflation. The final argument is that gaining confidence of masses to believe in the policy makers' decision is based on how long the policy can last, and in my view this makes the assumption of rationality not a very conflicted one because when policies last, people learn to make rational decisions and having a longer tenure for inflation targeting in a volatile economy like Pakistan may induce people to be rational.

In conclusion, I would say that the paper is a good exercise in explaining the concepts regarding inflation targeting in different scenarios and different beliefs. It convinces us that a longer period of about 3 years to be taken to achieve an average inflation target but then every year a narrower target can be implemented to achieve the long term target. The only point where the paper lacks is its casual approach which makes it more of an essay. However, this paper is very instrumental since on every page it provides us with new ideas to ponder especially when dealing with developing countries. I hope Peter Sinclair comes up with a theoretical paper to show how some of his extensions to the previously existing ideas work out to be so that we are definite about the results mentioned in this paper.

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