Preliminary

Price-Level versus Inflation Targeting in a Small Open Economy

by

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Abstract

The paper compares two types of monetary policies: price-level targeting and inflation targeting. It reviews recent arguments which favour the former, and examines how certain factors, such as the nature of the shocks affecting the economy and the degree to which agents are forward-looking, bear upon the claim. The paper then extends the analysis to a small open economy such as Canada, and considers whether it is practical for this country to pursue price level targets if its dominant trading partner, The United States, allows the price level to drift.

1. Introduction

Most central bankers agree today that a primary objective of monetary policy ought to be price stability. However, the debate continues as to what price stability ought to mean exactly: Should it mean keeping *inflation* (low and) stable? Or should it mean keeping the *price level* stable? For now, most countries have opted for the former interpretation, at least until a low and stable inflation rate is secured, and some amount of experience is acquired about the workings of the economy in such an environment. Canada, in particular, has chosen to target the inflation rate since 1991.

The conventional view is that a policy which targets the price level causes large variations in prices and output in the short run, because it stipulates to return prices to their previous level[1] after every shock. In contrast, a policy which targets the inflation rate allows the price level to shift, and requires only that the shift is not repeated in the future. Accordingly, this policy is thought to generate less volatility in the short run, although it causes prices to be non-stationary in the long-run. Thus, the debate in the past has opposed the benefits of an anchor for prices in the long run against the costs of volatility in the short run.

Recently, a number of authors disputed this account of the trade-off between the two types of policies.[2] They contended that, contrary to conventional thinking, targeting the price level induces relatively small variations in prices, both in the short run and in the long run. Their rationale is that, under this policy, agents would expect the monetary authorities to return prices to their initial level following a shock, and therefore would be reluctant to change their own prices. In other words, price level targeting would inhibit price changes from occurring in the first place, whereas inflation targeting only ensures that unexpected price changes do not perpetuate in the future. As a result, these authors support a certain degree of *price-level* stability in monetary policy.

The purpose of this paper is twofold. First, it reviews the argument just related in favour of price-level targeting, and the assumptions it is based upon, in some detail. Second, since the literature has focussed on closed economies, the paper examines whether a similar argument continues to

1. Or a level which involves a trend
2. See for instance Duguay (1994), Svensson (1999) Svensson and Woodford (1999), Vestin (1999), and Woodford (1999).

apply in the context of a small open economy such as Canada. In particular, the paper considers whether it is practical for Canada to pursue price-level targets if its dominant trading partner, the United States, allows the price level to drift.

The rest of the paper is organized as follows. Section 2 provides a proof of the argument conferring comparative advantage to price-level targeting in the context of a very simple closed-economy model. It shows that the more forward-looking is the price-setting mechanism in the economy, the more transitory are shocks, and the less weight is placed on output variability in the welfare function, the more advantageous is price-level targeting.

Section 3 extends the analysis to the case of a small open economy with a flexible exchange rate. It is shown first that, in the context of a simple representation of the transmision mechanism, price level targeting has the same comparative advantages in a small open economy as in a closed economy. It is then argued that this conclusion may be too simplistic for a country such as Canada, and that it is subject to important qualifications. One qualification is that the exchange rate is likely to be highly volatile if the two countries pursue very different monetary policies, and that such volatility may be harmful to the economy. Section 4 concludes.

2. The Closed Economy Case

This section examines price-level targeting and inflation targeting in the context of a simple model of a closed economy.

2.1 The Base Case

Suppose that prices in the economy are governed by a standard Phillips curve of the form

$$\pi_t = \beta\pi_{t+1|t} + BZ_{t|t-1} + \varepsilon_t \tag{1}$$

where β is a discount rate, π_t is the inflation rate, Z_t is a vector of variables, and ε_t is a white noise shock.[1]

1. $x_{i|j}$ denotes the expected value of the variable *x* at time *i* based on information at time *j*.

Although the notation is slightly tedious, this formulation is very practical for it subsumes a variety of specifications, and will be most convenient in the sequel to extend the results beyond the base case. For example, the model can allow for lagged variables which can be incorporated in the vector Z_t, or even contemporaneous variables, which can always be written as the sum of an anticipated term, which can be incorporated in the vector Z_t, and an unanticipated term, which can be incorporated in the shock ε_t. The crucial element in the present model is the forward-looking expectations, $\pi_{t+1|t}$.

Although the notation is slightly tedious, this model representation has the advantage that it is very broad, and will be most convenient in the sequel to extend the results beyond the base case. Note, for example, that lagged variables can be incorporated in the vector Z_t, while contemporaneous variables can always be written as the sum of an anticipated term, which can be incorporated in the vector $Z_{t|t-1}$, and an unanticipated term, which can be incorporated in the shock ε_t.

For simplicity, the model is further assumed to effectively range over only two periods. Specifically, the economy is assumed to be initially in steady state, whereby all variables (except the price level) and their expected future values equal 0.[1] It is then subject to a single unanticipated inflationary shock, ε_1, at time 1. At time 3, the economy automatically returns to the steady state under all circumstances. (The infinite-horizon case is examined briefly in section 2.5.)

Consistently with the specification of a two-period horizon, the social welfare of the economy at time *t* is assumed to have the form

$$-L_t = -E_t[(\pi_t^2 + \lambda y_t^2) + \beta(\pi_{t+1}^2 + \lambda y_{t+1}^2)] \tag{2}$$

where y_t is the output gap, and $0 \le \lambda \le 1$. According to this function, only inflation and output variability are detrimental to the economy; price-level variability per se is not.

1. The price level at time 0 is also assumed to equal 0.

The policy which maximizes the welfare function at time 1 will be refered to as the socially optimal policy. In general, this policy is not time-consistent, i.e., it is not identical to the policy that obtains under rational expectations when the decision-maker seeks to maximize welfare *in each period*. The latter policy will be refered to as inflation targeting,[1] on the grounds that, *in every period*, the objective is to stabilize inflation over the future horizon (taking output variability also into consideration). A policy which seeks, *in each period*, to maximize the function

$$-E_t[(p_t^2 + \lambda y_t^2) + \beta(p_{t+1}^2 + \lambda y_{t+1}^2)]\,, \tag{3}$$

where p_t is the price level, will be refered to as price-level targeting.

Time-consistency is a desirable property in public policy, for it means that the announced objective in every period can be clearly and simply explained to the public. By the same token, time-*in*consistency can make a policy impractical. The following two sections show that, in the present two-period model, the socially optimal policy, which is time-*in*consistent, in fact amounts to price-level targeting, which is time-consistent, given the objective described in (3). Thus price-level targeting can provide a practical way to implement the socially optimal policy.

According to the Phillips curve (1), the change in prices at time 1, π_1, is the result of the combined effect of the contemporaneous shock, ε_1, and the change in prices expected next period, $\pi_{2|1}$. Prices at time 1 would therefore react less to the shock if they are expected to move back towards their initial level in the future. Returning prices to their initial level entails some welfare cost, but the welfare gained from reducing the change in prices in the first period[2] can more than compensate for it. Thus, under very general conditions, the socially optimal policy will, to some degree, seek to move prices back towards their initial level following a shock.

So far, nothing has been said about the timing of monetary actions or the manner in which they influence the economy. To illustrate the proposition above in algebraic terms, we assume from

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1. With an inflation target equal to 0. The welfare function can be trivially modified to accomodate a positive inflation target.
2. Or, indirectly, the welfare gained from reducing the monetary actions needed in the first period.

now on that the shock ε_t is independent of monetary actions at time *t*. This conforms with the conventional wisdom that prices respond with a lag to unanticipated monetary actions. Also, we assume that the value of $BZ_{t|t-1}$ is determined by the expected value, $i_{t|t-1}$, of the monetary instrument at time *t*. This obtains, for instance, if $BZ_{t|t-1} = bi_{t|t-1} + CX_{t|t-1}$, $(b \neq 0)$, and the central bank takes action at time *t* after it observes all variables in $X_{t|t-1}$.

We examine first the case where output variability does not affect economic welfare, i.e., $\lambda = 0$, hence the social welfare function has the form:

$$-E_t[\pi_t^2 + \beta\pi_{t+1}^2]. \tag{4}$$

In fact, the discount rate β cancels out in all the derivations below (with the two-period model). Henceforth, unless stated otherwise, we shall assume that β equals 1.

The socially optimal policy

In order to maximize equation (4) in period 1, the inflation rate needs to be smoothed equally between the two periods, i.e.,

$$\pi_{2|1} = -\pi_1, \tag{5}$$

which obtains if $BZ_{2|1}$ is set equal to $-\pi_1$. Substituting (5) back into equation 1 gives

$$\pi_1 = \frac{\varepsilon_1}{2}. \tag{6}$$

Thus, under the socially optimal policy, only half of the shock is assimilated into prices in period 1, although at the cost of a change in prices of equal magnitude, but opposite sign, in period 2. The overall loss at time 1 amounts to

$$L_1 = \frac{1}{2}\sigma_\varepsilon^2, \tag{7}$$

where σ_ε is the standard deviation of the random shock ε.

Inflation targeting

In contrast, under inflation targeting, prices would not be expected to fall in period 2, since the rational public would expect the authorities to target a 0 inflation at that time. Hence

$$\pi_{2|1} = 0, \tag{8}$$

which obtains if $BZ_{2|1}$ is set equal to 0.

In that case, the full shock is assimilated into prices in period 1,

$$\pi_1 = \varepsilon_1, \tag{9}$$

and the overall loss at time 1 is twice as large as that under the socially optimal policy:

$$L_1 = \sigma_\varepsilon^2. \tag{10}$$

Price level targeting

The socially optimal outcome also obtains if the authorities are believed to target in each period the price level instead of the inflation rate, i.e., if they are believed to maximize in each period equation (3) instead of equation (2) (again with $\lambda = 0$). Indeed, under this policy, the bank's objective at time 2 is precisely to reverse the shock to inflation at time 1, in order to bring the price level back to its initial level.

Thus, in the two-period model, when output variability is not a concern, the socially optimal policy is equivalent to price-level targeting.[1] (We shall see in section 2.5 that this result applies also to the infinite-horizon model.)

1. This argument ignores the effect on wages. As long as the shocks considered do not affect real wages, price level targeting should enhance both price and wage stability. However, in the case of shocks which affect real wages, greater price stability may come at the cost of greater variability in wages. For example, consider a positive productivity shock which calls for higher real wages: if one targets the price level, then nominal wages have to rise; if one targets inflation, then it is likely that wages would remain relatively constant while prices decline.

2.2 Output Variability

Of course, to return prices back to their initial level following a shock is likely to require larger deviations in interest rates and, consequently, of output, than would be necessary if the shock to prices were accomodated. For example, in the case illustrated above where $\lambda = 0$, price-level targeting requires that $BZ_{2|1} = -\frac{\varepsilon_1}{2}$, whereas inflation targeting requires that $BZ_{2|1} = 0$. If one supposes that

$$BZ_t \equiv by_t + CX_t, \tag{11}$$

where X_t is a vector of variables orthogonal to ε_t, then price-level targeting increases the standard deviation of output at time 2 by $\frac{\sigma_\varepsilon}{2b}$ over that under inflation targeting.

Thus, under plausible specifications, price-level targeting is likely to generate higher variability in output than inflation targeting (with equal weights placed on output variability in the objective functions).

When output variability is not a concern, i.e., $\lambda = 0$, it was found above that price-level targeting coincides with the socially optimal policy. In fact, in the present model, this claim holds even if output variability is a concern, i.e., $\lambda \neq 0$. The reason is that (an anticipated) monetary action at time 2 shifts one-for-one part of the change in prices at time 1 into a change (of opposite sign) at time 2. So the marginal benefit of the action effectively equals the amount by which the change in prices from time 0 to time 2 is reduced, e.g.:

$$\frac{\partial}{\partial BZ_{2|1}}(\pi_1^2 + \pi_2^2) = 2(\pi_1 + \pi_2)\frac{\partial \pi_2}{\partial BZ_{2|1}} = 2p_2\frac{\partial \pi_2}{\partial BZ_{2|1}}. \tag{12}$$

But this is precisely the marginal benefit, from the standpoint of a price-level targeter, of a monetary action at time 2, given the price level at time 1, e.g.:

$$2p_2\frac{\partial \pi_2}{\partial BZ_{2|1}} = 2p_2\frac{\partial p_2}{\partial BZ_{2|1}} = \frac{\partial}{\partial BZ_{2|1}}(p_2^2). \tag{13}$$

Since, on the other hand, the marginal cost of the action at time 2 equals the marginal cost from the standpoint of a price-level targeter, e.g.,

$$\frac{\partial}{\partial BZ_{2|1}}(\lambda y_1^2 + \lambda y_2^2) = \frac{\partial}{\partial BZ_{2|1}}(\lambda y_2^2), \tag{14}$$

it follows that price-level targeting coincides with the socially optimal policy.

Thus, in the two-period model, price-level targeting always dominates inflation targeting in terms of overall welfare,[1] *even though output may be more variable under the former policy.*[2] (While suggestive, this result is particular to the two-period model.)

2.3 The Role of Forward-Looking Behaviour

Present theory supports the type of Phillips curve described in equation (1). However, empirical studies seem to support an equation of the form

$$\pi_t = a\pi_{t+1|t} + (1-a)\pi_{t-1} + CX_{t|t-1} + \varepsilon_t \qquad , (a < 1), \tag{15}$$

whereby current inflation is partly influenced by future expectations and partly by past inflation. Since forward-looking expectations by agents are at the heart of the arguments presented above, it is important to examine how alternative specifications such as equation (15) may alter the conclusions of the previous sections. For that purpose, suppose now that the Phillips curve has the form

$$\pi_t = a\pi_{t+1|t} + BZ_{t|t-1} + \varepsilon_t \tag{16}$$

where $0 \le a \le 1$.

Assuming again $\lambda = 0$ for simplicity, elementary calculus shows that, under the *socially optimal policy,*

$$BZ_{2|1} = \pi_{2|1} = -a\pi_1 \tag{17}$$

1. With equal weight, λ, placed on output variability in both regimes.
2. In a very simplified model, Vestin (1999) shows that for any weight λ, a weight λ' can be found so that price-level targeting, defined with the weight λ' placed on output variability instead of λ, outperforms inflation targeting in terms of both inflation and output variability.

$$\pi_1 = \frac{1}{1+a^2}\varepsilon_1 \tag{18}$$

$$L_1 = \frac{1}{1+a^2}\sigma_\varepsilon^2 . \tag{19}$$

Thus, the smaller is *a*, i.e., the less prices are influenced by future expectations, the smaller is the capacity of expected future monetary actions to restrain current inflation, and the larger is the social loss. In the extreme case where $a = 1$, one reproduces the result of the earlier section that the socially optimal policy consists in returning prices to their initial level: $\pi_{2|1} = -\pi_1$. In the other extreme case where $a = 0$, the central bank cannot offset contemporaneous inflationary shocks by means of expectations. Consequenly, it accomodates shifts in the price level and targets a 0 inflation at time 2, as would obtain under inflation targeting (see below). In general, with $0 < a < 1$, the socially optimal policy involves a partial return of prices to their initial level, as witnessed by equation (16).

Inflation targeting calls for a 0 inflation at time 2. The outcome under this policy is therefore independent of *a*, and is identical to the outcome that obtains under the socially optimal policy when $a = 0$, e.g.:

$$\pi_1 = \varepsilon_1 \tag{20}$$

$$BZ_{2|1} = \pi_{2|1} = 0 \tag{21}$$

$$L_1 = \sigma_\varepsilon^2 . \tag{22}$$

Price-level targeting calls for returning prices at time 2 to their initial level. Therefore, this policy is also independent of *a*, and is identical to the socially optimal policy that obtains when $a = 1$:

$$BZ_{2|1} = \pi_{2|1} = -\pi_1 . \tag{23}$$

$$\pi_1 = \frac{1}{1+a}\varepsilon_1 \tag{24}$$

$$L_1 = \frac{2}{(1+a)^2}\sigma_\varepsilon^2. \tag{25}$$

Thus, as witnessed by the magnitude of the loss L_1 *in each case, the more forward-looking are prices, i.e., the larger is the coefficient a, the greater the benefit of price-level targeting over inflation targeting.*[1]

2.4 Serially Correlated Shocks

In terms of overall welfare, the conclusions above are unchanged if the shock, ε_t, is not white noise. To see this, note that one can re-write the Phillips curve in the form

$$\pi_t = \pi_{t+1|t} + \hat{B}\hat{Z}_{t|t-1} + \nu_t, \tag{26}$$

where $\hat{B}\hat{Z}_t \equiv BZ_t + \varepsilon_{t|t-1}$, $\varepsilon_t \equiv \varepsilon_{t|t-1} + \nu_t$ and ν_t is white noise, and thus revert to the previous case with white noise shocks.[2] (As will be noted below, the same claim cannot be made if the horizon is infinite.)

However, the more persistent are the inflationary shocks, the greater are likely to be the deviations in output needed to return prices to their initial level, and, therefore, the smaller is likely to be the benefit of price level targeting over inflation targeting. Conversely, the more transitory are the shocks, the smaller output variability is likely to be under price level targeting relative to inflation targeting. At the extreme, if the shocks are mean-reverting with regard to the price level, then output variability, in fact, can be smaller under price level targeting than under inflation targeting.

For example, if $\varepsilon_2 = -\varepsilon_1 + \nu_2$,[3] then price-level targeting would call for no monetary action at time 2, since the price level is expected to converge back to the target of its own accord; whereas

1. Price-level targeting outperforms inflation targeting if $a > \sqrt{2} - 1$, in the case $\lambda = 0$,
2. For this claim to hold, it is essential that price-level targeting be defined as the policy which maximizes equation (3). This ensures that the derived policy adjusts monetary policy responses to the nature of the shocks involved. For instance, the policy will call for a diferent response to a persistent shock than it would to a transitory shock. The same conclusion may not hold if, instead, price-level targeting is defined as the policy which brings prices back to target within a certain fixed horizon. In this context, the optimal horizon is likely to depend on the regime adopted in the U.S.
3. And output is unaffected by the shock.

inflation targeting would perversely offset the shock ε_2 and move the price level back towards the level at the end of period 1.[1]

Thus, the effect of price-level targeting on output variability, and its overall merits over inflation targeting, depends on how persistent or transitory the shocks are in general.

2.5 The Infinite-Horizon Model

The weakness of the two-period model specification is that it does not show unambiguously the trend of prices in the long run. Thus, it is not immediately clear from the previous results whether or not the socially optimal policy would eventually return prices to their initial level if the horizon were infinite.[2] Even if it is not the case in the two-period model, prices could still be returned to their initial level in the infinite-horizon version, because the cost of doing so could be smaller due to "smoothing".

Suppose therefore that there are infinitely many periods, and the welfare function has the form

$$-L_t = -E_t\left[\sum_{i=0}^{\infty} \beta^i(\pi_{t+i}^2 + \lambda y_{t+i}^2)\right]. \tag{27}$$

Define the various types of policies in a similar fashion to the two-period case, and consider as before a shock, ε_1, in the first period.

Then, except in odd cases, inflation targeting would not return prices to the target, since, in every period, once bygones are bygones, the incentive is to cause no further changes in prices. Price-level targeting, on the other hand, would always return prices to the target, since, in each period, there is an incentive to bring prices closer to the target.

1. This scenario is plausible if periods are not too short, say annual. Otherwise, the cost of offsetting the transitory shock ε_2 at time 2 would be quite large, in which case the shock would be ignored under inflation targeting as well.
2. Some authors consider the convergence of prices to a target in the long run, rather than optimality with respect to the objective function in (3), as the defining condition of price-level targeting (Barnett and Engineer, 2000).

As to the socially optimal policy, as of time 1, the overall cost of moving prices eventually back towards their initial level consists of the additonal (squared) deviations in inflation induced in the subsequent periods plus the (squared) deviations in output necessary for that purpose. It follows that, if output variabilty is not a concern to welfare, i.e., $\lambda = 0$, then inducing movements in prices beyond the second period cannot be efficient, for inflation in period 1 is affected only through expected inflation in period 2..

Thus, if output variabilty is not a concern to welfare, i.e., $\lambda = 0$, then the socially optimal policy in the infinite-horizon model is identical to those in the two-period model. In particular, in this case, prices converge back to their initial level under the optimal policy if, and only if, the coefficient, a, on inflation expectations (in equation (16)) equals 1.

In general, the optimal policy in the infinite-horizon case depends on the full data generating process of all the variables in the model, and does not coincide with price-level targeting.[1] (This complexity, which becomes apparent in a small open-economy setting where a number of explanatory variables enter the model, makes attractive the use of the two-period model as a benchmark.) Nonetheless, it can be shown that the socially optimal policy does eventually return prices to their initial level under general conditions. We illustrate below a very simple case.

Suppose that the vector of explanatory variables Z_t in the Phillips curve consists solely of the output-gap, and the latter is negatively proportional to the real interest rate so we can think of the output gap as the instrument of policy.

Define the Lagrangian,

$$minE_1\left\{\sum_{t=1}^{\infty}\beta^i[(\pi_t^2+\lambda y_t^2)+2\phi_t(\beta\pi_{t+1}+By_t+\varepsilon_t-\pi_t)]\right\}. \tag{28}$$

The first-order conditions then give

1. Using the simple model described below, except that the interest rate can affect inflation contemporaneously, Vestin (1999) shows that, when shocks are white noise, for any given weight λ, one can find a different weight λ' so that the socially optimal policy based on λ is identical to price level targeting based on λ'; and when the shocks are persistent, λ' does not exist.

$$\pi_t = \phi_t - \phi_{t-1}, \text{ for } t > 1 \tag{29}$$

$$\pi_1 = \phi_1, \tag{30}$$

$$\lambda y_t = -\phi_t B, \text{ for } t > 1. \tag{31}$$

Combining the three equations, it follows

$$p_T - p_0 = \sum_{t=1}^{T} \pi_t = \phi_T = -\frac{\lambda}{B} y_T. \tag{32}$$

Hence, since the output gap must converge to 0 in the long run, the price level returns to its level at time 0.

3. Small Open Economy

This section extends the analysis to the case of a small open economy with a flexible exchange rate such as Canada. The section also discusses whether it is practical for Canada to pursue a policy that is too different from the policy pursued by its major trading partner, the United States.

Suppose that the transmision mechanism in the open economy is represented by the following three equations

$$\pi_t = \pi_{t+1|t} + by_{t|t-1} - f(e_{t|t-1} - e_{t-1}) + \Phi X_{t|t-1} + \varepsilon_t$$
$$y_t = -cr_{t|t-1} - ge_{t|t-1} + \Psi X_{t|t-1} + \eta_t$$
$$e_t = hr_t + \Omega X_t + \nu_t$$

where: r_t is the real interest rate, defined as the nominal interest rate minus one-period ahead expected inflation, $\pi_{t+1|t}$; e_t is the real exchange rate, defined as $e_t \equiv p_t + s_t - p_t^f$, where s_t is the nominal exchange rate, (e.g., the price of a unit of domestic currency in terms of foreign currency), p_t is the domestic price level, and p_t^f is the foreign couterpart; X_t is a vector of exogenous variables such as US variables and real commodity prices; ε_t, η_t, and ν_t are white noise shocks; and, as before, π_t is the inflation rate and y_t is the output gap. Again, all variables equal 0 at steady state, and the economy returns automatically to the steady state in period 3. The central bank sets the interest rate at time *t* before observing the shock ε_t.

The first two equations stand for a Phillips curve and an IS curve respectively, while the third equation describes the link between the interest rate and the exchange rate. The exchange rate term in the Phillips curve witnesses the direct effect of the exchange rate on inflation, for instance through its effect on import prices, while the exchange rate term in the IS curve witnesses the effect of that variable on demand through its effect on net exports. The lag structure assumed in the model is convenient but not essential for our purposes. The crucial elements are the dependence of current inflation, π_t, on expected future inflation, $\pi_{t+1|t}$, and the inability of monetary actions to immediately offset unanticipated shocks to inflation.[1]

Although the exchange rate introduces a second channel by which monetary policy can affect the economy in this model, this makes no difference as far as the comparison between inflation targeting and price-level targeting is concerned. To see this formally, set

$$BZ_t \equiv by_t - f(e_t - e_{t-1}) + \Phi X_t \tag{33}$$

to transform the Phillips curve above into the form considered in the earlier section. Furthermore, since

$$\begin{aligned} BZ_{t|t-1} &= by_{t|t-1} - f(e_{t|t-1} - e_{t-1}) + \Phi X_{t|t-1} \\ &= -(bc + fh + bgh)r_{t|t-1} + (b\Psi - f\Omega - bg\Omega + \Phi)X_{t|t-1} + fe_{t-1} \end{aligned}, \tag{34}$$

$r_{t|t-1}$ determines the value of $BZ_{t|t-1}$.

Thus, in principle, the conclusions obtained earlier regarding the benefit of price-level targeting ought to apply equally to the small open economy represented above. Moreover, one may argue that this benefit is independent of the monetary regime adopted by a trading partner, whether for instance the trading partner is itself targeting the price-level or the inflation rate.

1. Alternatively, one obtains similar results if the cost in terms of output variability of offsetting shocks contemporaneously is very high.

There are, however, a number of important qualifications to the conclusion above. With regard to the irrelevance of the monetary regime adopted in the trading partner, it is useful to examine first one argument that is offered in support of this claim. Namely, it is argued that a flexible exchange rate would automatically adjust to alternative monetary regimes in the foreign country so as to keep the real exchange rate, hence the choice of domestic policy, unaffected. This is true if the alternative regimes under consideration in the foreign country differ only in nominal terms, and the difference is reflected solely in the behaviour of the nominal exchange rate, i.e., the alternative regimes induce identical behaviour of the exogenous variables X_t. Under these conditions, which regime is adopted in the foreign country, in principle, should have no bearing on the choice of domestic policy. For example, everything else being equal, the trend inflation rate targeted by the foreign country, whether it is 2 per cent or 3 per cent, should have no bearing on the domestic economy and, a fortiori, its monetary policy. If, however, the alternative regimes under consideration in the foreign country differ in other than just nominal terms, as would be the case for instance if the alternative regimes are inflation and price-level targeting, then it is most likely that exchange rate adjustments would not completely insulate the domestic economy from the changes in behaviour in the foreign country. Under these conditions, the particular regime adopted in the foreign country would matter for the manner in which domestic policy is conducted.[1]

In fact, it is not at all clear how the exchange rate would adjust to different behaviours in prices or output in the foreign country. In general, the effects of shocks and monetary actions on the exchange rate, as well as the pass-through effect of changes in the exchange rate on inflation, are quite uncertain. This uncertainty is likely to be larger, the larger the spread between domestic and foreign interest rates, i.e., the more divergent are the monetary policies in the two countries. One possible reason is that the foerign country has private information about the state of its economy and/or the path that its policy will take in the future in response to current events. By imitating its policy, the domestic country can reduce the risk of error regarding conditions in the foreign coun-

1. Nonetheless, it was shown in sections 2.3 and 2.4 that in the two-period model, price-level targeting coincides with the optimal policy, and that this is the case irrespective of the particular behaviour of the exogenous shocks. Section 2.5 also showed that the solutions to the infinite-horizon model are identical to those in the two-period model when output variability is not a concern for welfare. These results suggest that the relative merits of price-level targeting are to some extent robust to the behaviour of exogenous shocks.

try. Another possible reason is that the exchange rate will be better anchored if the spread in interest rates between the two countries remains close to the equilibrium level. Also, while one might reasonably expect the exchange rate elasticut to various shocks to remain stable if the state conditions are the same in both countries and the two economies pursue identical policies, this is not necessarily the case if the two countries take different policy actions. Given the uncertainty about the effects of monetary actions on the exchange rate, and the effects of the exchange rate on inflation, there is therefore an incentive to pursue a policy that is somewhat similar to the policy pursued by the trading partner, in order to reduce the variability in the exchange rate and consequently the variability of inflation.

Another qualification is that the arguments above ignore the costs of nominal exchange rate variability per se. To the extent that exchange rate variability (in its own right) is detrimental to the economy, and price-level targeting induces a more variable nominal exchange rate, the latter policy will be less advantageous than inflation targeting. Aside from direct costs of exchange rate transactions, empirical studies so far have not been able to find conclusive evidence regarding the welfare implications of exchange rate variability,[1] but then the same can be said regarding the welfare implications of price variability. At an intuitive level, one would expect nominal exchange rate variability to be detrimental to foreign investors and importers/exporters for the same reasons that price variability is detrimental to domestic producers and consumers.

Finally, at a more fundamental level, the model above does not distinguish between different sectors of the economy, specifically the traded and non-traded sectors, and the effect of policy on the terms of trade.

4. Conclusion

The paper has first reviewed the argument in favour of price-level targeting, and the assumptions it is based upon, in the context of a closed economy. It was shown that price-level targeting is more advantageous, the more forward-looking is the price-setting mechanism in the economy, the more transitory are shocks, and the less weight is placed on output variability in the welfare function.

1. See for instance Lafrance and Tessier (2000) for a study of the relationship between exchange rate variability and investment in Canada.

The paper has then examined the case of a small open economy with a flexible exchange rate such as Canada. It was shown that, in the context of a simple representation of the transmision mechanism, the results extend to the open economy case. However, it was argued that this conclusion may be too simplistic for a country such as Canada, and that it ignores important factors, such as the cost of exchange rate volatility that would ensue if Canada and the US pursued very dissimilar policies, and the effects on the terms of trade. Further research is needed, especially in the context of a general equilibrium model, to provide more satisfactory answers.

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