ISSN 1677-4205

BANCO CENTRAL DO BRASIL

Banco Central do Brasil Technical Notes

Number 30
November

Inflation Targeting: An Analysis of International Experience

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ISSN 1677-4205
CGC 00.038.166/0001-05

Banco Central do Brasil Technical Notes

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Statistical conventions:

- **...** Data unknown.
- **-** Null data or an indication that the corresponding item does not exist.
- **0** ou **0,0** figure smaller than half the value of the last digit to the right.
- ***** preliminary data.

An hyphen (-) between years (1970-1975) indicates the total of years, including the first and the last. A slash (/) between years indicates the yearly average of such years, including the first and the last, or harvest-year or agreement-year, according to the text.

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Foreword

The institutionalization of the Banco Central do Brasil Technical Notes, conducted by the Department of Economics, promotes the dissemination of works featuring economic content, attracting both theoretical and methodological interest, giving a view of the short-term developments of the economy and reflecting the work of the Bank's employees in all areas of action. Besides, other works, though external to the Banco Central, may be included in this series provided the Bank has afforded institutional support to their preparation.

INFLATION TARGETING: An analysis of international experience

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DEPEP/CONEP

Introduction:

Brazil's system of inflation targeting was introduced in July 1999, six months after adoption of the floating exchange rate system. The objective of the measure was to define a new nominal anchor that, according to Fraga (2000), would be essential in a period of acute instability such as that through which the country was then passing. Given the impossibility of adopting a policy that would utilize monetary aggregates as the nominal anchor, this role was to be assumed by the inflation target itself.

In an inflation targeting system, the overriding objective of monetary policy is a commitment to price stability. To achieve this objective, the Monetary Authority announces medium-term targets based on its projections of inflation. Since credibility is an essential ingredient to a system such this, sharp deviations from the projected target are certainly not desirable. However, no one can deny that the task of projecting inflation is a highly dubious endeavor as a result of the parameters built into the model utilized and the simple unpredictability of the exogenous shocks that may impact the economy. Such shocks can produce severe impacts on the Consumer Price Index. Consequently, it is essential that the inflation targeting system be equipped with mechanisms capable of safeguarding Monetary Authority credibility. However, given the lags inherent to monetary policy, the system also seeks to attenuate the volatility of the product and, in this way, diminish the costs imposed by more aggressive interest rate policies.

According to Mishkin and Schmidt-Hebbel (2001), an inflation targeting system must be structured in such a way as to preserve credibility in moments of crisis. There are four ways of attaining this end. The first would be to adopt a measure that would impact core inflation and, in this way, reduce the volatility of price indices. The second would be to make room for utilization of escape clauses. The third way in which the effects of shocks can be lessened would be to broaden the temporal horizon used in evaluating the targeting system. The fourth would be to adopt broader bands so as to increase the space within which it would be possible for inflation to fluctuate.

Based on this framework, this paper has the objective of analyzing the experience of several countries in the use of inflation targeting systems, with the overall aim of enriching the debate on the structuring of the Brazilian targeting system. The first section evaluates the experience of other countries in the adoption of core inflation as the target. The second section deals with experiences in the adoption of escape clauses. The third section discusses diverse possibilities in defining evaluation horizons. Finally, the fourth section analyzes the breadth of the bands used as targets and the deviation that have occurred.

1. In an inflation targeting system, the use of core inflation indices can represent a way of dealing with the inevitable shocks that impact the economy without overly impairing the reliability of the system. These indices are constructed by purging certain elements from the Consumer Price Index. Among the classic systems of measuring core inflation, one would exclude the most volatile headings or government managed prices. The advantage of this mechanism is that it does not depend on discretionary measures to be taken after shocks have occurred, since the inflation core methodology is defined *ex-ante.* Despite this, however, a number of criticisms are leveled at the system, including the difficulties encountered by the public in efforts to understand the concept of core inflation and the fact that measurements of core inflation will not reflect the population's cost of living. Taking due account of these arguments, one can go on to an analysis of the options adopted by several countries that utilize inflation targeting.

As noted in Table 1, most of the nations that adopt the inflation targeting system utilize the Consumer Price Index (CPI) without excluding any of its headings. Some countries use a measuring instrument that differs from the classic concept of core inflation, since they exclude only items referring to interest payments from the CPI (for example, payments of mortgage interest). Non-exclusion of these items would mean that changes in interest rates would generate inflation rate fluctuations in the same direction, thus impairing the efficacy of monetary policy. Currently, few countries adopt the classic core measurement system, which excludes other items from the price index aside from those involving interest outlays.

Table 1. Core Inflation – International Experience

Never Utilized Core[(1)]	Utilize CPI Core	Exclude only Interest	Abandoned Core [(2)]	Target Change After Abandoning Core?
Brazil (1999)	Canada (1991)	South Africa (2000)	Australia (1993/1998)	No
Chile (1991)*	Thailand (2000)	England (1992)	New Zealand (1990/1999)	No
Colombia (1999)			Czech Republic (1998/2002)	Yes
Iceland (2001)				
Israel (1992)				
Mexico (1999)				
Peru (1994)				
Poland (1998)				
Sweden (1993)				
Switzerland (2000)				

Source: Central Banks

(*) Though targets are defined on the basis of the full CPI, core measurements are used for periods of up to 12 months.

(1) Year of adoption of inflation targeting system.

(2) Year of adoption of inflation targeting system / Year of abandonment of Core.

The Canadian system is a classic case of successful utilization of core inflation in inflation targeting systems. In order to eliminate transitory impacts and obtain a more precise adjustment to the long-term inflation trajectory[1], the Canadian system has, since its inception in 1991, been based on a measurement of core inflation: the Core CPI.

The Canadian Core CPI excludes the eight most volatile items and the effects of changes in indirect taxes on the other components of the Consumer Price Index. The excluded items represent approximately 16% of the full price index and are specified in Table 2. Exclusion of indirect taxes is done by utilizing the following *ad hoc* hypothesis: changes in indirect taxes would be transferred to the price index with no lag and on a one-to-one basis. The contribution is then quantified and excluded in the calculation of the Core CPI.

Using the Core CPI, one notes a sharp decrease in the volatility of the price index. The standard deviation of the Core CPI calculated for the period from January 1996 to March

[1] "Over the short-term, a good deal of the movement registered under the CPI is caused by passing fluctuations in volatile product prices, such as fruit and gasoline and by variations in indirect taxes. For this reasons, the Bank of Canada utilizes a core inflation measurement that excludes the eight most volatile items from the CPI and adjusts the remaining items in such a way as to purge the effects of changes in indirect taxes. Core CPI tends to

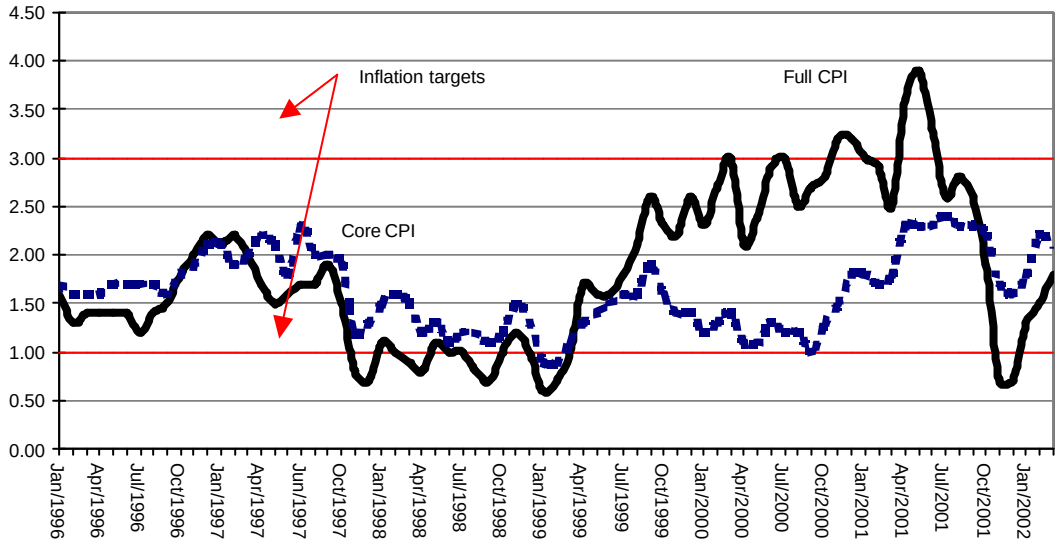
2002 is 0.39, while that of the CPI for the same time span is 0.81.

There is another core inflation measurement known as the CPI-XFET, which excludes food, energy and the impact of indirect taxes. However, this index is not used to underpin the Canadian target system.

Table 2. Canada (*Core CPI*) - Items Excluded from the CPI basket	
fruits, derivatives, and nuts	
vegetables and derivatives	
gasoline	
fuel oil and other fuels	
natural gas	
tobbaco and other products for smokers	
intercity transportation	
mortgage interest	
Total	16%

Source: Bank of Canada

Graph 1
Canada – Price indices – accumulated % change over 12 months



In the wake of its IMF program, Thailand's Central Bank adopted the inflation targeting system in 2000 and opted to utilize a core inflation measurement with the objective of excluding from the Consumer Price Index (CPI) those items marked by the greatest volatility. Consequently, several items strongly dependent on climatic conditions were excluded

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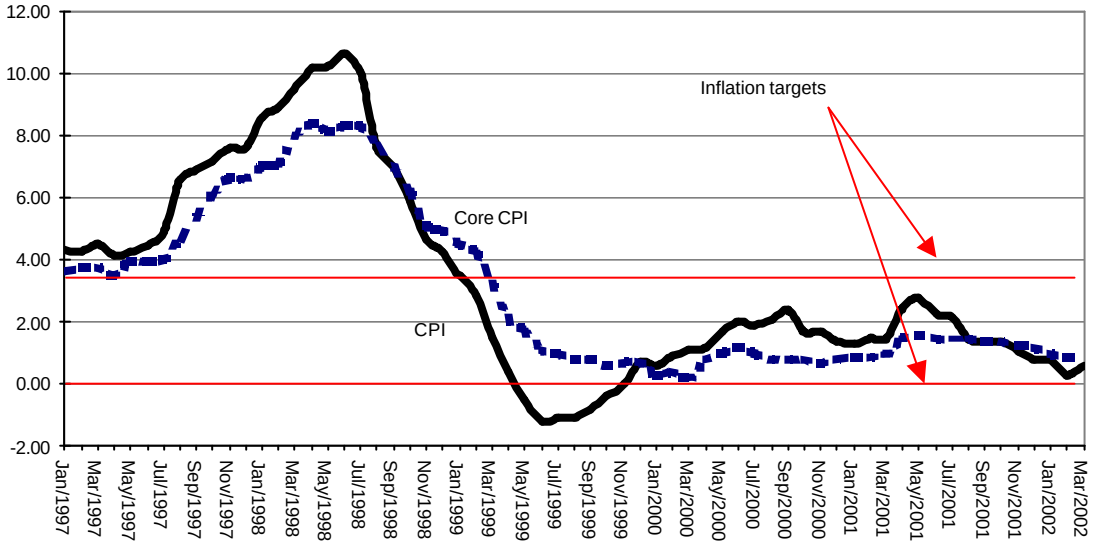
be a better forecasting instrument of future growth in the full CPI than the recent historical series of the full CPI itself." (Bank of Canada, Monetary Policy Report, April 2002). Free translation by the authors.

together with energy outlays, which are subject to external factors over which the Central Bank has no control. Despite these exclusions, the core still covers approximately 81% of the CPI.

Aside from Canada, Thailand is one of the countries that currently utilize the classic core measurement, which excludes more items than those related to interest payments. Most countries use the full index and some only exclude interest. Despite this, in the case of Thailand, the volatility of the core series is not significantly less than that of the CPI, probably because few items are excluded. For the period from January 1997 to March 2002, the standard deviations for the CPI and core were equivalent to 3.24 and 2.63, respectively.

Graph 2
Thailand – Price index – accumulated % change over 12 months



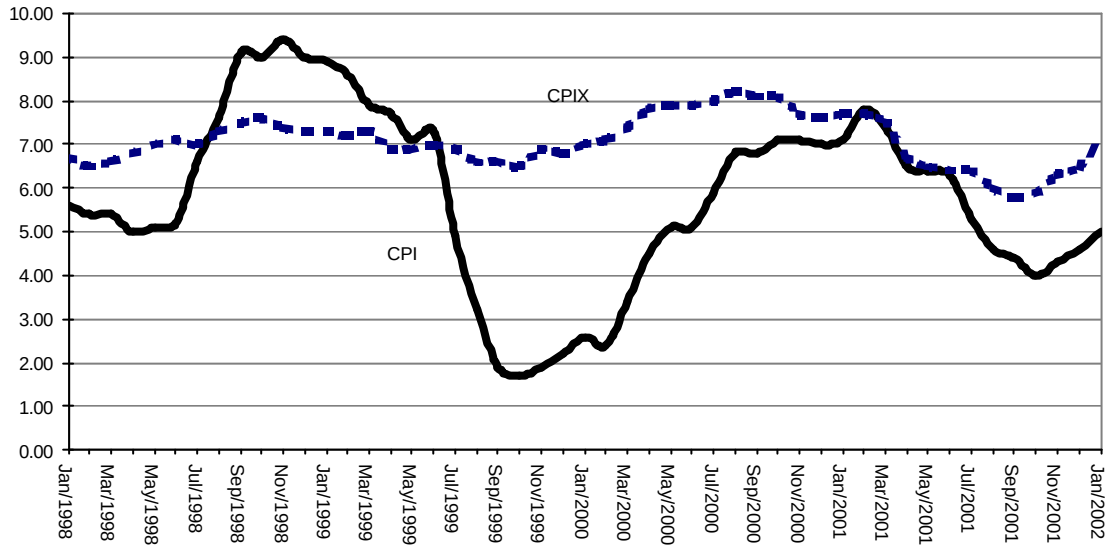
South Africa adopted the inflation targeting system in 2000, but defined the first targets only in 2002. The index utilized is the CPIX, which corresponds to the Consumer Price Index excluding payments of mortgage interest. By eliminating this item from the CPI, interest rate increases introduced by the Reserve Bank no longer directly provoke increases in the price index underlying the system.

Even when one recognizes the advantages of using other measurements of core inflation that exclude more volatile prices or those controlled by the government, the South African Central Bank came to the conclusion that core inflation would not satisfactorily reflect the cost of living and that the population would have a very hard time understanding the concept. As a

consequence, it was decided that only mortgage interest would be purged from the CPI.

With adoption of the CPIX, the major share of consumer spending is taken into account when determining inflation targets. However, it is important to note that the volatility of the CPIX is sharply less than that of the CPI: while the standard deviation of the CPI series in the period from January 1998 to January 2002 was 2.07, the standard deviation of the CPIX was no more than 0.59.

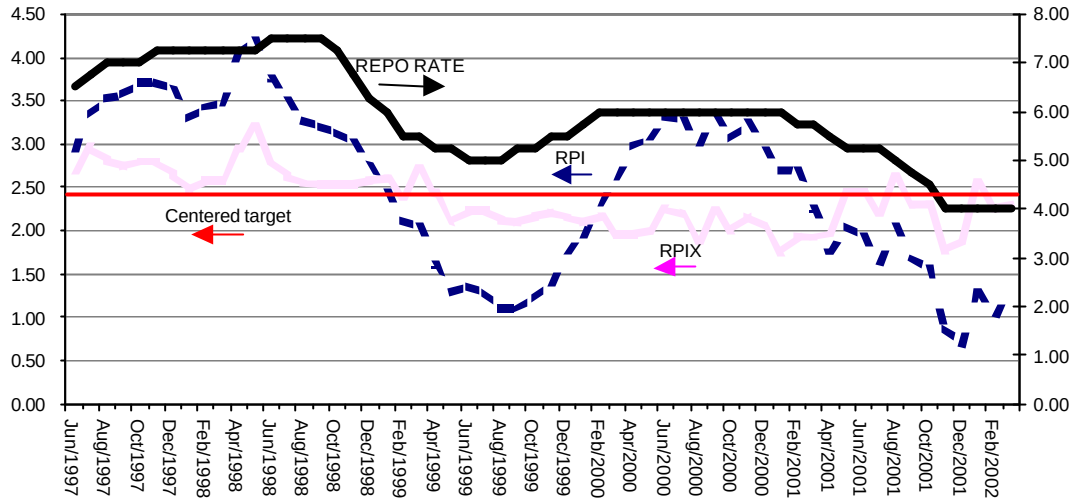
Graph 3
South Africa – Price indices – monthly % change



Though the English system also excludes elements from the Consumer Price Index, it is not a classic Core CPI case. It should be stressed that this purged index has been the one utilized as the foundation of the target system since it was first implemented in October 1992.

Just as in the case of South Africa, the objective is to exclude the direct positive effects of monetary policy on the price index and, consequently, eliminate any ambiguity that may be generated by interest rate policy. Thus, England opted to base its inflation targeting system on the RPIX, which is the Retail Price Index from which mortgage interest rates are excluded. One can clearly note the effects of mortgage interest on the full price index in the following graph. Analysis demonstrate that the process of purging this element is efficient, since no significant interest rate pressures on the RPIX are noted.

Graph 4
England – Price Indices – accumulated % change over 12 months and Repo Rate



When mortgage interest is excluded, there is a significant reduction in the volatility of the rate of inflation. This is evident in the fact that the Retail Price Index – RPI registered a standard deviation of 0.84 in the period extending from January 1996 to March 2002. In the same period, the RPIX turned in a standard deviation of 0.38[2].

Australia adopted the inflation targeting system in 1993. From that point to 1998, the Australian Central Bank used an index known as the "Treasury Measure of Underlying Inflation" to measure inflation and support the targeting system. This index was calculated through exclusion of several items from the Consumer Price Index (CPI) corresponding to approximately 49% of the full index. Table 3 indicates the items excluded from the CPI in the calculation of the core measurement and the reasons for these exclusions.

The principal justification for utilizing a core inflation measurement is based on the excessive volatility of the full index. As is evident in the table, the Australian case involves exclusion of several highly volatile or seasonal items from the index. Other items for which prices were determined by government decision (government monitored prices) were also excluded. The major problem in building the Australian CPI referred to inclusion of mortgage interest payments and direct consumer credit. As a result, part of the movement of the index represented only the direct and adverse impacts of monetary policy, without correctly

[2] After this date, calculation of the Underlying Inflation series was suspended.

reflecting the overall pressures of the economy. Interest rate increases resulted in an almost immediate increase in the CPI, erroneously pointing to a rise in the general price level.

Table 3. Australia - Items Excluded from CPI Basket

Item	% in CPI	Justification Underlying Exclusion		
		Volatility	Seasonality	Policies
Meats and Seafood	3.001	x	x	
Fresh fruits and vegetables	1.417	x		
Apparel	6.264		x	
Rentals (government real estate)	0.382			x
Mortgage interest	6.608			x
Taxes and local fees	2.190		x	x
Heating and electricity	2.339			x
Telephone and postal services	1.715			x
Interest on consumer credit	2.498			x
Fuels	4.698	x		x
Urban transportation	1.212			x
Tobacco and alcohol	7.475			x
Health services	3.961			x
Pharmaceutical products	0.820		x	x
Tourism	2.349		x	
Education and daycare	1.939		x	x
TOTAL EXCLUSIONS	48.868			

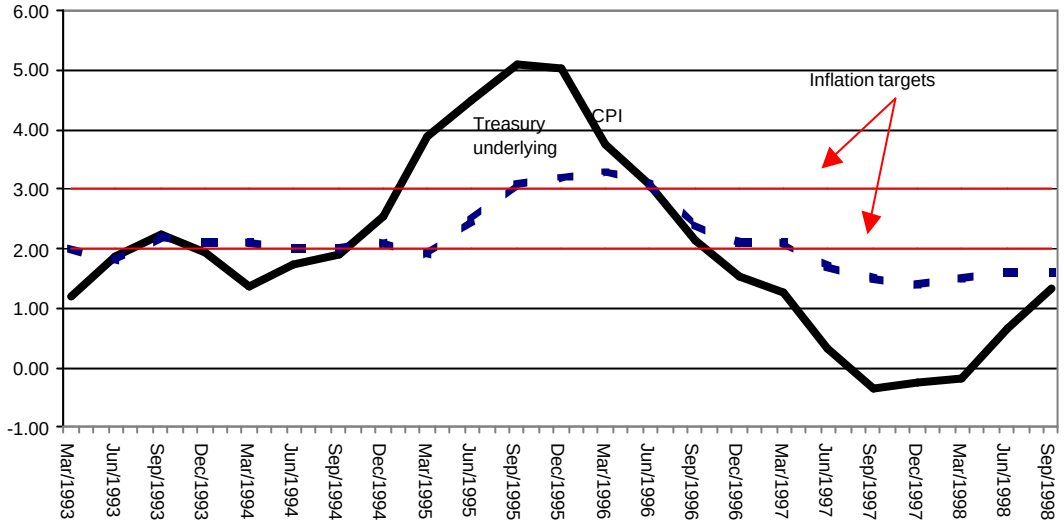
Source: Parliament of Australia – Monthly Economic and Social Indicators (September/2001)

Core inflation was only abandoned in 1998 as a result of alterations introduced into the construction of the CPI, excluding interest payments from the index. For the most part, the arguments supporting utilization of the Consumer Price Index instead of core inflation were based on the simplicity of the CPI and the fact that it enjoyed a high level of recognition among the general public. With the passing of time, the move to utilization of the CPI gained momentum and eventually replaced the "Treasury Measure of Underlying Inflation".

Despite the change in the index, no alterations were introduced into the system adopted by the Reserve Bank. Not even the inflation target was altered. The reason for this can be found in one of the fundamental characteristics of the Australian system of targets which is the temporal horizon used to attain compliance, as will be discussed further on.

It is important to note that, with the index changed, the series utilized is much more volatile. The standard deviation of the "Treasury Measure of Underlying Inflation" in the period from December 1987 to September 1998[3] came to 1.99, while that of the CPI totaled 2.79 in the same period.

Graph 5
Australia – Price indices – accumulated % change over 12 months



Since the 1990 adoption of the inflation targeting system in New Zealand, three different indices have been used to orient monetary policy decisions. In the first period, which lasted from 1990 to 1997, the reserve bank constructed a series known as Underlying Inflation, which basically differed from the CPI in the sense that the latter included mortgage interest payments under the heading of the cost of housing, while the former included the value of rents instead of interest. Aside from this, in the construction of the core, important changes in the terms of trade and strong impacts caused by changes in tax rates were sometimes excluded from the CPI.

In 1997, the Central Bank decided to suspend calculation of Underlying Inflation. However, until 1999 the system was still based on a core measurement, known as the CPIX, which excluded only items related to interest payments from the CPI. Once again, the objective was to exclude from the Consumer Price Index only those items that reflected direct impacts of changes in interest rates. As will be seen further on in this paper, the switch in indices occurred one year after the broadening of the target band.

Aside from this, following adoption of the CPIX, a new monetary policy stance was adopted. When faced with factors that could temporarily alter the inflation trajectory, the Bank would

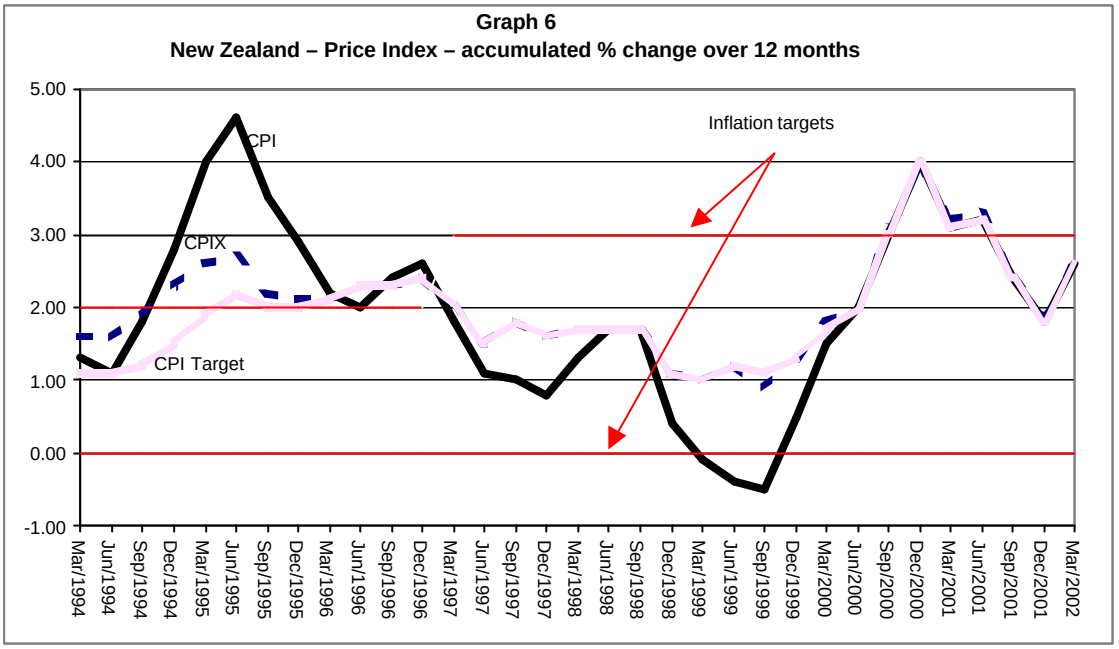
[3] After this date, calculation of the Underlying Inflation series was suspended.

refrain from adjusting its policy and, consequently, inflation would tend to deviate from the target for a certain period of time. Instead of using a measurement that would exclude the adverse impact of these factors, such as the concept of Underlying Inflation, the Bank would now use the CPIX, which excluded only interest payments. With this, the index underpinning the system would be subjected to stronger fluctuations in moments of strong exogenous shocks, and the Reserve Bank would have the task of explaining to the public how this index had been affected by such adverse factors. What was, in fact, occurring was that the Central Bank was disseminating the use of escape clauses as will be detailed further on.

As defined in the December 1999 Policy Target Agreement (PTA)[4], as of 2000 the full CPI has been used as the foundation for the inflation targeting system. In the previous year, the methodology used in calculating this index had been altered and interest excluded from the result. Once the problem of the direct effects of monetary policy on the full index had been resolved, the Reserve Bank defended use of the CPI since it considered that this index more adequately reflected the cost of living of the populace.

What occurred on this occasion was no more than an index change with no previous or subsequent alterations in the system. This is quite understandable given that the latter alteration was really no more than a simple change of nomenclature. Despite this, analysis of the series from 1994 onward shows a significant difference in terms of volatility: the standard deviation of the CPI between the first quarter of 1994 and the first quarter of 2002 was 1.25, while that of the CPIX was no more than 0.68.

[4] This is a document in which the Banco Central Governor and Minister of Finance specify the objectives of monetary policy. A new agreement must be prepared when a new Banco Central Governor takes office.



The Czech Republic implemented its inflation target program in 1998, using a type of Core CPI different from those discussed previously. Basically, this price index consisted of that segment of consumer products not covered by specific regulations, with adjustments for indirect taxes and elimination of subsidies. In overall terms, 117 items out of a total of 775 included in the Consumer Price Index were excluded, accounting for approximately 18% of the total index. Among the items excluded, the following deserve mention: heating, energy, petroleum derivatives, controlled rents, pharmaceutical products and services in the areas of health, transportation, mail, fixed telephone, water, sewers and diverse other rates. The reasoning underlying the purging of controlled prices was the inexistence of an adjustment plan for these prices (or for indirect taxes and subsidies)[5]. Net inflation was calculated on the basis of this new index.

It should be stressed that utilization of this core by the Czech Republic did not significantly reduce the volatility of inflation. In the period between January 1995 and January 2002, the standard deviation of the CPI closed at 3.24, while the Core CPI came to 3.16. As indicated in Graph 7, this type of core tended to run parallel to the full price index. Contrary to the cases

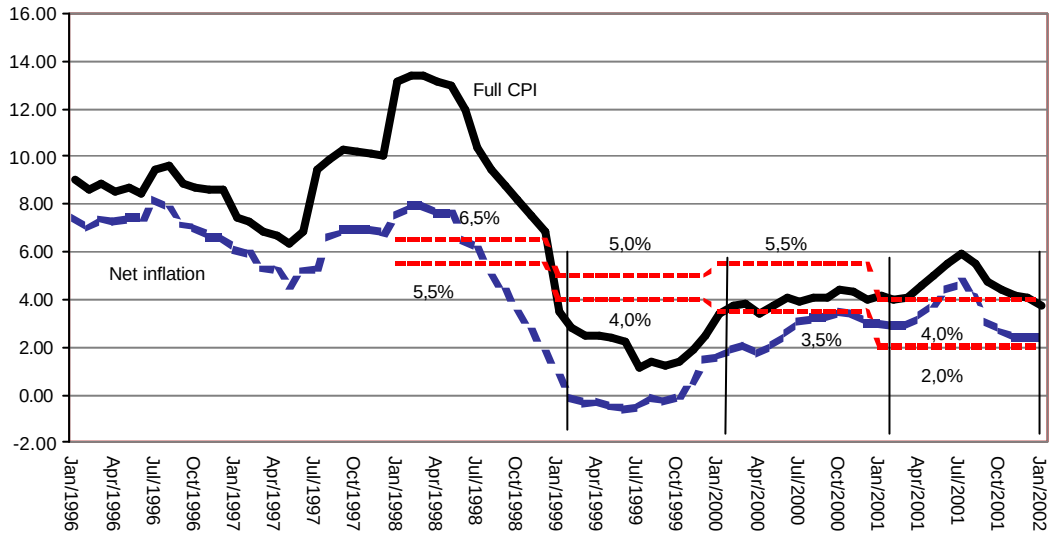
[5] "This approach was justified primarily by the inexistence of a specific plan for increases in managed and regulated prices and for changes in indirect taxes and fees." (CNB, Czech National Bank, The Setting of Infaltion Target for 2001).

of Thailand (as will be seen further on) and Canada as of 1996, at no point whatsoever did the CPI surpass the full index. There was no evidence of long-term convergence.

Announcement of a medium-term adjustment plan to be applied to regulated prices as of 2002 resulted in a review of the price index used to back the target system[6].

The full price index was first utilized as of January 2002. Targets were revised and enlarged. The target center increased from 3% for the end of 2001, based on the Core CPI, to 4%, for the start of 2002, using the full index. However, the width of the band was maintained at 1% (up or down). The new Czech targets will be discussed in greater detail in the following section.

Graph 7
Czech Republic – Price Index – accumulated % change over 12 months



2. Escape clauses:

Adoption of escape clauses (whether explicitly or not) is another way of dealing with exogenous shocks, since such clauses provide the monetary authority with greater flexibility when unforeseen events occur. Should a supply shock occur, the Central Bank is in a position to deviate temporarily from its targets, provided that it gives the public an explanation of the

[6] "Announcement...of a medium-term adjustment plan for regulated prices, indirect taxes and fees (in the form of the Outlook for Changes in Regulated Prices up to 2002) altered the situation and provided a foundation for a

reasons for doing so. Though it is obviously not possible to include all of the potential vicissitudes to which an economy may be prone in the escape clauses, some countries have used this mechanism to reduce the costs imposed on economies that disrespect the rules of the inflation targeting system.

On opting to use the inflation target system, the South African Central Bank made it very clear that, though monetary policy would be geared to attaining inflation targets, this did not mean that the institution would simply comply with a set of very strict rules in the pursuit of this end, with no freedom to act on its own. Ever since the beginning, the Reserve Bank underscored the danger implicit in excessive emphasis on targets, without an adequate analysis of the overall scenario.

With the intention of avoiding distortions that could result from excessively stringent application of preordained rules, the Reserve Bank instituted clauses that would allow it to adjust to supply shocks without generating higher costs in terms of product and employment. Though it is obviously impossible to foresee all of the shocks to which an economy may be susceptible, several circumstances are cited in which the Bank would be able to adopt a more flexible stance and even opt for noncompliance with the rules. These include such events as accentuated variations in the terms of trade, abrupt halts in the flow of external capital and natural disasters.

Should any of these events occur, the population must be informed of the possible consequences in terms of monetary policy instruments and objectives. Thus, in the face of severe abnormalities, the Bank is in a position to opt for less than total compliance with the targets so as not to subject the economy to an inordinate degree of sacrifice, provided that the need for such measures be clearly justified to the general public.

According to Mishkin and Schmidt-Hebbel (2001), Canada also has the possibility of revising the inflation target trajectory in such exceptional situations as natural disasters, high petroleum prices, and so forth. There is no mention of utilization of escape clauses by Canada, principally because the country has never deviated from its inflation target. Aside from this, as already stated, the price index used to back the target system is that of the Core CPI, which

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gradual change away from the targets defined in terms of net inflation, transforming them into targets for the full

clearly reduces the probability of having to utilize such rules.

In New Zealand, the first PTA, formalized in March 1990, cited the possibility of altering inflation targets when faced with events capable of negatively impacting the inflation trajectory, such as taxation changes and accentuated shifts in the terms of trade caused by alterations in import or export prices. In December of the same year, a new agreement was signed and included measures to be followed should unexpected shocks occur. However, instead of allowing the Reserve Bank to renegotiate the target, the new PTA determined that the Bank should allow inflation to deviate from the target but, at the same time, must provide the public with adequate information on the effects of the shocks, while clarifying the strategy to be followed by the Bank in its efforts to bring inflation back within band limits.

As already stated in the previous section, with substitution of the Underlying Inflation Index by the CPIX, the major share of the effects of the adverse shocks would no longer be excluded from the index underlying the system. Consequently, inflation would tend to more easily deviate from the target for a given period of time, thus demonstrating the importance of such instruments as escape clauses.

The most recent PTA, signed in 1999 and valid until 2003, stresses that, in seeking price stability, the Reserve Bank must avoid excessive instability in terms of products, interest rates and exchange rates. In this sense, several factors are listed that are capable of provoking temporary deviations from the targets, such as changes in commodity prices, alterations in indirect tax rates and natural disasters. According to the PTA, these events can generate powerful - albeit temporary - impacts on the CPI which, in turn, may not adequately reflect the long-term price trend. When such a scenario occurs, the Central Bank must take steps to avoid greater inflationary pressures without, however, overly jeopardizing the overall trajectory of the economy.

Aside from this, in cases of effective noncompliance or even forecasts of noncompliance, the Bank is obligated to explain the reasons for such an occurrence to the public, while also clarifying the measures taken or proposed to ensure that inflation will be reined in to the targeted level.

CPI." (CNB, Czech National Bank, The setting of Inflation Target for 2001).

The Swiss Central Bank also recognizes the possibility of short-term price fluctuations originating, for example, in alterations in the prices of petroleum or other imported goods or even accentuated shifts in exchange rate positions. The stance adopted by the National Bank is to respond only to those shocks that involve the threat of strong inflationary or deflationary pressures. The Bank refrains from reacting to occasional short-term price movements since intervention in such cases could result in strong product fluctuations and even cause damage to the economy as a whole.

The motives underlying the existence of escape clauses in the Czech inflation targeting system are common to practically all countries: external shocks that cannot be foreseen and are beyond Central Bank control.

However, among the countries that adopt inflation targeting systems, the Czech Republic is the one that could make the most use of escape clauses. Practically all adverse situations originating on the supply side can justifiably be used as reasons for deviating from the predetermined inflation targets. Among the situations in which the escape clauses can be used, the following deserve mention:

i) strong shifts in international prices: raw materials, energy, commodities;
ii) large scale deviations in the rate of exchange unrelated to domestic monetary policy;
iii) significant alterations in farm output;
iv) natural disasters (and other events) that impact prices;
v) changes in regulated prices that have an impact of more than 1-1.5 percentage points on the price index (full inflation);
vi) changes in indirect taxes (full inflation);
vii) price shocks consequent upon adoption of the standards of the European Union.

It should be stressed that this is the only country in which utilization of an escape clause is subject to a quantified limit (item v).

3. Time horizon:

On adopting an inflation targeting system, one should specify the time horizon to be observed in evaluating inflation trends and determining when the country has or has not complied with the specified target. Some countries, such as Brazil, use a 12 month horizon based on the

Gregorian calendar, thus defining the target in terms of the accumulated January-December index. Other countries utilize more rigid time horizons such as, for example, those known as the *rolling window*, which corresponds to the monthly variation of inflation accumulated in a specified number of months.

Given the lags intrinsic to monetary policy, adoption of a longer and more flexible time horizon for the inflation target system can be a useful way of coping with adverse shocks while, at the same time, preserving system credibility. An extended horizon demands a less drastic response to shocks, since inflation is allowed to fluctuate over a longer period of time. The following section of this paper will analyze the experiences of Australia and New Zealand, both of which utilize rather unique time horizons in their inflation targeting systems.

In Australia, the inflation targeting system is less rigid than in many other nations, since it does not require that the rate of inflation be held constantly within the band limits. The time horizon used to verify compliance with the target is not predetermined (for example, at the end of each year, as is done in Brazil) and targets are to be attained in median terms over the course of time. Consequently, based on an average drawn from recent years[7], inflation should remain in the range between 2% and 3% per year.

This was the major reason why no alterations were introduced into the system (such as changes in targets or inclusion of escape clauses) nor into the policy applied by the Reserve Bank when the index used to measure inflation was substituted in 1998 (the Treasury Measure of Underlying Inflation was replaced by the CPI). Since, in median terms, the full index and the core index are quite close to one another (the only significant difference being that the full index is more volatile), the index switch had no real impact in terms of compliance with the target. Thus, even if the CPI deviates from the band by a margin greater than the Core Index, if the median result of one of them is within the band limits, so will the other.

Though the time horizon used in New Zealand is not as flexible as that employed in Australia, the Central Bank of New Zealand operates on a time horizon considered “indeterminate”. As a matter of fact, each time a new Central Bank Governor takes office, a new PTA must be formalized by both the new Governor and the Minister of Finance and each new PTA specifies the duration of the target. This does not mean, however, that the rate of inflation

[7] Observe that the number of years used in calculating the median is not defined nor is it predetermined.

must be held within the band parameters at all possible instants during the course of time up to 2003. In the words of Reserve Bank Governor Donald Brash:

"Though expressed in a different way, the target of 0 to 3% per year adopted in New Zealand has characteristics quite similar to the target adopted in Australia (target of 2% to 3% over the course of the economic cycle). In the approach taken by each of these countries, temporary deviations from the target are not particularly relevant."[8] (free translation by authors)

The more flexible time horizon was adopted in the December 1990 PTA, based on the position taken by the government and the Reserve Bank itself in the sense that such a measure would aid in reducing the costs consequent upon a drop in inflation.

By adopting more flexible time horizons, the possibility of Australia and New Zealand not complying with inflation targets is practically nil. As will be seen further on, however, if these countries had adopted the Gregorian calendar in their target systems (as in Brazil), several deviations would already have occurred.

4. Deviations from target and band alterations

The direct consequence of misgivings surrounding monetary policy and the impact of exogenous shocks is an increase in uncertainties regarding inflation trends. Estimates of the impact of these uncertainties indicate that they are sufficiently strong to provoke a difference of 5 to 6 percentage points between the band ceiling and floor[9]. Evidently, broader bands are very costly in terms of system credibility. The alternative would be adoption of highly precise short-term targets. We will now go on to an analysis of the structuring and altering of targets in different countries that have adopted inflation targeting systems, while also looking at the deviations that have occurred in these countries in relation to such targets.

Band alteration

Those countries that had high levels of inflation at the time they adopted the target system have had to alter their targets on various occasions, in the pursuit of a state of equilibrium or steady state inflation. The purposes underlying these changes were to enhance the credibility

[8] "Inflation Target in New Zealand 1988-2000", speech given in Melbourne in February 2000.

of their Central Banks and monetary policies, while also reducing inflationary expectations.

Chile is a typical and highly successful case in which the system of inflation targeting was adopted in order to stabilize prices[10]. Besides Chile, other countries with inflation levels above 15% at the time they adopted their systems were Peru, Israel and Mexico.

The first target defined by Chile in 1991 was an interval between 15% and 20% for accumulated year-over-year inflation. This target was gradually reduced and the intervals were narrowed from 5 percentage points between the upper and lower band limits to a level of just 2 percentage points. Between 1995 and 2000, a precise centered target was defined without abandoning the downward trend. In 2001, following inflation 1% above the 3.5% target, Chile shifted back to the interval system with a 2 percentage point difference between the upper and lower band limits (2% to 4%)[11]. The entire process of convergence to steady state inflation consumed a period of approximately 11 years.

England is another case that reveals alterations in the band structure of the target system. Starting in 1996, the target that had previously been set at an interval between 1% and 4% for accumulated 12 month inflation was transformed into a centered target defined as the midpoint of the former band (2.5%). Following passage of the 1998 Bank of England Act, any deviations of more than 1% from the target had to be explained as to the causes of the deviation and the steps taken to reverse the situation. What this represents is an implicit band of 1 percentage point up or down, a margin that was somewhat narrower than the 1.5 percentage point up or down limit of the previous system.

In the case of Israel, the inflation target band is altered in light of the previous year's deviation. In December 1994, Israeli inflation came to 14.5%, 6.5 percentage points above the predetermined centered target. In the following year, the target was set at a level higher than in 1994, with the previous year's target transformed into the lower limit of the 1995 target

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[9] Mishkin and Posen (1998) cite the estimates elaborated by Haldane and Salmon (1995) and Stevens and Debelle (1995).

[10] It is worth recalling that, up to September 1999, Chile also utilized a system of exchange bands concomitantly with the inflation targeting system.

(8% to 11%).

Despite many deviations in relation to the target, the Israeli system is also characterized by the fact that it tends to converge to a long-term rate of inflation. It began at a high level, with a target of 14%-15% for 1992. From that point forward, it converged gradually over approximately 10 years until reaching the long-term target (1%-3%).

Just as in the case of Israel, New Zealand also altered its targets in light of the previous year's deviation. When the target system was adopted in 1990, it was set at 0% to 2% per year. This target was maintained until 1997 when it was broadened to 0% to 3% annually. One should stress that, in 1996, annual inflation came to 2.4% which, as will be seen in the next subsection, would have meant noncompliance had the Gregorian calendar been adopted. In the wake of that "deviation", the inflation index was allowed to float within a broader range and that system has remained in force ever since.

In the Brazilian case, given the intensity and scope of the shocks that have battered the economy and their resulting impact on inflation, it was considered advisable to adopt a smoother trajectory for the defined targets. This adaptation was deemed necessary since, when cost and supply shocks impact an economy, monetary policy has to be conducted in such a way as to bring inflation gradually back into line, while avoiding excessive volatility in the level of economic activity. Thus, in Resolution 2,972, dated June 27, 2002, the National Monetary Council determined that the inflation target for 2003 would be altered from 3.25% to 4%, with a tolerance level of 2.5 p.p. up or down. At the same time, this instrument determined the 2004 inflation target at 3.75%, with the same tolerance[12].

When it abandoned the Core CPI and adopted the full Consumer Price Index as the foundation of its target system, the Czech Republic increased the center point of the inflation band accumulated over 12 months from 3% to 4%. The band was not broadened and remained at one percentage point either up or down. The alterations in the target that occurred with the change in price indices can be summarized in the following graph, which was provided by the Central Bank of the Czech Republic.

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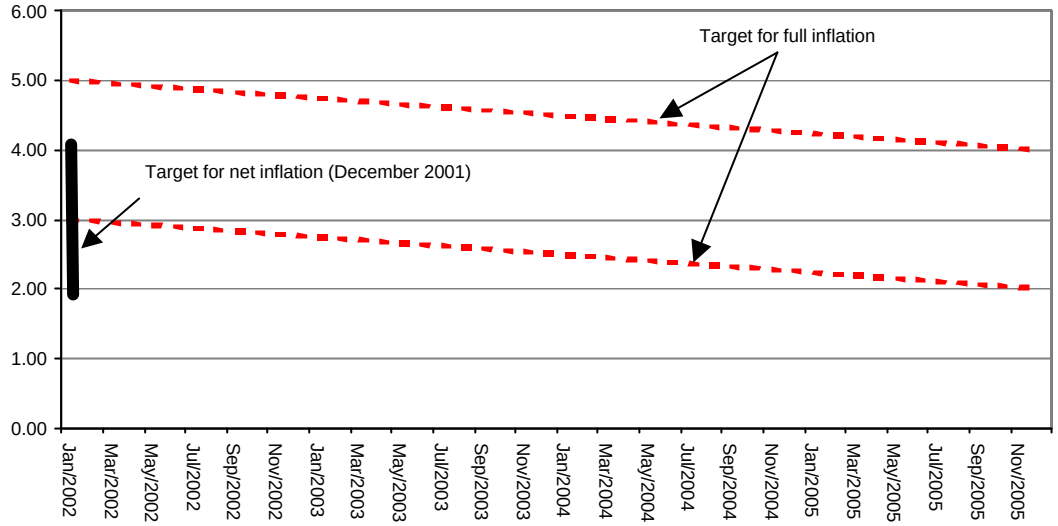
[11] Though the targets are defined in terms of the full CPI, measurements based on the core index are taken into consideration in evaluations and inflation projections for periods of up to 12 months.

Graph 8
Czech Republic - Inflation target



However, as is evident in Graph 7, the target for 2000 indicates a widening of the band when compared to the first two years of the system. Until the end of 1999, the difference between the upper and lower limits of the band was only 1 percentage point. This difference was expanded to 2 percentage points at the start of 2000.

Deviation from targets

It is not always possible to avoid noncompliance with inflation targets without generating excessively high costs for the economy, even in well-structured and successful systems. The following table summarizes the most significant deviations registered by countries that have adopted the inflation targeting system. In this subsection, the various cases will be individually analyzed.

[12] Banco Central do Brasil (2002), Inflation Report, September.

Table 4. Summary – Deviations in relation to target*:

Australia	**Brazil**	**Israel**
	–2001: p = 7,7% (p*anual = 2%-6%)	
–1995: p =3,2% (p*= 2%-3%)		–1994: p = 14,5% (p*anual = 8%)
–1997: p =1,4% (p*= 2%-3%)	**Chile**	–1996: p = 10,6% (p*anual = 8%-10%)
–1998: p =1,6% (p*= 2%-3%)		–1999: p = 1,3% (p*anual = 4%)
–1999: p =1,8% (p*= 2%-3%)	–1992: p = 12,7% (p*anual = 13%-16%)	–2000: p = 0,0% (p* anual= 3%-4%)
–2000: p =5,8% (p*= 2%-3%)	–1993: p = 12,2% (p*anual = 10%-12%)	–2001: p = 1,4% (p*anual = 2,5%-3,5%)
–2001: p=3,1% (p*= 2%-3%)	–1994: p = 8,9% (p*anual =9%-11%)	
	–1999: p =2,3% (p* anual= 4,3%)	**Czech Republic**
New Zealand	–2000: p = 4,5% (p*anual = 3,5%)	
		–1998: p = 1,7% (p*anual =5,5%-6,5%)
–1996: p = 2,4% (p*anual = 0%-2%)	**Iceland**	–1999: p = 1,5% (p*anual = 4%-5%)
–2000: p =4,0% (p* anual= 0%-3%)	–2001: p = 8,6% (p*anual = 1%-6%)	–2000: p =3% (p*anual =3,5%-5,5%)

***** Applying the gregorian calendar.

If Australia had opted to utilize the Gregorian calendar in its target system, noncompliance would have occurred in six of the last nine years. In three of those years, the rate of inflation closed above the upper target limit (which has always been and still is 2% to 3% per year). In the other three years, inflation remained below the lower limit. Though deviations that surpass the upper limit are more susceptible to criticism, any type of deviation stands as a sign of the innumerable uncertainties inherent to an inflation targeting system. The simple existence of these uncertainties makes perfect operation of the system difficult, principally when the target is as narrowly defined as in Australia[13].

The Australian target system began in 1993 and the first deviation occurred only in 1995. No problems were encountered in 1996. However, from 1997 forward, situations of noncompliance occurred every year. Particular mention should be made of 2000 when inflation came to 5.8% per year, considerably above the upper band limit of 3% per year.

After complying with the targets defined in the first two years following implementation of

[13] As a matter of fact, the Australian target can be quite narrow precisely because the Reserve Bank operates with a more flexible time horizon that does not give undue importance to "temporary" deviations. The important this is that, over the long-term, the rate of inflation must remain within the band limits. And this is precisely what has occurred (based on both the Treasury Underlying standard up to 1998 and the CPI from that point forward, one obtains a median mark of 2.6% for the 1993 to 2001 period), even though deviations occurred in several of these years in relation to the targets, when viewed under the prism of the Gregorian calendar.

the system (1999 and 2000), Brazil was unable to comply with the inflation target for 2001[14].

In the first year following implementation of its inflation targeting system, Iceland surpassed the upper band limit by a full 2.6 percentage points.

Israel was responsible for the largest ever deviation from a predetermined inflation target, with 6.5 percentage points above the 1994 band ceiling. As already stated, following this deviation, Israel transformed the 1994 target (8%) into lower band limit (8% to 11%) for the following year.

Other lesser deviations were registered above the target in 1993 (1.2 percentage points above the centered target) and 1996 (0.6 percentage points above the upper band limit). In the last three years (1999, 2000, 2001), Israel closed the period below the stipulated centered target (in 1999) and below the lower target band limit (in 2000 and 2001).

As already stated, New Zealand adopts a highly flexible time horizon. However, if one were to apply the Gregorian calendar (such as in the case of Brazil), we would note that, in 1996, inflation ended the year at 2.4%, surpassing the upper band limit of 2% per year. In the same way, in 2000, annual inflation closed at 4%, well above the upper limit of the target parameters which had been set at 0% to 3% per year.

In its turn, the Czech Republic deviated from its target on three consecutive occasions, closing below the specified targets in 1998, 1999 and 2000.

Conclusion

The institutional arrangement of an inflation targeting system is of the utmost importance to the success of the system. Well structured systems enjoy greater credibility, generate correct incentives and diminish the adverse impacts of exogenous shocks on the economy.

Brazil adopted the inflation targeting system recently. Since then, efforts have been made to improve the structure of the system so as to reduce the uncertainties inherent to it and attenuate product volatility.

[14] The reasons that led to the deviation from the target are presented in the Open Letter to the State Minister of

This paper is an attempt to enrich the recent Brazilian debate with respect to such points as adoption of core measurements for inflation and/or escape clauses, broadening of bands and the choice of the time horizon to be applied to evaluation of the targets, utilizing elements of international experience as a benchmark for these studies.

With respect to adoption of core inflation, this system has been abandoned by several of the countries that had adopted it when implementing their inflation targeting systems. In its classic form, the core is currently used only by Canada and Thailand.

Escape clauses are explicitly utilized in a number of different countries, such as South Africa, New Zealand, the Czech Republic and Switzerland, though most of them do not clearly specify the conditions under which they can resort to this instrument. Despite this, it is possible to utilize these clauses in moments of shocks that tend to generate powerful impacts on the rate of inflation and, in this way, avoid excessive costs for the economy in terms of product and employment.

Australia and New Zealand have highly distinct manners of evaluating the evolution of their inflation targeting systems, based on more flexible time horizons. By adopting this aspect, it is not required that the price index used to back the system remain constantly within band limits. Consequently, the economy has a longer period of time in which to recover from exogenous shocks.

Utilization of centered inflation targets is seen to be far from the optimum solution, particularly when one considers the uncertainties intrinsic to the process of projecting inflation due as much to the parameters of the model utilized as to the high levels of volatility to which some economies are subject, such as in the case of Brazil. Instead of this, it may well be more suitable to use the band system as a way of avoiding loss of credibility.

The optimal size of the band can be determined on the basis of the volatility of the economic variables that impact price levels, such as exchange rates. Countries like Israel, New Zealand and, more recently, Brazil revised the optimal size of their bands and broadened the intervals used as their targets, particularly in light of deviations that occurred in the last year.

Finance (2002).

Finally, it should be underscored that there is no single formula for designing an optimum system of inflation targeting. Due consideration must be given to the specific facets of each economy in such a way as to adopt the most effective protection mechanisms against shocks in each specific case.

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