

Core versus headline inflation targeting in Thailand

by Robert Neil McCauley¹

Abstract

This paper analyses the choice between targeting core or headline inflation in Thailand. It frames the choice as one of whether a measure of core inflation serves as a useful intermediate target between the operating target of a short-term interest rate and the ultimate objective of headline inflation or some broader measure of price stability. It is argued that the shift in the global terms of trade between manufactures and commodities has presented a systematic challenge to the usefulness of core measures as intermediate targets, analogous to the role of financial innovation in breaking down the relationship between monetary aggregates and nominal GDP a generation ago. In light of this discussion, the paper examines international practice. Then the record of core inflation as an intermediate target is examined for the inflation targeting period in Thailand. The deficiency of the measure of core inflation used may not be unique to it: an alternative measure of core inflation would not have performed in a satisfactory manner either. Finally, transition and design issues are highlighted in a potential shift away from using core as an intermediate target, drawing on the experience of similar shifts by Sweden, the United Kingdom and Korea.

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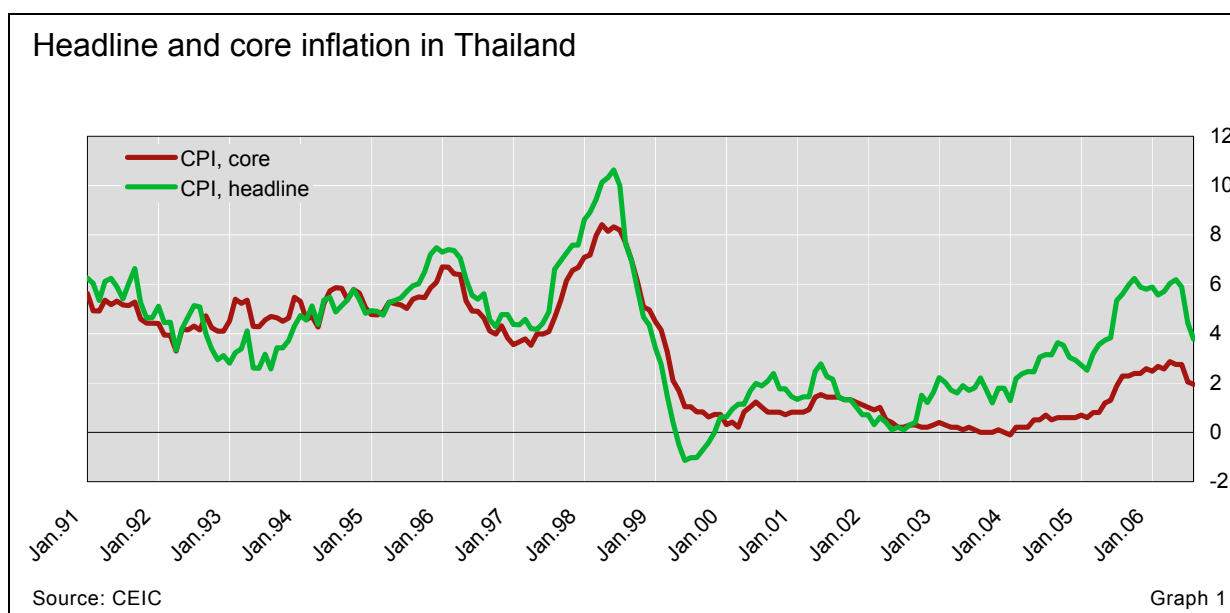
¹ Chief Representative, Representative Office for Asia and the Pacific, Bank for International Settlements. Views expressed are those of the author and not necessarily those of the BIS. Paper prepared for Bank of Thailand's international symposium on "Challenges to inflation targeting in emerging countries", Bangkok, 13-14 November 2006. The author thanks Bill Allen, Chaywadee Chai-anant, Dietrich Domanski, Andrew Filardo, Hans Genberg, Yong-E Ha, Corrinne Ho, Eli Remolona, Toshitaka Sekine and Michael Spencer for discussions of this topic. The author thanks San-Sau Fung, Gert Schnabel and Andrea Tesei for research assistance. All errors remain the author's.

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1. Introduction

Should the Thai authorities abandon core inflation in favour of headline inflation as a target of monetary policy? This question surfaced in August 2006 in the Thai English-language press (Srisukkasem (2006)). In addition, changes in the current range of the inflation target and the time span over which the target is to be hit are under consideration. The reason cited is that core inflation and headline inflation have diverged. Core rose over the last couple of years from near zero to two to three percent while headline reached a year-over-year reading of 6.2% in early 2006 before falling off (Graph 1).



This paper offers an outsider's perspective on these policy questions. The plan of the paper is first of all to consider whether core and headline inflation are in some sense competitors in an inflation-targeting framework or whether one is pre-eminent and the other only of interest in its relation to the first. The burden of the argument is that headline inflation is imbedded in the wage-setting process in Thailand, and thus core inflation can only be justified as a target in terms of its relationship to headline inflation. While core enjoyed a good relationship with headline in the 1990s, in this decade the relationship has faced a challenge in the form of the impact of China and India's growth on global relative prices. Then comes a review of international practice, which suggests that core inflation measures are more used in communication than as a target. Still, in some cases inflation targets involve important exclusions that are often overlooked. Then follows an analysis of core inflation as a predictor of headline inflation. The evidence does not favour focusing policy on core inflation. Finally, transitional and design issues are addressed. The experience of Sweden, the United Kingdom and Korea is consulted.

2. Core and headline inflation: intermediate target and ultimate goal

Following Rich and Steindel (2005), one can argue that headline inflation—or indeed a broader measure of inflation—serves as the ultimate goal in an inflation targeting framework. The general argument for taking headline inflation as the ultimate goal is that it ramifies widely through the economy. One set of dissenters to the focus on headline consumer prices ask “Is price stability enough?” (White (2006)). They worry about misaligned asset prices and unsustainable build-ups of debt and other cumulative imbalances (Borio (2006)). This paper leaves it to Claudio Borio to pursue

these themes in this conference. Another set of dissenters, on much weaker ground, argues that core inflation is the appropriate target.²

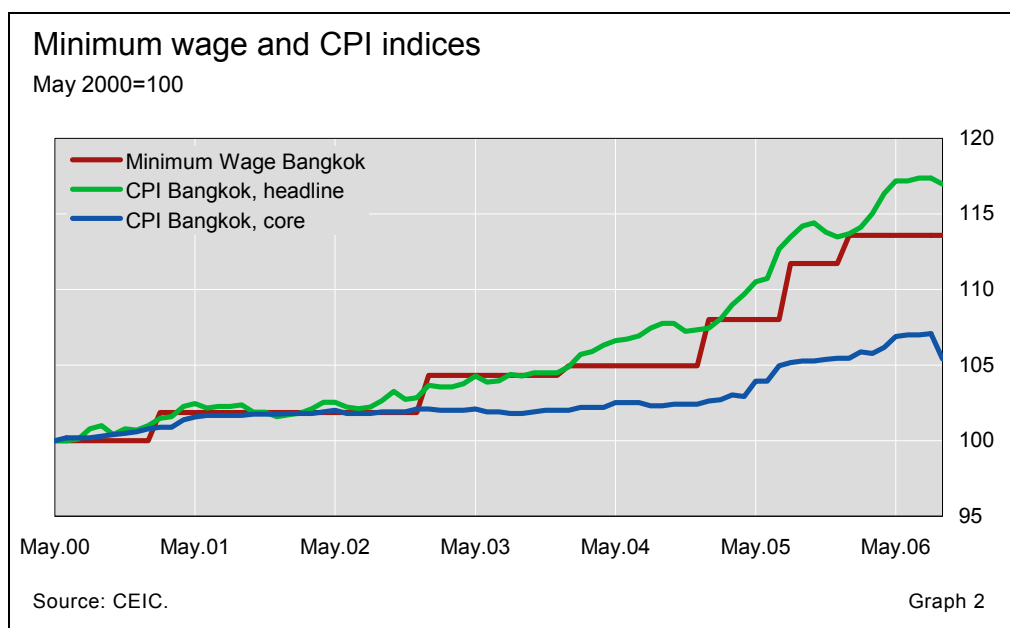
It is less obvious in Thailand than in the United States that headline inflation should serve as the ultimate goal, so the next section gives reasons for why it should be preferred to core inflation.³ Then follows an analysis of the relationship between core and headline inflation in Thailand up to the beginning of the inflation targeting regime in 2000. After that, evidence is presented that the challenge to core inflation as an intermediate target over the last several years has had a global dimension.

2.1 Headline inflation as an ultimate goal

The argument for headline rather than core inflation as an ultimate goal rests on the variety of contractual and legal linkages to the structure of wages, social payments and capital returns. Of course, such contractual and legal links are not givens over the medium to long term. If a central bank were convinced that a core measure were superior, it could attempt to influence employees and employers and legislators to switch.⁴

In the United States, Social Security and many government and some private pensions are indexed to the headline consumer price index. Some wages are likewise indexed, though a smaller fraction than was the case a generation ago. And tax tables and some government debt are so indexed.

In Thailand, headline inflation does not seem to be legally linked to social payments, pensions, taxes and government debt service. The social partnership-style bodies that set the minimum wages, however, do appear to pay attention to headline inflation. Graph 2 shows that increases in the minimum wage in Bangkok, for instance, have tracked the increase in the level of headline consumer prices quite closely during the period of inflation targeting, despite its focus on core inflation.

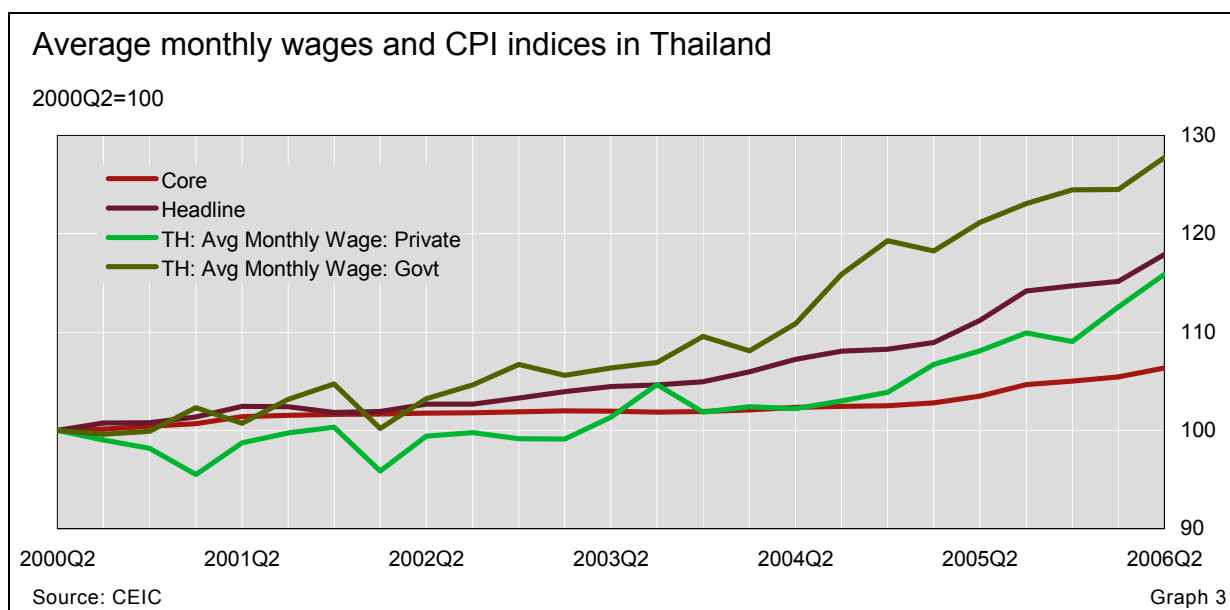


² Blinder (1997, p 160) recalls, “As a central banker, I always preferred to view the inflation rate with its food and energy component removed as our basic goal. But not because these components are extremely volatile. The real reason was that the prices of food (really, food at home) and energy are, for the most part, beyond the control of the central bank. The Fed cannot do much about food and energy prices—except, of course, to cause a recession deep enough to ensure that increase in these prices do not lead to overall inflation”. Silver (2006, p 35) cites this passage without approval.

³ This is not to exclude other goals (McCauley (2006)).

⁴ The reference for private contracting, however, can lag the shift in an official inflation target: “The retail price index rose to an annual 3.6 per cent in September, an eight-year high. ‘There is a very real danger that 2007 wage settlements will be markedly higher as many pay deals are still based on the retail price index,’ said Howard Archer, economist at Global Insight. ‘Consequently, I expect the Bank of England to make a further precautionary 25 basis point interest rate hike in November’” (Garnham (2006)). For the market reaction to the RPIX before the switch, see Burrows and Wetherilt (2004). See also section 5.1.2, below.

Whether headline inflation is as powerful an influence throughout the labour market is less clear. Civil service wage increases during the inflation targeting period reflected the former government's policy to increase incomes to stimulate consumption. Still, private wages, after suffering some deflation in the early years of recovery from the 1997-98 crisis, seem to have chased headline inflation (Graph 3).



Thus, wage developments suggest that the inflation process works off of headline inflation.⁵ The Bank of Thailand macroeconomic model takes the minimum wage (treated as an exogenous variable) and headline inflation as drivers of average earnings, which, along with the output gap and import prices, drive core inflation. On this showing, headline inflation deserves to be considered the ultimate goal, leaving attention to core inflation to be justified in terms of its relationship to headline.

2.2 Core inflation as an intermediate target

Rich and Steindel (2005) use the term intermediate target and draw an analogy with the role of monetary aggregates in the early 1980s. At the Bank of Canada, Laflèche and Armour (2006) consistently refer to core as serving as the “operational guide”. To call core an operating target would not be appropriate: that term should be reserved for something that the open market desk can be held accountable for in real time, which in the case of most inflation targeters would be the short-term policy rate (Borio and McCauley (2001)). A fair reading is that intermediate target and operational guide refer to much the same role. That is, the operating target, the policy interest rate, is moved to control the intermediate target/operating guide in order to achieve desired outcome in terms of headline inflation.

Certainly, there is agreement among these authors on what makes a measure of core useful in this role. Following Roger (1998), they cite several properties of a useful core measure of inflation: that it be timely, credible, understandable and not biased with respect to the targeted measure. Wynne (1999) elaborated on the last property, calling for a measure that is “forward-looking in some sense” and that has “some predictive power for future headline inflation”.

When the Bank of Thailand embarked upon inflation targeting in the spring of 2000, the choice of core inflation as an intermediate variable was well grounded empirically. That is, it had desirable properties in relation to headline inflation: much the same mean, lower variability and good predictive power.

⁵ At the limit, one could argue for what Keynes in the *Treatise on Money* called a wage standard, or in more modern parlance, a wage inflation target, with headline inflation as an intermediate target. Here the point is simply the connection of headline inflation to the wage-setting argues for headline as the ultimate target.

Thai core inflation had the same mean as headline inflation. Looking at the data from January 1991 through April 2000, policymakers could draw comfort (Table 1). “The trends in the two measures of inflation move together in the long run [Graph 1]. Hence, the maintenance of price stability in terms of core inflation will lead to stable prices overall” (Sriphayak (2001, pp 5-6)). In particular, a core measure within a given range would keep average headline inflation in the same range. At the same time, the lower variability of core inflation must have suggested that core would be more likely to remain within a given target band.⁶ Indeed, the test set for themselves by Thai policymakers was quite exacting its frequency: that quarterly average year-over-year inflation remain in the target band.

Table 1 **Descriptive statistics for core and headline inflation before inflation targeting (January 1991-April 2000)**

	Core	Headline
Mean	4.66	4.74
Median	4.77	4.85
Maximum	8.42	10.64
Minimum	0.20	-1.14
Standard deviation	1.75	2.42
Skewness	-0.66	-0.28
Kurtosis	3.90	3.53
Probability of normality	0.003	0.246
Observations	112	112

Source: CEIC, BIS calculations.

Following Wynn (1999), Rich and Steindel (2005) and Lafèche and Armour (2006) hold that another desirable property of an intermediate target is that it predict the ultimate goal well. In particular, over some horizon, it is desirable that the current difference between core and headline inflation be closed by headline inflation’s movement to the core level. This can be tested by a regression of the change in headline inflation over a horizon of 12, 24 and 36 months on a constant and the current gap between core and headline inflation. Such a regression estimated over the January 1991 to April 2000 data performed in satisfactory fashion, notwithstanding the effects of the Asian financial crisis of 1997-98 (Table 2). At the 12- and 24-month horizon, differences between headline and core inflation were resolved on average by headline inflation moving up or down to core inflation. More formally, the joint hypothesis that the estimated constant is zero and that the coefficient on the current gap between core and headline is -1 could not be rejected. In addition, the explanatory power of the gap between core and headline was respectable with about 40% of the variance accounted for at the two longer horizons.

⁶ Sriphayak (2001) reported standard deviations for core of 1.9% versus raw food and energy price volatility of 5.4% and 8.7%, respectively.

Table 2 **Core inflation as an unbiased predictor of headline inflation (January 1991 to April 2000)**

Months ahead (<i>h</i>)	α^1	β^2	\bar{R}^2	$H_0: \alpha = 0$ and $\beta = -1$
12	-0.295 (-0.504)	-1.526 (-0.964)	.215	0.466 <i>p</i> -value = 0.629
24	-0.570 (-1.099)	-1.984** (-2.113)	.382	2.266 <i>p</i> -value = 0.109
36	-0.800 (-1.413)	-2.049** (-2.487)	.366	3.714 <i>p</i> -value = 0.028

Note: Reports estimated parameters for equation, $\pi_{t+h} - \pi_t = \alpha_h + \beta_h (\pi_t - \pi_t^{CORE}) + \varepsilon_{t+h}$ where π_{t+h} is the *h*-month-ahead year-over-year inflation rate, π_t is the current year-over-year inflation rate, π_t^{CORE} denotes year-over-year core inflation, and ε_{t+h} is a mean-zero random disturbance term. T-statistic using Newey- West (1987) covariance matrix estimator reported in parentheses. ¹ $H_0: \alpha = 0$ ² $H_0: \beta = -1$ *Significant at the 10 percent level. **Significant at the 5 percent level. *** Significant at the 1 percent level.

Source: CEIC, BIS calculations.

In sum, viewed from the perspective of early 2000, core inflation in Thailand had much to recommend it as an intermediate target. It promised to average out at the same rate as headline inflation over time while showing substantially lower variability. Over a two-year horizon, core seemed like an unbiased predictor of headline inflation.

2.3 The challenge of China and India to core inflation as an intermediate target

The recent rise in energy and other commodity prices has posed a challenge to central banks relying on such relationships between core and headline inflation. These challenges are conditioned by energy pricing policies of the respective governments, the level of energy taxes and the overall income level as well as by central banks' own elaboration of their monetary policy frameworks. For a central bank focused on a core measure of inflation in an economy with only passing energy subsidies, with low energy taxes and at an intermediate level of income, the challenge has been acute.

At the outset it should be recognised that the energy price rise differs from cases often taken to be precedents. Whereas in earlier decades cutbacks in supply led to oil "shocks", in the recent past supply has expanded in the face of strong demand, which was led not least by the fast-growing Asian economies. In general, commodity prices have risen because world growth has been more robust than in a generation.

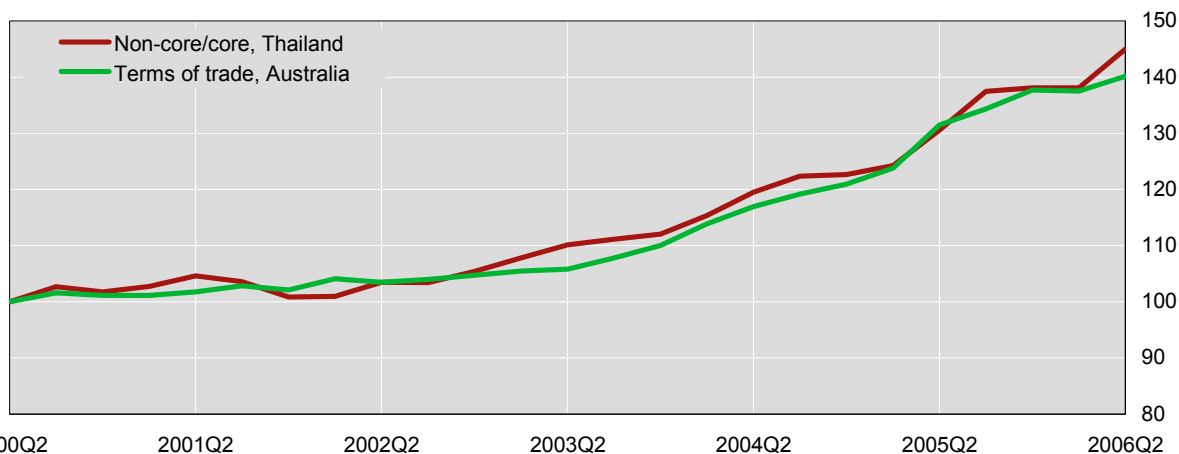
Observers have emphasised the role of China and India in the rise of commodity prices relative to internationally traded goods and services prices (King (2005b)). Edey (2006), in commenting on a paper by Richard Cooper on China's effect on global commodity markets, argued that

China is already a large presence in global commodities demand, and has the potential to become much larger. Let me come back to the question of what this means for world relative prices. I apologise here for being parochial and showing a graph on Australia. I do so only to make a point. As a simplified proposition, we can describe Australia as an exporter of commodities (of which mineral resources is the largest component) and an importer of manufactured goods. Australia's TOT [terms of trade] is therefore a rough indicator of the global relative price of resource commodities to traded industrial outputs.

If this rough indicator of the global relative price of resource commodities to traded industrial output is juxtaposed to the ratio of non-core to core prices from the Thai consumer price index, they resemble each other remarkably (Graph 4). If Edey is right that China's growth has improved Australia's terms of trade, then perhaps China has likewise put a wedge between Thai core and noncore prices.

Non-core/core prices in Thailand and the terms of trade of Australia

2002Q2 = 100



Source: CEIC and Reserve Bank of Australia

Graph 4

Clearly factors particular to Thailand were at work, but the global influence suggested by this juxtaposition merit consideration. The initial rise in non-core inflation in Thailand reflected mostly a weather-related rise in raw food prices. While the timing of this rise may have reflected harvests in Thailand, an important exporter of food, especially rice, its sustained nature resembles the rise in the price of other staple foods. For its part, the energy price rise tends to pose a particular challenge to emerging market economies. First, at medium levels of income, the energy intensity of the consumption basket tends to be higher (an Engle curve observation). Second, and in part as a consequence, the baseline of energy taxes tends to be lower in emerging markets than in more advanced countries. As a result, a given percentage increase in energy prices makes for a larger percentage change in consumer prices in emerging markets.

In sum, the influence of the rapid growth in Asia on global commodity prices may have disturbed the relationship between core and headline inflation in Thailand. It may not be restored by the recent fall-back in energy and commodity prices.

3. Core and headline inflation: international practice

Many central banks use a core inflation measure in external communication. However, few inflation targeting central banks use core as their target. The next two sections take up in turn the wide and narrow use of the core inflation concept across central banks.

3.1 Use of core inflation in external communication

Almost all inflation targeting central banks use one or more measure of core inflation in their public discussion of inflation. Practice with regard to the exclusions varies, with volatile elements like food and energy the most frequent, followed by administered prices and mortgage interest (Table 3). The last tends to be excluded in Commonwealth countries with floating-rate mortgages, but not in economies where fixed rate mortgages are more common, as in Continental Europe, Japan or the United States. Median measures are discussed in Australia, Norway and Sweden (see below section 4). Core measures can include anywhere from 60% to 95% of all prices (Table 4).

Table 3 Use of core inflation in external communication in selected countries

	Excluding mesures ¹	Others ²	No core measure
Argentina	VA		
Australia	V	T, Wm	
Brazil	VA	T	
Canada	VA, VAM	Wv	
China	V		
Euro area	V		
Indonesia	VA		
Japan	V		
Korea	V		
Mexico	VA		
Norway	VA	T, Wm	
Poland	V, A	T	
Russia	VA		
South Africa	M		
Sweden	AM, VAM	T, Wm	
Switzerland	V, VA	T	
Thailand	V		
United Kingdom			X
United States	V		

¹ V = Excluding volatile items (eg food and/or energy), A = Excluding administered prices and tax effects, M = Excluding mortgage interests, VA = Combination of V and A, VM = Combination of V and M, AM = Combination of A and M, VAM = Combination of V, A and M. ² T = Trimmed mean, Wm = Weighted median, Wv = Weighted variance

Sources: Domanski and Sekine (2007); national data.

		Share ¹
United States	PCE price deflator excluding food and energy	80.2%
	CPI excluding food and energy	77.4%
Euro area	HICP excluding unprocessed food and energy	83.4%
Japan	CPI excluding fresh food	95.5%
Canada	CPI excluding eight volatile items and the effect of changes in indirect taxes	82.8%
	CPI excluding food, energy and the effect of changes in indirect taxes	74.3%
	Weighted variance CPI ³	100%
Sweden	CPI excluding household mortgage interest expenditure and the effect of changes in indirect taxes and subsidies	94.4%
Switzerland	15% trimmed mean CPI	70%
	CPI excluding food, beverages, tobacco, seasonal products, energy and fuels	78.2%
	CPI excluding food, beverages, tobacco, seasonal products, energy, fuels and administered prices	58.3%
Brazil	20% trimmed mean	60%
	CPI excluding household food and administered prices	-
Thailand	CPI excluding fresh food and energy	75.3%

¹ Proportions to headline CPI. ² Latest observations, annual changes in per cent. ³ Weighted by a factor that is inversely proportional to the component's variability. ⁴ Change from the previous month.

Sources: Domanski and Sekine (2007); national data.

3.2 Use of core inflation as a target

Few central banks ostensibly use core inflation as a target. Norway's central bank "places particular emphasis on developments in consumer price inflation adjusted for tax changes and excluding energy products...as an indicator of underlying inflation" (Norges Bank (2001)). South Africa continues to exclude mortgage interest payments that are closely related to its own policy rates. Korea recently switched (back) to headline inflation. On the face of it, Thailand is left with only two other central banks out of the 23 inflation targeting countries target a core measure (Table 5).

Yet other central banks, while not using the term "core", nevertheless focus on a measure with significant exclusions. Thus the Bank of England focuses on the harmonised index of consumer prices (dubbed the "consumer price index"), which excludes housing prices and local taxes (King (2004)). This exclusion is not justified on grounds of volatility but is a practical expression of the difficulty of obtaining agreement in the euro area on the measurement of housing costs. (The management of the transition from the former measure of the retail price index excluding mortgage interest payments, RPIX, to the new measure is treated below in section 5.) For its part, the Riksbank, though targeting headline inflation, told market participants in 1999 that it would not react to the inflationary effect of interest rates and indirect tax changes. (This change is described below in section 5 as well.)

More confusing is the case of New Zealand. There the target measure has changed over time from "Underlying inflation until the September 1997 quarter, CPIX inflation through to the June 1999 quarter, then CPI inflation from the September 1999 quarter. CPI Inflation has been adjusted by Statistics New Zealand to exclude interest and section prices from the September 1999 quarter to the June 2000 quarter" (Reserve Bank of New Zealand (2006)). It might then seem that an inclusive headline measure is now used, but read on: "From September 1999 the index excludes interest

charges and section prices". One might say that the headline figure (that reported by the Statistics New Zealand) is a core measure!⁷

On this showing, Thailand is not nearly as isolated. Five of the 23 countries on Table 5 target a core measure.

Table 5

Inflation targeters

	Year started inflation targeting ¹	Targeted inflation concept ²	Policy/Official interest rate
Brazil	1999	CPI	SELIC O/N
Chile	1991	CPI	O/N discount
Colombia	1999	CPI	TBS O/N rate
Mexico	1999	CPI	1-day bank funding ³
Peru	2002	CPI	O/N interbank rate
Indonesia	2000	CPI	1-month SBI
Korea	1998	CPI	O/N call
Philippines	2002	CPI	Reverse repo
Thailand	2000	Core CPI	14-day repo
Czech Republic	1998	CPI	2-week repo
Hungary	2001	CPI	2-week deposit
Poland	1998	CPI	28-day intervention
Israel	1992	CPI	Headline
South Africa	2000	CPI-X	Repo
Turkey	2006	CPI	O/N borrowing rate
Australia	1994	CPI	Cash rate
Canada	1991	CPI (CPIX)	O/N funding rate
Iceland		CPI	7-day repo
New Zealand	1990	CPIX	Cash rate
Sweden	1993	CPI (CPI ex interest and indirect tax)	Repo
Norway	2001	CPI ex tax & energy	O/N deposit rate at central bank
Switzerland	2000	CPI	3-month CHF Libor ⁴
United Kingdom	1992	CPI (HCIP)	Repo

¹ According to Mishkin and Schmidt-Hebbel (2001), except for Iceland, Indonesia, the Philippines, Hungary and Norway.

² According to Schmidt-Hebbel and Tapia (2002), except for the latter and Korea, New Zealand and United Kingdom.

³ Also corto. ⁴ Policy stance expressed as a target range for this offshore interest rate.

Sources: Mishkin and Schmidt-Hebbel (2001); Schmidt-Hebbel and Tapia (2002); national data.

4. Does Thai core inflation still serve as a useful intermediate target?

However one interprets the trend across inflation targeters in the use of core measures of inflation, the question remains how core inflation has performed in relation to headline over the inflation targeting years in Thailand. This section analyses the disappointing performance of core inflation in Thailand as an intermediate target in the last several years. It first shows how the similarity of means, tracking and

⁷ Roger and Stone (2005, p 9) report that "South Africa, Australia and New Zealand also excluded interest cost components of the CPI until CPIs were redefined to exclude these items".

predictive power of core in relation to headline all broke down. The question then arises, however, whether the performance was peculiar to the core measure selected in 2000. Thus an alternative measure of core inflation is defined and its performance assessed. The simple alternative analysed would have offered little improvement over the core measure in actual use.

4.1 The disappointing performance of core inflation during the inflation targeting period

Core inflation has not performed in this decade as it had in the previous decade. Then, it had practically the same mean as headline; more recently, it has had a mean of one and a half percentage points less (Table 6). Then, it could predict about 40% of movements of headline inflation over a two- or three-year horizon, more recently, it has predicted little or nothing of subsequent movements (Table 6). Then, a core below (above) headline predicted a subsequent decline (rise) in headline inflation; more recently, headline has continued to move away from core.

	Core	Headline
Mean	0.97	2.56
Median	0.81	2.12
Maximum	2.87	6.24
Minimum	-0.10	0.10
Standard deviation	0.82	1.71
Skewness	-0.87	0.83
Kurtosis	2.71	2.74
Probability of normality	0.007	0.011
Observations	76	76

Source: CEIC, BIS calculations.

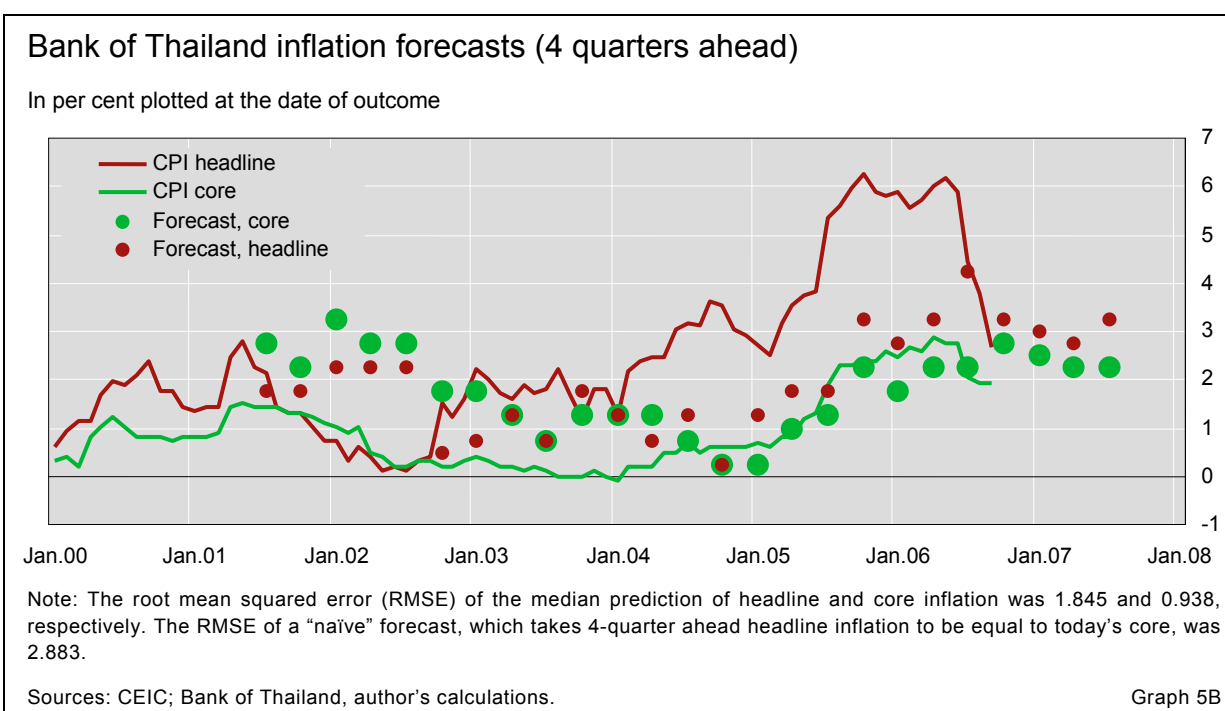
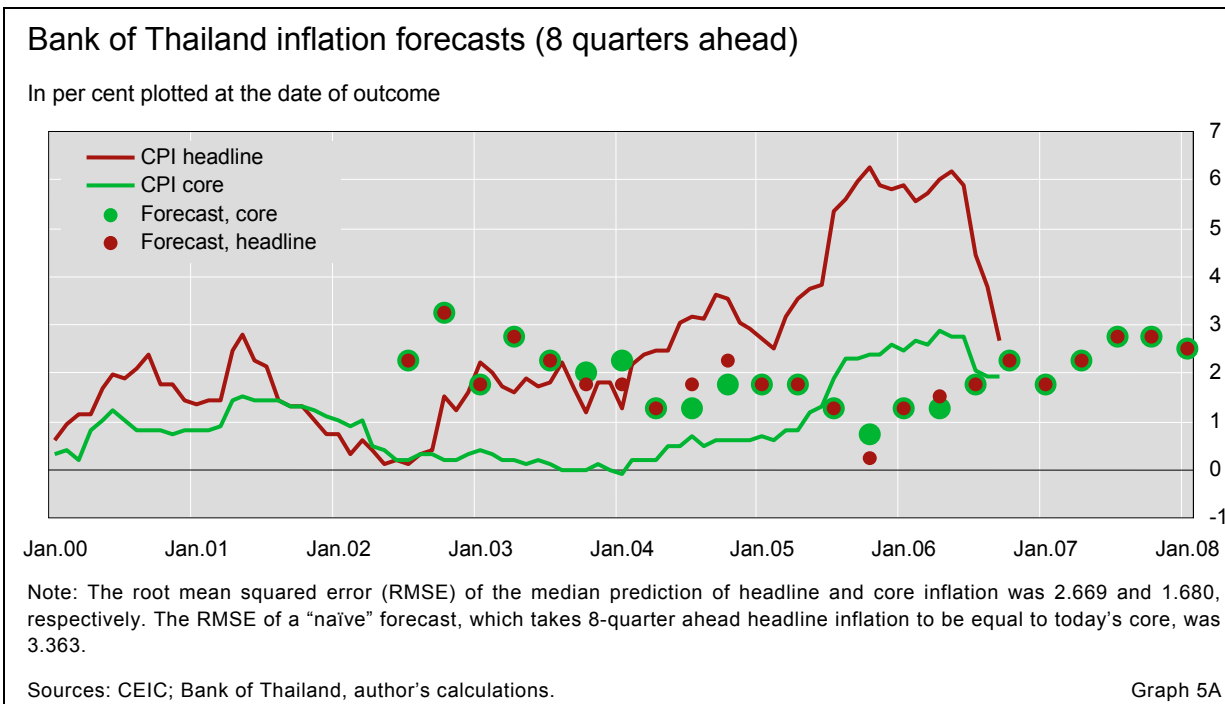
Months ahead	α^1	β^2	\bar{R}^2	$H_0: \alpha = 0$ and $\beta = -1$
12	0.291 (0.587)	0.324*** (4.535)	.040	32.665 p -value = 0.000
24	0.957* (1.769)	0.472*** (3.978)	.032	18.957 p -value = 0.000
36	2.313*** (3.980)	-0.166 (1.513)	-0.022	12.539 p -value = 0.000

Note: Reports estimated parameters for equation, $\pi_{t+h} - \pi_t = \alpha_h + \beta_h (\pi_t - \pi_t^{CORE}) + \varepsilon_{t+h}$ where π_{t+h} is the h -quarter-ahead year-over-year inflation rate, π_t is the current year-over-year inflation rate, π_t^{CORE} denotes year-over-year core inflation, and ε_{t+h} is a mean-zero random disturbance term. T-statistic using Newey-West (1987) covariance matrix estimator reported in parentheses. ¹ $H_0: \alpha = 0$ $H_0: \beta = -1$. *Significant at the 10 percent level. **Significant at the 5 percent level. *** Significant at the 1 percent level.

Source: CEIC, BIS calculations.

The point is not that the Bank of Thailand was led astray by the core. Quite to the contrary, it has a macroeconomic model to predict headline inflation, in which core is but one input (Sriphayak (2001),

Waiquamdee (2001)). Its predictions for headline inflation were much better than what a “naïve” model that predicted future headline from today’s core (based on the bivariate relationship in Table 2) would have suggested (Graph 5).⁸ However, the point is not whether the Bank of Thailand’s forecasts did better than the core in some sense, but that headline inflation drifted away from core for some time.



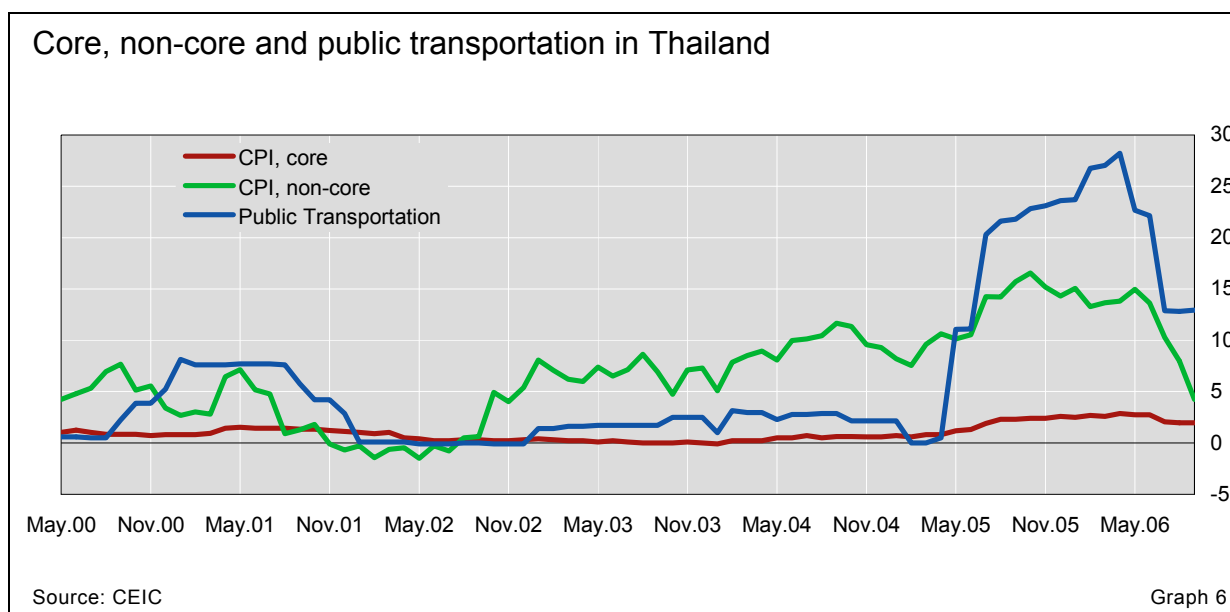
⁸ Kohn (2005) reports that the Board of Governors staff forecast of core CPI over the 1984-2000 period had a root mean square error of 0.51, compared to a “naïve” model, which that takes core CPI a year from now to be the current core CPI, of 0.67. In the case of the Bank of Thailand, such a “naïve” model, which that takes core inflation in four or eight quarters from now to be the current core inflation, had a root mean squared error of 0.97 and 1.39, respectively.

4.2 Would an alternative core measure have done better?

This section defines and discusses three alternative measures of core inflation: a variant on the official measure that excludes public transportation costs, median inflation and weighted median inflation. The first moves a component of the core index that is heavily influenced by the cost of diesel and petrol to the non-core index along with food and energy. The median rate of inflation, taken without respect to weights, is untested but easy to compute. The weighted median inflation has been shown by Bryan and Cecchetti (1994) and Smith (2004) to provide better forecasts of subsequent inflation than the consumer price index ex food and energy in the United States. While the first and third measures remain untested, the unweighted median would have performed no better than core inflation over the inflation targeting period.

4.2.1 "Core prime"

Public transportation tariffs bear a close relationship to the price of diesel and petrol in Thailand. As these have been allowed to rise after an initial subsidy programme, bus, taxi, train and boat fares have been raised. The volatility of this component suggests that it might be useful to exclude it from core inflation along with energy prices. However, adding this component to noncore prices and subtracting it from core would have only increased the difference between their means as shown on Table 6. It may also be doubted that it would improve the performance of core as a predictor as shown in Table 7.



4.2.2 Median inflation

The median in effect orders all the components included in the inflation measure from slowest to fastest growing for each month and takes the rate of inflation that divides the list into two *by number*. In a simple example of nine components of the consumer price index, the fifth slowest-growing component would be the median (Table 8).

It makes sense to look at some sort of median measure because it lessens the effect of extreme observations that may prove transitory or that may be accommodated over some period by other prices moving in the opposite direction. It might be expected that the unweighted median would be inferior to the weighted median, but this has not to the author's knowledge been asserted or tested.

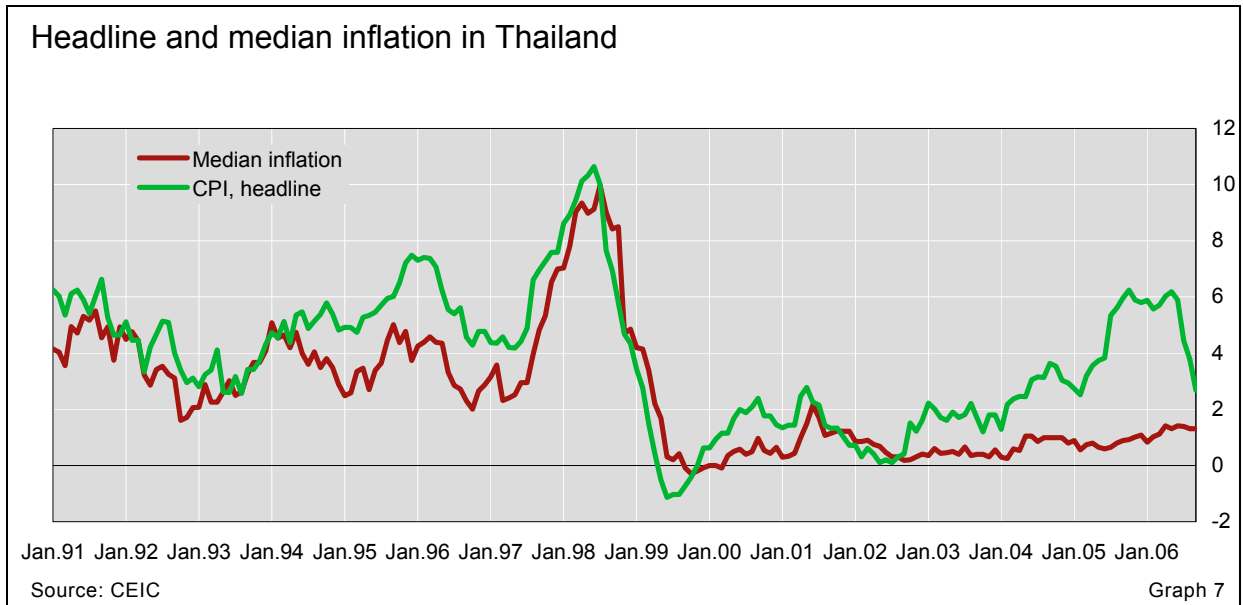
Table 8

Median and weighted median inflation based on the cross-section of inflation data: an example

Item	Weight	Cumulative weight	Year-over-year change	Median	Weighted median
Housing	20%	.2	0.9%	2.8%	5.6%
Clothing	11%	.31	2.1%		
Electronic goods	6%	.37	2.3%		
Medical care	7%	.44	2.5%		
Personal services	5%	.49	2.8%		
Education	7%	.56	5.6%		
Transportation	9%	.65	9.5%		
Food	20%	.85	10.3%		
Energy	15%	1.00	23.5%		

Source: Author's calculations.

The unweighted median inflation, based on about 21 components, shares with core inflation a relatively modest rise in relation to headline inflation (Graph 7). Unfortunately its ability to track headline was not evident in the 1990s and has proven no better in this century (see Annex 2). It cannot be considered a serious contender to replace the current core.



4.2.3 Weighted median inflation

The weighted median, by contrast, takes the same ordered list of individual components, and scrolls down the list until the cumulative weight in consumer expenditure has reached 50%. The weighted mean inflation rate has the property that half of consumer expenditure is for items with slower inflation than the weighted median and half of such expenditure is for items with faster inflation. Given this measure's track record elsewhere, it might be worth computing it for Thailand, but this effort lies outside the scope of this paper.

5. Transition and design issues

5.1 Making the shift

This section starts by asking how much of the transition from core to headline remains to be managed in Thailand. Then this section reviews the manner of shifting or clarifying targets by inflation-targeting central banks in Sweden, the United Kingdom and Korea. In the case of Sweden, headline inflation was not abandoned, but it was clear that monetary policy would not respond to deviations from the target caused by monetary or fiscal policy. It is possible to characterise the UK shift as one from a headline measure from which mortgage interest rates that directly reflected monetary policy had been excluded (Silver (2006), p 13)) to a CPI that in principle is exhaustive. But in practice the euro area's harmonised index excludes all housing costs, so that it is perhaps more accurate to say that the UK authorities switched from a measure with an important exclusion to one with a substantial exclusion. However one characterises the shift, it is worthwhile to recall how the Bank of England communicated what had changed and what had not changed. For its part, the Bank of Korea shifted back to a headline measure from a core measure, reversing its earlier shift in the opposite direction. At writing, its explanation is in the process of being translated from Korean to English, but it is still possible to describe some of the rationale and mode of communication.

5.1.1 *To what extent might the shift in Thailand already have been made?*

Central banks face a challenge when adapting their policy frameworks of refocusing market participants from one key variable of interest to another. In this case, well-informed market participants already appreciate that Thailand's headline inflation plays a role in the determination of core inflation. In particular, they are well-aware of how excluded energy costs enter into included measures such as that for public transportation, as bus, train and boat fares are adjusted to reflect higher costs (Graph 5). At a deeper level, market participants can see how headline influences core in the Bank of Thailand model. Still, it is worth asking how prepared might market participants be for the abandonment of core.

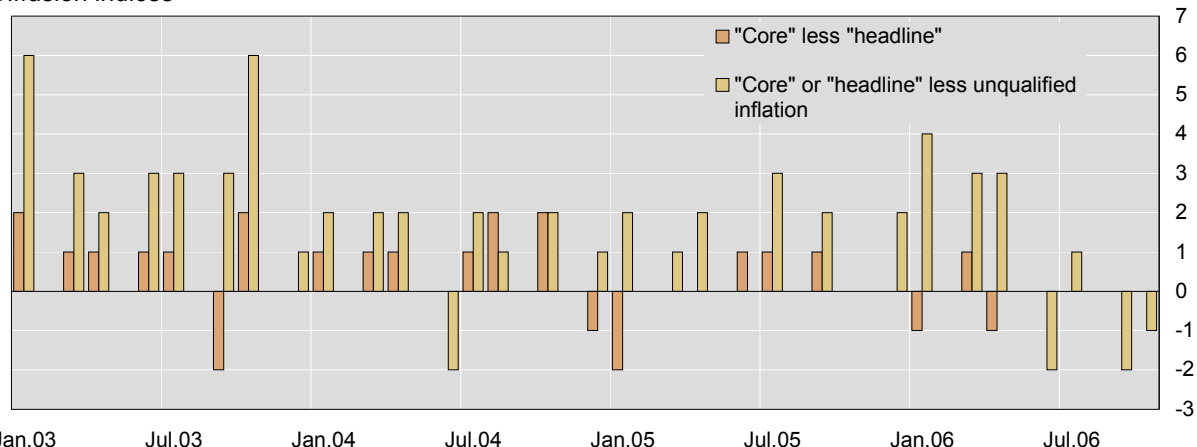
While the news story cited in the introduction no doubt put observers on notice, a reading of the Bank of Thailand's monetary policy announcements can provide a more systematic indication of the preparation of market participants. These four- to five-paragraph announcements were coded for each unqualified reference to inflation (or inflationary pressure), and references to core inflation, headline inflation and real interest rates (counting no more than one reference to any per sentence). The citation of negative real interest rates implicitly referred to headline inflation insofar as core inflation remained below the policy (two-week repo) rate.

From these word counts, two rhetorical diffusion indices were created (Graph 8). The first index starts with the references to core inflation in a given press release and subtracts the references to headline. The second starts with the sum of references to core and headline inflation and subtracts the unqualified references to inflation or inflationary pressure. This latter measure tracks the use of the distinction without respect to the balance of references between core and headline. If the Bank of Thailand's announcements have downplayed core in favour of headline or de-emphasised the distinction between core and headline altogether, then one or the other of the indices would show a decline. Of course, it can be objected with some force that such measures presume that policy-makers weighed their words carefully with the intention of sending signals, when they had no such intention.

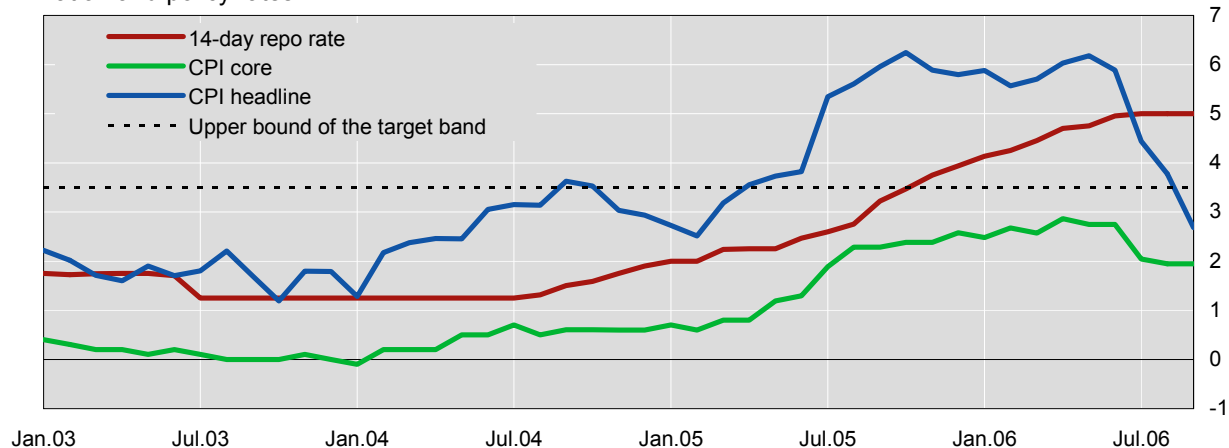
The rhetoric of monetary policy announcements in Thailand

References to core, headline and unqualified inflation

Diffusion indices



Inflation and policy rates



Sources: CEIC, Bank of Thailand.

Graph 8

The most striking observation is that, as the gap between core and headline has narrowed in recent months, the distinction of between the different measures of inflation has been less drawn. That is, the second measure has generally shown positive readings, indicating references to core or headline, but from June 2006, the readings have turned negative. This corresponds to the collapse of the gap between headline and core which has recently been observed. A second observation is that, while references to core have outnumbered references to headline in the period under review, headline has at times received more mention than core. While the core concept received more mention at the beginning of the tightening cycle in August and October 2004, headline, including references to negative real interest rates, received more mention around the turn of the year 2004-05. Without insisting on policymakers' weighing their words in quite the fashion reconstructed here, one can venture to say that the monetary policy statements have attuned market participants to the shifting relationship between core and headline inflation.

5.1.2 The Riksbank, 1999

Having adopted inflation targeting based on headline inflation in 1993, the Riksbank in 1999 made it clear that it would not put weight on the direct influence of monetary and fiscal policy on measured inflation. In particular, it clarified that it would

“not react to changes in interest rates and changes in indirect taxation. This led the Riksbank to focus also on a core inflation measure called UND1X in its monetary

policy decisions...The Riksbank publishes forecast[s] of UN1X-inflation in its quarterly Inflation Reports and comments on these forecasts in its monetary policy decisions..." (Johansson (2006, p 140)).

Heikensten (1999) elaborated the clarification that had been adopted by the executive board. First, there was no change in the ultimate goal. Second, the horizon for meeting the target was stated to be one to two years. With regard to transitory effects, Heikensten recognised that "The Riksbank's reasoning concerning transitory effects on monetary policy had not always been perceived as consistent" (pp 9-10). He reported that the board had considered abandoning headline and adopting a new measure but could not convince itself that there was an alternative that would work in all situations. Instead,

When it is considered that there are transitory effects that can affect the CPI, the Riksbank will *in advance*, when monetary policy is being formulated, make it clear that a deviation from the goal, as defined by the CPI, is justified. There is a good reason to emphasise "in advance": defining things when decisions are being made makes evaluation possible (Heikensten (1999, p 10).

In practice, the difference between this approach and the Bank of Canada's use of core as an "operating guide" (to be revisited periodically to ensure its ongoing utility) may be quite subtle. For a central bank contemplating a switch, the lesson to be drawn may be less the particular choice of the Riksbank, but the attempt to communicate clearly, especially in case of anticipated deviations from the target.

5.1.3 Bank of England, 2003-04

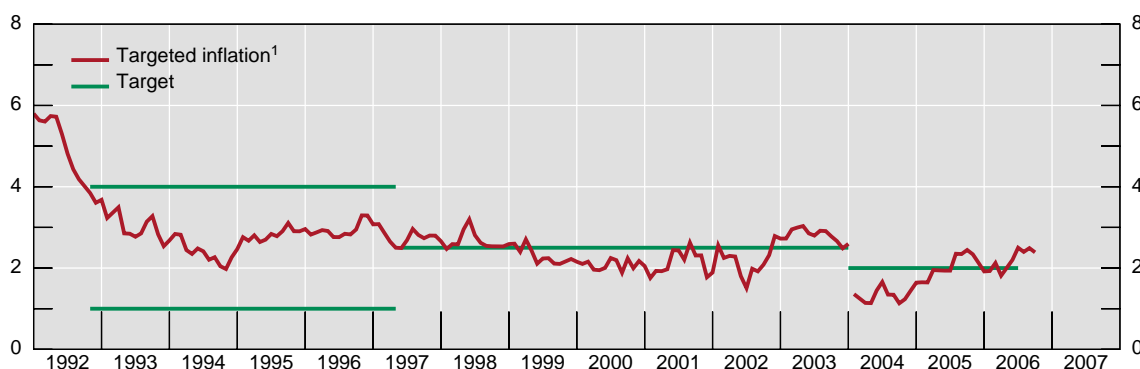
One case of interest was the Chancellor of the Exchequer's assignment of the harmonised European index to the Bank of England in 2003. Stone (2004, p 14) reports:

The government retained control over the setting of the inflation target. In 1997, the Chancellor specified that the objective for the MPC [Monetary Policy Committee] was to achieve, at all times, a 2½% rate of inflation in the RPIX, a consumer price index that excluded the direct effect of mortgage interest payments. The government has retained the right to change the nature of the target altogether, for example, to an exchange-rate target. In practice the Chancellor has generally chosen to re-iterate the unchanged nature and level of the inflation target in his annual budget statement. The focus on a single, unchanging nominal point target has been [a] strength of the UK inflation targeting framework. The only time he has exercised that right to vary the target was announced in 2003 when, partly in order to make the target consistent with those countries in the Euro Area, he switched to a target of 2.0% for the CPI, the UK analogue of HICP.

Since inflation on the old retail price index excluding mortgage interest payments (RPI-X) had been "on or above target for the whole of last year" while that on the new CPI was "below 2% throughout the same period", explanation was required (King (2004)). The explanation combined a pure measurement effect, which called for a lowering of the target range, and a new exclusion required by the harmonised European measure. And taken together, the measurement effect, the exclusion and the lowering of the target range had an implication for the long-run effective inflation target and consequent interest rates. Let us consider each in turn.

The *measurement issue* arose from the old target being based on an arithmetic average index while the new target would be based on a geometric one. As a result, a half point lower outcome could be expected, and the target was lowered accordingly (Graph 9). This the Governor likened the switch from the RPIX to the CPI as like the switch from Fahrenheit to Centigrade: the temperature of the economy, and thus appropriate monetary policy, would not change, but it might take a while to get used to the new scale.

Graph 9
Inflation and inflation targeting in the United Kingdom



¹ CPI (HICP) inflation targeted since end 2003; previously RPIX inflation.

Sources: National data.

In addition, the harmony in the euro area had been achieved at the cost of excluding housing costs. As a result, the new CPI would *exclude UK housing costs* (other than the previously excluded mortgage interest) and local property taxes. Since housing costs had run about a quarter of a percentage point above the RPIX over a period of time, the Governor conceded that

“moving from a target of 2.5% to 2% represents a small *increase in the effective target*. But no reasonable person could describe a symmetric target of 2% as inconsistent with price stability, defined as a state of affairs in which inflation does not materially affect economic decisions by families or businesses” (King (2004) *emphasis added*).

There are lessons here for any central bank contemplating a shift in the operationalisation of inflation targeting. If the event is a joint event, its separate aspects—in this case, measurement, exclusion and numerical target shift—need to be identified and rationalised. In this case, the shift was decided by the political authorities in a manner that proponents of considerable goal independence for a central bank from the Continent and the United States might find unsettling. Proponents of no more than instrument independence for the central bank would find the ministry of finance designating a new measure of the inflation goal unobjectionable in principle. In practice, however, a negative lesson can be drawn from its abrupt introduction.⁹

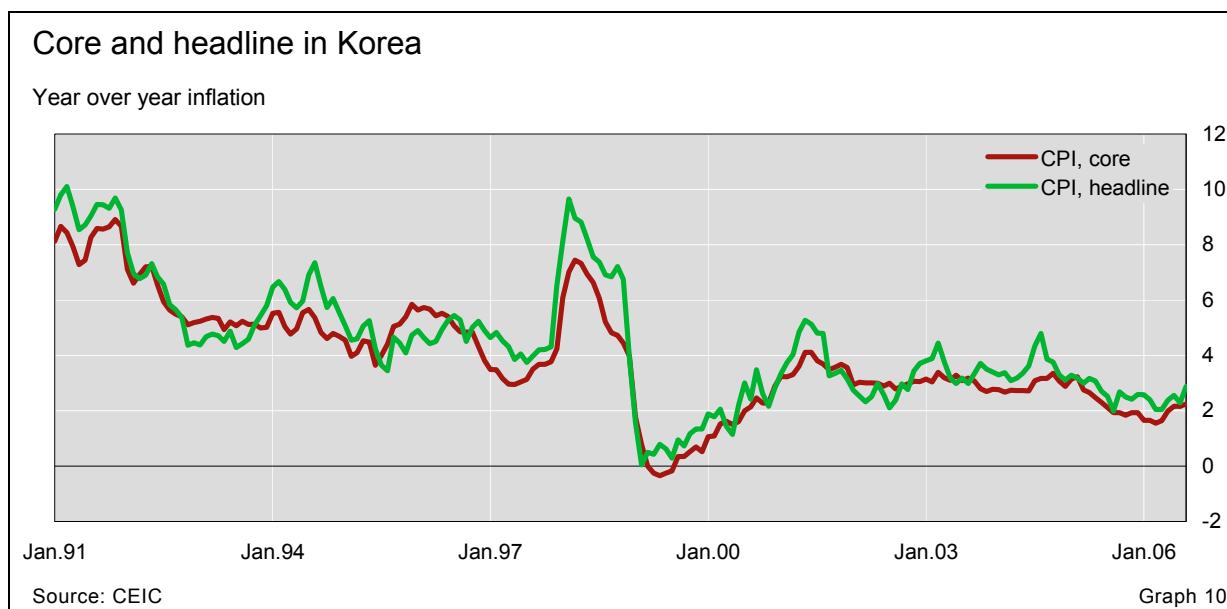
Beyond the management of the transition, is the longer-term question of the the effect of the switch in targets on the private sector’s focal point for inflationary expectations. In the UK case, because the old and new indices are announced simultaneously, it is not obvious which one elicits the biggest response in the fixed-income markets. The impression, however, is that surprising readings on the new consumer price index move markets the most. The old retail price index retains much salience, however. Index-linked gilts, even the new ones, are still based on it. Indexation of pensions and regulated prices remains based on it as well.¹⁰

⁹ According to Smith (2006): “The CPI became the Bank’s target in 2003. It was Brown’s sop to Tony Blair when the Treasury rejected euro entry. The new index, constructed on the same basis throughout Europe, was his way of showing willing. Crucially, it does not include house prices or council tax. At the time I wrote that the new measure would be seen as misleading and that changing to it was a mistake. Mervyn King, the Bank governor, was also unhappy. ‘When defending a free kick from David Beckham, you don’t expect somebody to move the goalposts,’ he said (Smith (2006)). Stone (2004) has a less pithy version: “although the Governor of the Bank of England recognised merits in the motivation for the switch, he also acknowledged some disadvantages. Speaking at the Inflation Report Press conference in August 2003, prior to the change in the target, Governor King said that ‘when you defend a free kick from David Beckham you don’t expect having covered the right post suddenly to turn round having left the ball to go past the outside of the post to find someone behind you has moved the goal post and it’s gone inside”.

¹⁰ I am indebted to Bill Allen for these observations.

5.1.3 The Bank of Korea, 2006

In August 2006, the Bank of Korea announced that it would shift from targeting core to headline inflation starting in the year 2007. The same band of 3% plus/minus 0.5% would be kept, but there would be new emphasis on the centre based on the judgment that “the general public will be able to grasp the central bank’s policy intentions when the midpoint of the target is clearly expressed” (Bank of Korea (2006, p 73). Consistent with the shift to a more volatile measure (Graph 10), and the unchanged band, the target is set in terms of the average consumer price inflation over the three years, 2007-2009.

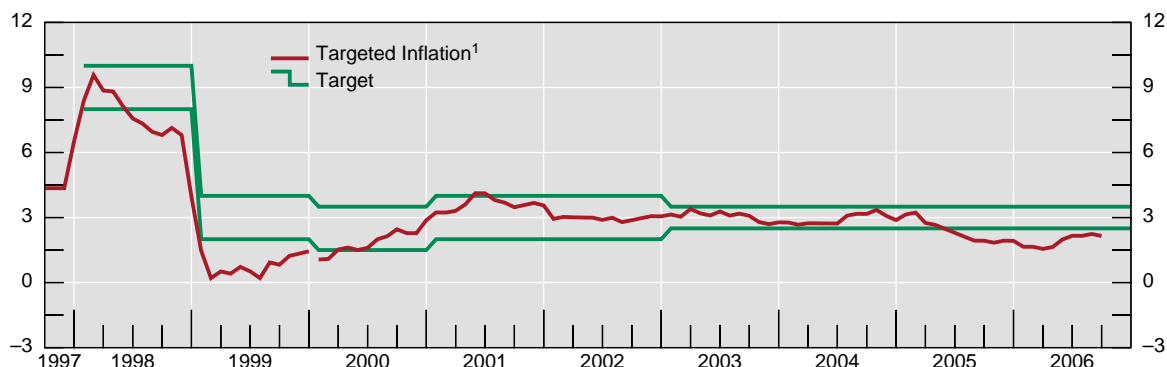


The Bank of Korea’s rationale for shifting from core to headline inflation has several points in common with the argument for the primacy of headline inflation as a goal made above in section 2. Core inflation is “thought by the general public to be little related to their daily lives’, while headline enjoys “public recognition”, presumably serving as the point of reference in wage negotiations and in some wage contracts. Government budgeting and planning is based on the headline measure, so that the Bank of Korea’s focus on it would facilitate coordination between fiscal and monetary policy and avoid “confusion arising among the general public in judging price levels”.

Unlike the Bank of England, the Bank of Korea allowed differences between the old and new measures in effect to reduce the intended inflation outcome. “In recent years, consumer price inflation has been running at about 0.5 percentage points above the rate of core inflation, so that, even though the numerical target is the same as the present target range (2.5%-3.5%), the change of the target index to the CPI will, in practice, have the effect of adjusting the price stability target downward to that extent” (Bank of Korea (2006, p 72). Moreover, the shift happened in a year in which core was undershooting the target range (Graph 11). Thus, the shift to the three-year annualized average would tend to make it less urgent to bring the target back into the range.

Graph 11

Inflation and inflation targeting in Korea



¹ Core inflation targeted since January 2000; between 1998 and 2000, and as of 2007, headline inflation.

Source: National data.

There is also a thought in Korea that the shift to headline from a core measure puts Korea more in line with international practice. Whatever the force of such a consideration, section 3.2 above argued that the international consensus in favour of headline is stronger in appearance than in reality, given that the CPI measures in a number of countries exclude substantial items in the consumption basket.

5.2 Designing a new inflation target: international considerations

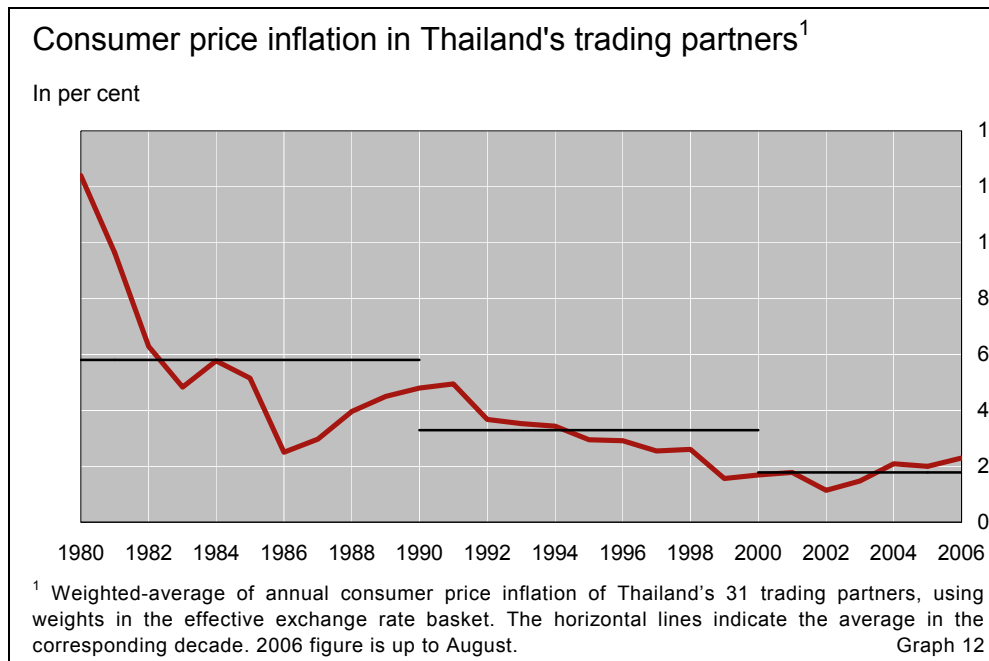
One consideration in setting an inflation target in Thailand is the desire for a rate that would conduce to exchange-rate stability. It is said that the top of the current band of 3.5% was the average of trading partner inflation rates over the last quarter of the Twentieth Century. The underlying rationale was presumably some version of long-run purchasing power parity, according to which a country matching its trading partners' inflation rate might expect to enjoy a stable or gently trending exchange rate. Another consideration is consistency with the choices of neighbours with whom future monetary and financial cooperation is a live possibility. This section takes up these two considerations in turn.

Regarding exchange rate stability, it must be immediately recognised that some observers would get nervous just hearing the question posed of what inflation target would be most conducive to such stability. Stabilising inflation and the exchange rate are competing and generally incompatible goals, would be the quick objection. This is not the place to recite the whole argument (Ho and McCauley (2003)), but let it be clear at the outset that the concept of exchange rate stability that is most consistent with price stability or inflation targeting is effective exchange rate stability, not any bilateral exchange rate stability. Effective exchange rate stability is already evident in the baht's behaviour, as in the Singapore dollar's behaviour (Ho et al (2005); MAS (2001)).

Any consideration of exchange rate stability in setting the inflation target draws on the degree of freedom in setting the inflation target. The use of this degree of freedom is usually discussed in terms of efficiency (avoiding shoe-leather costs of inflation), measurement (eg upward biases in the inflation index¹¹) and more recently the zero lower bound. It is not wrong to suggest in a very open economy that effective exchange rate stability be a consideration in the setting of the inflation target. Of course, if a country trades heavily with countries with chronic inflation problems, effective exchange rate stability would produce an unacceptably high level of inflation.

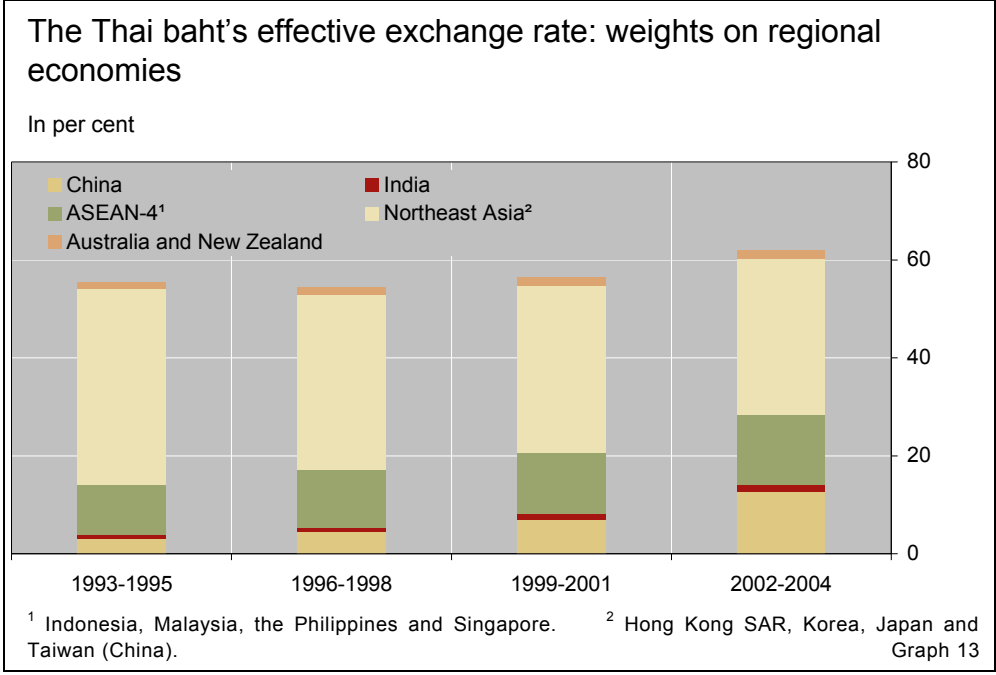
¹¹ See Irving Fisher Committee on Central-Bank Statistics (2006).

What sort of inflation standard has Thailand's trading partners been setting? Drawing on Klau and Fung (2006) and Fung et al (2006), the answer can be given in relation to the new BIS effective exchange rates (Graph 12).¹² Thailand's trading partners ran an average exchange rate of about 6% in the 1980s, about 3½% in the 1990s and about 2% so far in this century. On this showing, if Thailand's inflation rate were to average 2%, then the baht could be stable in real effective terms without nominal appreciation or depreciation, at least as measured by consumer prices.



The shifting of Thailand's trade toward its fast-growing neighbours, particularly China and India, complicates this line of reasoning, however. As trade with fast-growing China and India expands (Graph 13), similar rates of inflation in China, India and Thailand might imply that the baht would need to depreciate over time against the renminbi and rupee. To see why this is so, consider that a low rates of inflation in China and India might come about through the combination of rising domestic currency prices of nontraded goods and services and falling domestic currency prices of traded goods there (a Belassa-Samuels effect). If such fast-growing neighbours with rapid productivity growth bulk large enough among Thailand's trading partners, then offsetting the deflationary force in the traded goods sector in order to match their inflation rates might require a noticeable trend depreciation of the baht's effective exchange rate. To put the same point differently, Thailand's inflation target might have to beat the average inflation performance of its trading partners to be consistent with effective stability. Of course, this need not present a problem if China and India persist with a "less than 5%" norm for inflation that produces average inflation rates noticeably above 2%.

¹² Excluded from the calculation are several Eastern European and Latin American countries. Despite Thailand's small trade with these countries, their inclusion would have distorted the result owing to their experience of hyperinflation.



An alternative consideration looks forward to regional monetary cooperation¹³. Genberg (2006) and Gudmundsson (2006) have proposed a different, in effect narrower, criterion for setting the inflation target. Instead of compatibility with the average results of all trading partners, they propose to focus on compatibility with the goals of regional trading partners with whom further cooperation is intended:

The first element of an Asian approach towards creating a region of monetary stability should thus be to adopt common objectives for central bank policies in the region, and these should be stated in terms of an inflation target (Genberg (2006, p 13)).

If the Thai authorities were to give weight to choosing an objective in common with their neighbours, the most immediate question would be the implicit targets of Malaysia and Singapore.¹⁴ These might be read from their long-term inflation records. For Malaysia, this would be 2-3%, judging from the outcome since the founding of the Bank Negara Malaysia in 1959, with the outturn in this century at 1.7% (McCauley (2006)). For Singapore, Taylor rule estimates of the Monetary Authority of Singapore's choice of nominal effective exchange rates have taken the target rate of inflation to be 1.5% (McCauley (2001, p 14)). On this showing, the centre of the Bank of Thailand's current 0-3.5% band is very close to the implicit targets of these neighbours.

5.3 Designing a new inflation target: width of the band

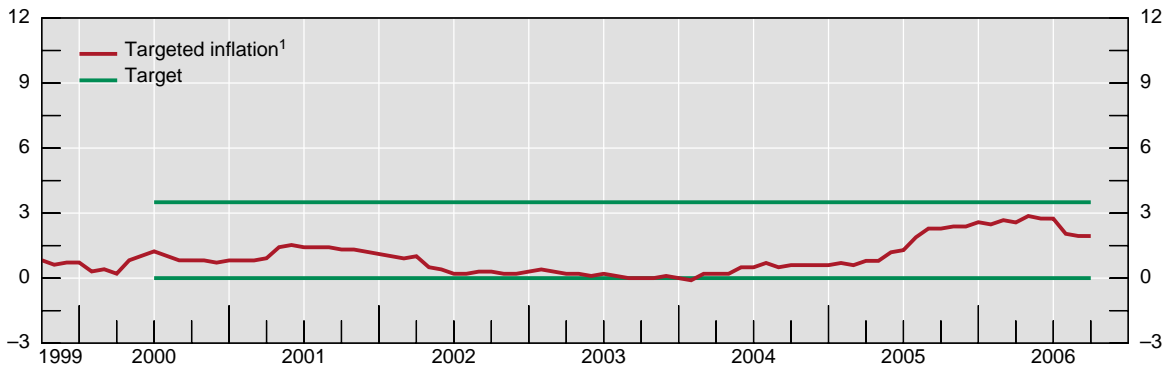
The reported inclination of some officials at the Bank of Thailand is to narrow the band, which currently extends from zero to 3.5%, at least in part by raising the floor (Graph 14). No doubt several considerations are in play but not least of them would be the zero lower bound, which has been much discussed since the original formulation of the Thai approach to inflation targeting. The setting of the policy rate at zero in Japan had already raised the salience of this constraint by the turn of the century. Then in 2001, the Reserve Bank of New Zealand narrowed its band from 0-3% to 1-3%. In 2002-2003, the discussion of deflation in the United States also highlighted the zero lower bound (Bernanke (2002, 2003)), as did the debate that led the Eurosystem to shift from its reference from below 2% to below and near 2%. In the wake of these, it now seems more risky than it would have in 2000 to set

¹³ Heikensten (1999, p 6) notes that, in the Riksbank's setting of its inflation target, "Another consideration was the perception that monetary policy in the European Union is directed at approximately this level".

¹⁴ It might seem asymmetric that one player takes into account its neighbours' behaviour, who themselves choose their inflation rates autonomously. In an "evolutionary approach to the creation of a zone of monetary stability", however, decision points need not occur simultaneously. Each set of authorities could in turn adjust its own system in the direction of consistency.

the lower bound of an inflation target at zero. Indeed, Thailand's own experience in some of the intervening years was of inflation hovering just above zero. Remaining inside the band at those levels left the Bank of Thailand hard pressed to answer to the inevitable objections from deposit holders to any cuts in the policy rate below the actual trough rate of 1.25%. And perhaps having the widest band among the inflation targeters adds to the inclination to narrow the band.

Graph 14
Inflation and inflation targeting in Thailand

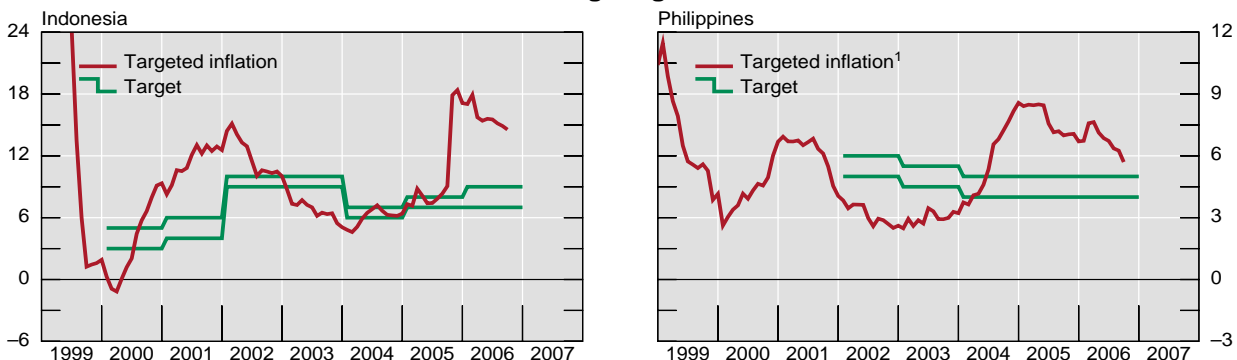


¹ Core inflation targeted since January 2000.

Source: National data.

Several considerations argue, however, for keeping a wide band. It is well-known that, other things equal, a more volatile target index of inflation requires a wider target band to be equally credible. Headline inflation was indeed a third more volatile in the 1990s and twice as volatile in the inflation targeting period. Moreover, Thailand's status as the only inflation targeting emerging market economy to have hit its target consistently should not be treated lightly (Ho and McCauley (2003); Roger and Stone (2005); Graphs 15 through 18).¹⁵ Finally, some would argue that a wide band permits the central bank, having done job one, to give due attention to asset prices, the exchange rate or other considerations.

Graph 15
Inflation and inflation targeting in other Asian countries

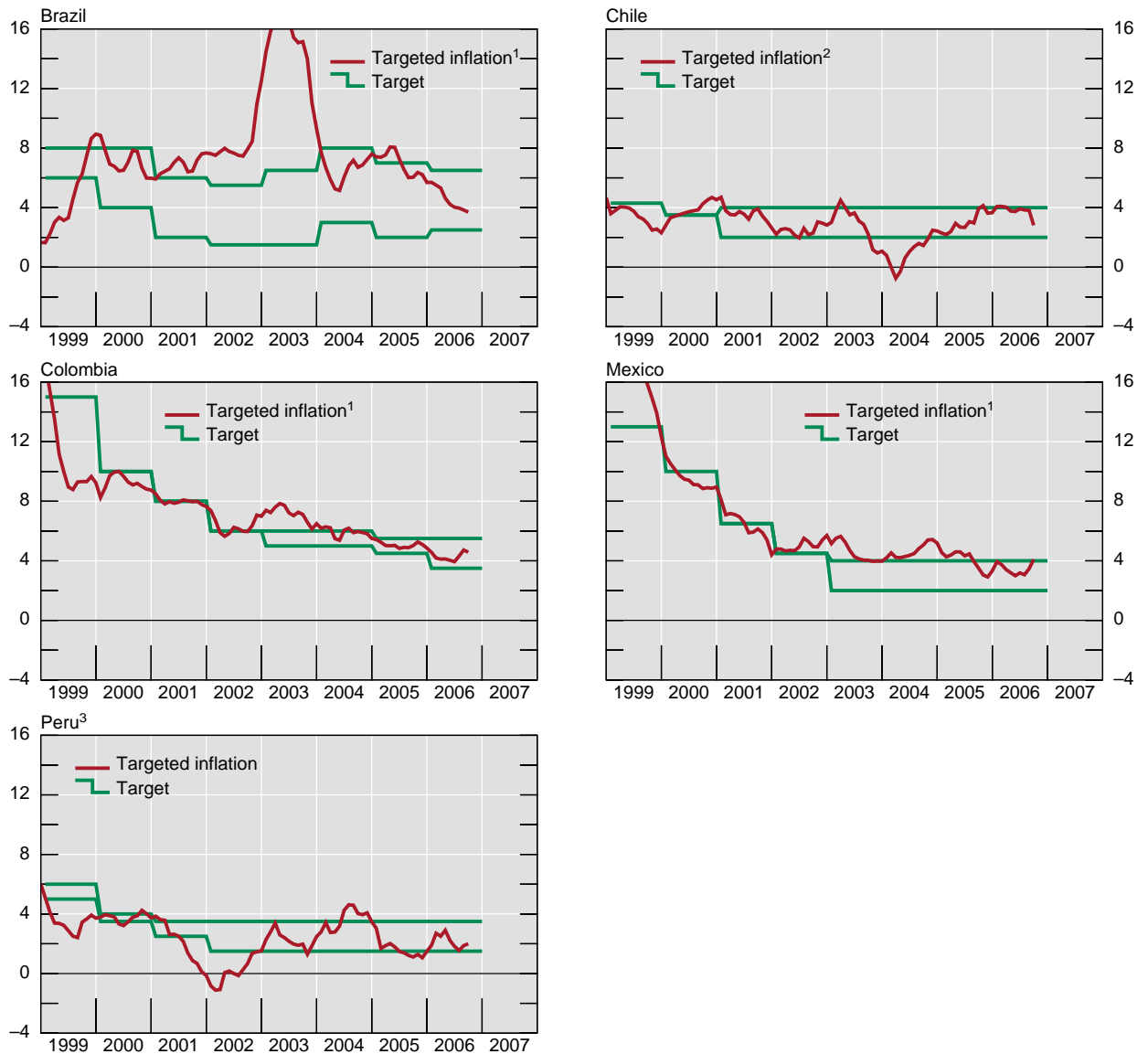


¹ CPI inflation targeted since 2002.

Sources: National data.

¹⁵ Roger and Stone (2005, p 42) show a one-month miss for Thailand (yielding a "frequency of deviation" of 2.0%). Most students would be happy with a 98% on a test. However, the Bank of Thailand frames the target in terms of a quarterly average of year-over-year rates, so the report consistent with this framing would be no misses and a frequency of deviation of 0%, leaving the Bank of Thailand and the Bank of England at the top of the class. Roger and Stone's suggestion on page 36 that the width of the band should be set at twice the standard deviation of the target variable leads to a band width of 3.42, based on the standard deviation of 1.71 for Thai headline inflation in May 2000 through August 2006 in Table 6 (very close to the emerging market average reported on Table 6 of Roger and Stone on page 20). This suggested calibration of volatility and band width is rationalised (page 36) as "help[ing to] maintain a reasonable balance between policy flexibility and policy discipline".

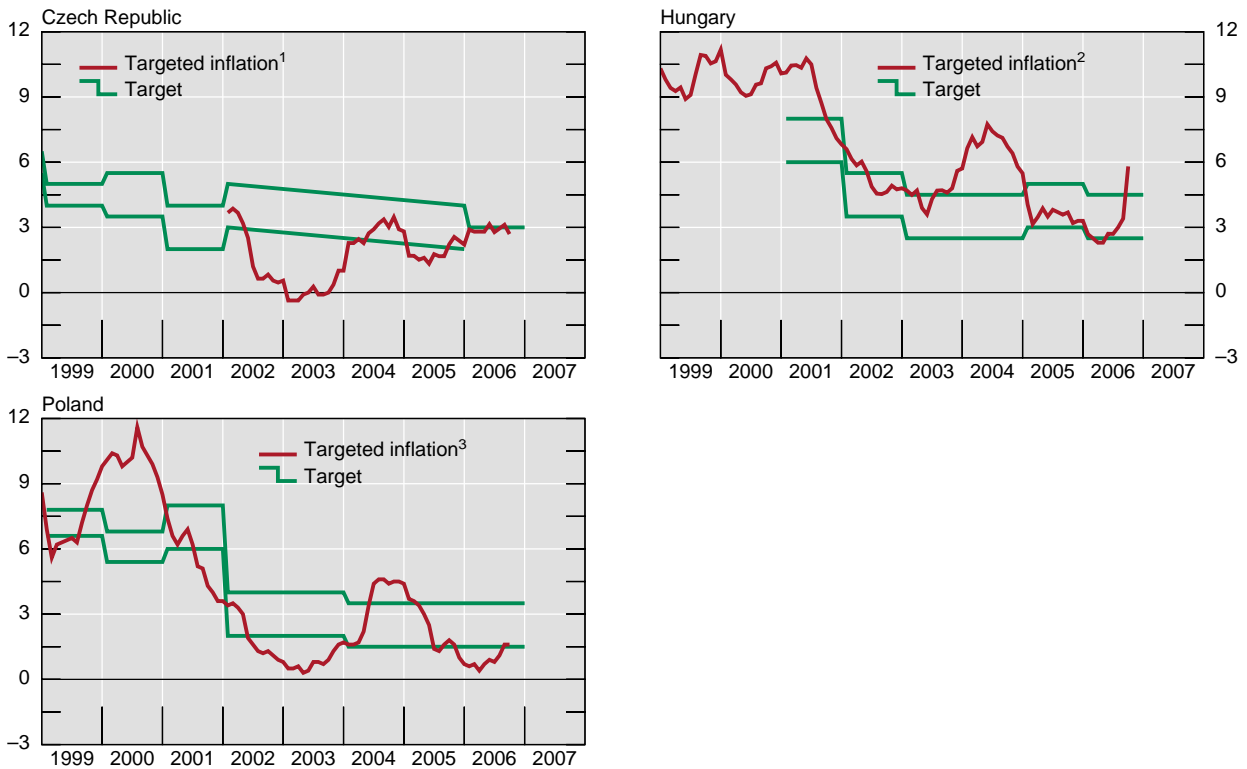
Graph 16
Inflation and inflation targeting in Latin America



¹ CPI inflation targeted since 1999. ² CPI inflation targeted since 1991. ³ CPI inflation targeted since 1994.

Sources: National data.

Graph 17
Inflation and inflation targeting in Central Europe



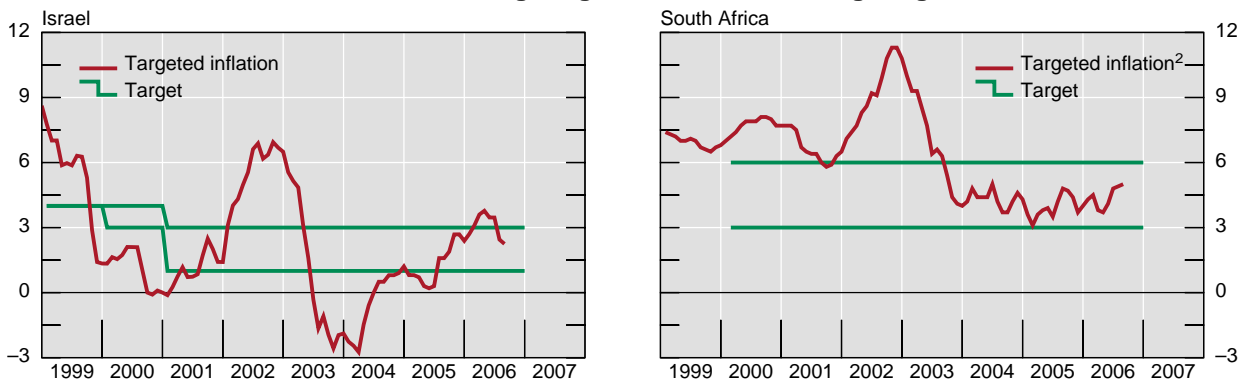
¹ CPI inflation targeted since 2002, before (as of 1998), core(net) inflation.

² CPI inflation targeted since 2001.

³ CPI inflation targeted since 1998.

Sources: National data.

Graph 18
Inflation and inflation targeting in other inflation targeting countries



¹ CPI inflation targeted since 1992.

² Core CPI inflation (CPIX) targeted since 2000.

Sources: National data.

6. Conclusions

The upshot of this consideration of the role of core and headline inflation in Thailand is that the elaboration of a monetary framework probably cannot be a once-and-for-all act. Events have a way of undermining the presumptions of any elaboration. Steve Grenville's (2001) question of whether inflation targeting can be viewed as the end of monetary history, seconded by Genberg's (2002) question of whether it can be viewed as the holy grail of monetary policy, remains.¹⁶

Returning to the analogy to the use of monetary aggregates as intermediate targets a generation ago, it is generally thought that the force of financial innovation blew away any stable relationship between monetary aggregate and ultimate goals like nominal gross domestic product. Of course, there were those who contended that the monetary targeting had not been undertaken well or with sufficient conviction. In the case of Thailand's use of core inflation to keep headline inflation in bounds, the world-historical rise of China and India may have upended the useful relationship that was apparent in the 1990s.

Bank of Canada Governor Gordon Thiessen (2000) recalled how his predecessor presented the end of a monetary aggregate as an intermediate target:

In 1982, after several disappointments, the Bank of Canada reluctantly conceded that the monetarist experiment had not worked and that the Bank would no longer be targeting M1. Movements in the monetary aggregates would continue to be monitored for any information they might provide on future economic developments, but no aggregate appeared to be sufficiently reliable to serve as an intermediate target. Similar difficulties were experienced in other industrial countries that had adopted money targets and, one by one, they were forced to follow Canada's example. Gerald Bouey, who had succeeded Louis Rasminsky as Governor of the Bank of Canada in 1973, probably summarized the situation as well as anyone when he said: "We did not abandon M1, M1 abandoned us."¹⁷

Paraphrasing, the Bank of Thailand might well report that, "we are not abandoning core inflation, it abandoned us".

¹⁶ See King (2005a) for an argument that, while inflation targeting is more robust to learning than monetary targeting, it is unlikely to prove the end of monetary history.

¹⁷ Citing Canada, House of Commons Standing Committee on Finance, Trade and Economic Affairs, *Minutes of Proceedings and Evidence*, No. 134, 28 March 1983, p. 12.

Annex 1: Treatment of housing in price indices

Annex Table A1.1	Practices of selected countries: treatment of owner-occupied housing				
	Rental equivalence approach	User cost approach	Payment approach	Net acquisition approach	Exclusion
Argentina					X
Australia				X	
Belgium					X
Brazil					X
Canada		X			
China		X			
Denmark	X				
Euro area					X
Finland				X	
France					X
Germany	X				
Greece					X
Hong Kong SAR	X				
Indonesia					X
Ireland			X		
Italy					X
Japan	X				
Korea					X
Luxembourg					X
Mexico		X			
Netherlands	X				
New Zealand				X	
Norway	X				
Poland	X				
Portugal					X
Russia					X
Singapore	X				
South Africa		X			
Spain					X
Sweden		X			
Switzerland					X
Thailand	X				
United Kingdom					X
United States	X				
Total number	10	5	1	3	15

Source: Domanski and Sekine (2007).

Annex Table
A1.2**Housing costs in headline CPI in selected industrial countries**

	Share of housing in CPI (%)	Method of estimating OOH	Share of OOH in housing component of CPI ¹	Change in rent CPI since end-2002 (%) ²	Increase in OOH CPI since end-2002 (%) ²	Increase in house prices since end-2002 (%) ²	Latest observation
Canada	22.6	UC	71 (66)	2.9	9.9	38.9	2/06
Euro area	0 (...)	5.8		14.8	12/04
France	9.6 ³	.	0 (55)	11.4		49.0	12/05
Germany	25.6	RE ⁴	0 (42)	1.7		-3.1	12/04
Italy	5.6 ³	.	0 (80)	6.8		30.2	6/05
Netherlands	18.2	RE	50 (53)	8.5		14.7	2/06
Spain	6.6 ³	.	0 (85)	8.5		38.1	12/04
Japan	21.2	RE	64 (60)	0.1	0.3	-15.6	9/05
Sweden	24.1	UC	38 (61)	8.3	-11.7	29.0	12/05
United Kingdom	20.9	UC/PA ⁵	60 (69)	7.9	40.3 ⁶	43.1	3/06
United States	30.5 ⁷	RE	76 (68)	8.9	6.9	36.5	12/05

RE = rental equivalent (cost of OOH estimated from rent index, differentiated by characteristics of the rental and owner market). UC = user cost (cost of OOH estimated on the basis of debt costs, depreciation, capital gains and recurrent costs). PA = payment approach (cost of OOH estimated on the basis of actual outlays, eg mortgage interest).

¹ Share of home ownership in parentheses. ² Cumulative increase. Definition and frequency may differ across countries. ³ Rental components only. ⁴ OOH is included in actual rents. ⁵ Retail price index (RPI). CPI does not include OOH. ⁶ Arithmetic mean of mortgage interest payments and depreciation. Difference to Canada and Sweden (both employ the user cost approach) is partly due to the fact that mortgage interest rates have risen in the UK and declined in the other two countries since end-2002. ⁷ In personal consumption expenditure (PCE) deflator, the housing component has a weight of 15%.

Sources: OECD; national data; Domanski and Sekine (2007).

Annex 2: Analysis of unweighted median inflation

	Median	Headline
Mean	3.76	4.74
Median	3.58	4.84
Maximum	9.96	10.64
Minimum	-0.29	-1.13
Standard deviation	2.14	2.42
Skewness	0.67	-0.28
Kurtosis	4.03	3.53
Probability of normality	0.001	0.24
Observations	112	112

Months ahead	α^1	B^2	\bar{R}^2	$H_0: \alpha = 0$ and $\beta = -1$
12	-0.621 (-0.673)	0.209** (2.518)	.005	4.31 p -value = 0.015
24	-0.499 (-0.609)	-0.238* (1.667)	.007	1.435 p -value = 0.242
36	-0.612 (-0.785)	-0.364 (1.316)	.016	0.904 p -value = 0.407

Note: T-statistic using Newey – West (1987) covariance matrix estimator reported in parentheses. ¹ $H_0: \alpha = 0$ ² $H_0: \beta = -1$.

*Significant at the 10 percent level. **Significant at the 5 percent level. *** Significant at the 1 percent level.

Source: CEIC, BIS calculations.

Table A2.3 **Descriptive statistics for median and headline inflation during inflation targeting (May 2000 – August 2006)**

	Median	Headline
Mean	0.76	2.56
Median	0.71	2.12
Maximum	2.15	6.24
Minimum	0.18	0.10
Standard deviation	1.70	1.71
Skewness	0.83	0.83
Kurtosis	3.77	2.74
Probability of normality	0.004	0.011
Observations	76	76

Source: CEIC, BIS calculations.

Table A2.4 **Median inflation as an unbiased predictor of headline inflation (May 2000 to August 2006)**

Months ahead	α^1	β^2	\bar{R}^2	$H_0: \alpha = 0$ and $\beta = -1$
12	0.758 (1.655)	-0.078*** (5.850)	.003	18.72 p -value = 0.000
24	1.544*** (3.431)	-0.165** (2.161)	.005	12.152 p -value = 0.000
36	2.732*** (5.358)	-0.751 (0.463)	-0.088	16.896 p -value = 0.000

Note: T-statistic using Newey – West (1987) covariance matrix estimator reported in parentheses. ¹ $H_0: \alpha = 0$ ² $H_0: \beta = -1$.

*Significant at the 10 percent level. **Significant at the 5 percent level. *** Significant at the 1 percent level.

Source: CEIC, BIS calculations.

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