

Inflation adjustment to changes in oil prices

In conducting monetary policy under the inflation targeting regime, which aims at maintaining price stability, the Bank of Thailand places great importance on the analysis of inflation transmission and price adjustment behaviour. Recently, the continuous rise in oil prices not only directly affected headline inflation, causing it to accelerate, but also indirectly affected prices of other goods and services such as transportation through higher input costs, causing core inflation to also accelerate, though at a lesser extent compared to headline inflation. However, oil prices fell significantly in the third quarter of this year, whereby the Dubai crude oil price averaged at 65.85 US dollars per barrel compared with the assumption used in the previous *Report* of 71 US dollars per barrel. Such a decline in oil prices caused both headline and core inflation to decelerate markedly instead of declining gradually as expected. This raises the question as to whether inflation adjustment to rises and falls in oil prices is symmetric.

Methodology in testing for asymmetric price transmission (APT)

In order to determine whether inflation adjustment to rises and falls in oil prices is symmetric or not, 2 dummy variables are introduced in the inflation equation, namely D+ and D-, where D+ is equal to 1 if oil prices in this period are higher than the last period and 0 otherwise, and D- is equal to 1 if oil prices in this period are lower than the last period and 0 otherwise. Assuming that transmission is linear, the inflation equation is

$$\Delta cpisa_t = \alpha + \beta_1^+ D^+ \Delta oilsa_t + \beta_1^- D^- \Delta oilsa_t + \sum_{n=1}^M \sigma_n \Delta Xsa_{nt} + \varepsilon_t \quad (1)^1$$

where $\Delta cpisa$, $\Delta oilsa$ and ΔXsa are seasonally adjusted first differences of the consumer price index, the domestic retail petroleum price index and other variables from both the supply and demand sides that explain changes in inflation, such as the farm price index, average earnings, an indicator of economic slack² as well as lagged values of $\Delta cpisa$. Solving the above equation yields estimates of the coefficients β_1^+ and β_1^- which can then be tested for equality using the F-test³. If the coefficients are equal, it can be concluded that inflation adjustment to rises and falls in oil prices is symmetric, and if they are not, it can then be concluded that the adjustment is biased towards the direction with the greater coefficient value. For example, if $\beta_1^+ > \beta_1^-$, then rises in oil prices are passed through to inflation more than falls in oil prices. In addition, lagged values of $\Delta oilsa$ can be added into the equation to help analyse the speed and persistence of the pass-through so that

$$\Delta cpisa_t = \alpha + \sum_{i=1}^K (\beta_1^+ D^+ \Delta oilsa_{t+i}) + \sum_{j=1}^K (\beta_1^- D^- \Delta oilsa_{t+j}) + \sum_{n=1}^M \sigma_n \Delta Xsa_{nt} + \varepsilon_t \quad (2)$$

¹ Houck JP (1977), "An approach to specifying and estimating nonreversible functions", *American Journal of Agricultural Economics*, 59:570-572, was the first to use this method. Later, Ward RW (1982), "Asymmetry in retail, wholesale and shipping point pricing for fresh vegetables", *American Journal of Agricultural Economics*, 62:205-212, introduced lags into the equation in order to test for persistence and speed of the pass-through. This method is widely used in testing for APT, especially in farm prices. Furthermore, Kochar A (1999), "Smoothing consumption by smoothing income: Hours-of-work responses to idiosyncratic agricultural shocks in rural India", *The Review of Economics and Statistics*, 81(1):50-61, introduced other variables into the equation for a more complete specification.

² Normally the output gap is used as an indicator of economic slack.

³ F-statistic = $[(RSS_R - RSS_U)/q] / [RSS_U / (T - k)]$, where RSS_R and RSS_U are residual sums of squares from the restricted and non-restricted equations (such as restricting 2 coefficients to have the same value), respectively. Moreover, q, T and k refer to the number of restrictions, the number of observations, and the number of coefficients (including the intercept) estimated. In this study, the critical value (5% significance level) is equal to 3.97 (q = 1, (T - k) = 75).

Test results for APT of Thai inflation

By using inflation equations of the above form to test for APT of Thai inflation using monthly data, it was found that headline inflation adjustment to rises and falls of oil prices is symmetric. In other words, $\beta^+ = \beta^-$. Moreover, the pass-through is immediate such that Δcpi_{sa} adjusts with Δoil_{sa} while its lagged values are not significant. On the other hand, in the case of core inflation, β^- was not only found to be negative but also insignificant for both the most recent period as well as the lags. In contrast, β^+ was found to be significant in the core inflation equation, but only in the most recent period. This means that only the direct rise in oil prices in the most recent period will be passed through to core inflation while the fall in oil prices does not significantly affect core inflation. Moreover, the variables that have the greatest effect on core inflation were found to be the second and third lags of core inflation itself whereas lags of headline inflation do not significantly explain

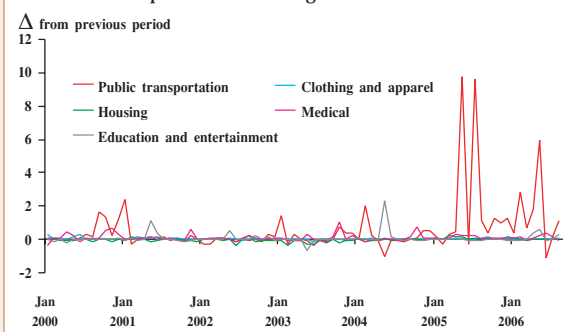
headline inflation. This implies that there is more persistence in core inflation than headline inflation (Table 1).

Table 1 : Regression results

Variable	Equation/variable Y		
	ΔCPI_{sa}	$\Delta CORE_{sa}$	$\Delta TRANS_{sa}$
C	0.07 (0.09)	-	-
$D^+ \Delta oil_{sa}$	0.04 (0.00)	0.01 (0.00)	0.09 (0.03)
$D^+ \Delta oil_{sa} (-1)$	-	-	0.07 (0.05)
$D^- \Delta oil_{sa}$	0.03 (0.02)	-0.00 (0.87)	-0.01 (0.92)
$D^- \Delta oil_{sa} (-1)$	-	-	-0.02 (0.74)
$\Delta farms_{sa}$	0.04 (0.00)	-	-
$\Delta avgearn_{sa} (-2)$	0.03 (0.04)	-	-
$\Delta avgearn_{sa} (-4)$	-	0.01 (0.21)	-
$\Delta MPI_{sa} (-2)$	0.01 (0.09)	-	-
$\Delta CORE_{sa} (-2)$	-	0.23 (0.03)	-
$\Delta CORE_{sa} (-3)$	-	0.16 (0.08)	-
$\Delta TRANS_{sa} (-2)$	-	-	0.24 (0.04)
Adjusted R ²	0.53	0.32	0.23
LM (2)	0.23 (0.79)	0.33 (0.72)	0.84 (0.44)

1. Using monthly data from January 2000 to August 2006
2. Numbers shown are coefficient values. P-values are in parentheses.
3. ΔCPI_{sa} , $\Delta CORE_{sa}$, $\Delta TRANS_{sa}$, Δoil_{sa} , $\Delta farms_{sa}$, $\Delta avgearn_{sa}$ and ΔMPI_{sa} are first differences of consumer price index, core consumer price index, public transportation price index, domestic retail petroleum price index, farm price index, average earnings (baht) divided by 100 and manufacturing price index, showing only significant coefficients with correct signs except for oil prices.
4. Use MPI_{sa} as a proxy of output gap

Chart 1 Changes in the price level of public transportation compared with other goods and services



Source: Ministry of Commerce and calculated by the Bank of Thailand

It is deemed that such behaviour of core inflation is largely caused by price behaviour of public transportation fares, which carry a 6 per cent weight in the core consumer price basket. From Chart 1, it can be seen quite clearly that the first difference of the public transportation fares index is upwardly biased. When tested using regression analysis, it was found that rises in oil prices in both the most recent period as well as the ongoing effect from the first lag significantly affect the adjustment of public transportation fares index. Meanwhile, falls in oil prices do not significantly affect the adjustment of public transportation fares and the coefficient was found to be negative. Such findings were consistent with those of core inflation.

From the above study, it can be concluded that rises and falls in oil prices equally affect headline inflation, partly because oil prices directly enter headline inflation. As a result, a large fall in oil prices would cause headline inflation to also slow down markedly. However, core inflation would only adjust to rises in oil prices and has more persistence than headline inflation which is largely a result of public transportation fares. Nevertheless, the fare reduction announcement of the Ministry of Transport for the Transport Co., Ltd. buses (long distance buses), as well as a possible fare reduction for the Bangkok Mass Transit Authority buses going forward would cause core inflation to slow down with oil prices, which may possibly alter the above conclusion.