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Pricing Petroleum Products in Ghana —The Automatic Formula

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AUTOMATIC PETROLEUM PRODUCT PRICING FORMULA

The Automatic Petroleum Product Pricing Formula (APPPF) that was adopted in June 2001 compared Ghana's ex-refinery prices for ten petroleum products in cedi terms during the preceding 30 days to corresponding prices for those products in northwest Europe (plus shipping and port charges), and computed the total value difference between the two (using product consumption volumes for the current month in Ghana). The formula was deemed to be triggered, when the weighted value of domestic products diverged by more than 2.5 percent from the equivalent value based on European prices – “import parity”.

The formula also incorporated a number of earmarked levies into a Petroleum-related Fund as well as a Road Fund levy, which provided resources for road maintenance. With the passage of budget (2003) by Parliament, the Road Fund levy was increased from an average of ¢230 per unit of sale to ¢400.

As part of the management strategy for the TOR debts, the price adjustment mechanism was modified with the inclusion of a petroleum debt service charge (PDSS) effective March 2002. Thus, with the requisite parliamentary approval, a portion of the potential savings arising from declines in the cedi value of world market prices of petroleum (and products) would be used to service the TOR debt rather than to reduce prices to consumers.

The PDSS was set at 95% of any decline in the cedi value of oil import cost from the average of the levels prevailing during the period November 27 to December 26, 2001. The modified formula was to have been applied throughout 2002.

The notion of taxing petroleum consumers to pay directly for the cost of past consumption subsidies was eminently commendable. What was more problematic was the loss of the flexibility of prices in both directions. This was because popular support

for the price adjustment mechanism could be lost if prices could only go in the upward direction.

This asymmetry was most likely in practice for the following reasons. In order to minimise the necessity for frequent price adjustments, a 5% band was placed around the import parity prices of the November 27 to December 26, 2001 period. This means a fall greater than 2.5% is needed before a downward adjustment in price is warranted. Thus, a PDSS that absorbs 95% little room – a maximum of 2.5% of the decline - for meaningful downward price adjustments. Moreover, the reference price level – the average for the one-month period specified – was a historical local low. It may be recalled that it was low enough to provide the opportunity to reintroduce the taxes that had been repealed earlier in the year, without the need to raise the ex-pump prices.

With the introduction of a specific DRL, the formula regains the flexibility, which was virtually lost with the floating PDSS.

The delay in adjustment in 2002 has meant that the short-term debt of TOR again rose to unsustainable levels. Fund staff report an increase of ₡1.0 trillion – 2% GDP – in 2002. To make TOR viable, the entire amount of short-term debt to the banking system that is quasi-fiscal in origin has had to be recognised as government debt.

Accordingly, in December 2002, about ₡1.4 trillion of TOR debt was exchanged for government TOR bonds paying 4.5% real rate of interest. With this total amount of TOR debt assumed by the government reached approximately ₡2.4 trillion or 4.9% GDP as at end-2002. This still leaves some ₡2.1 trillion of short-term debts on TOR's books.

Cross-subsidisation

An important social policy objective that was formally incorporated into the Automatic Price Adjustment Mechanism was the amelioration of the impact of price adjustment on the poorer segments of society through product cross subsidisation. Thus, to moderate the ex-pump price increases while protecting the refinery from incurring losses, the average

ex-refinery price for premium petrol was increased by 61% to allow for the increases in prices for kerosene and gas oil, to be limited to 45% and 52% respectively. Cross-product price subsidisation was thus the instrument for mitigating the impact of required upward price adjustments on the poor.

The rationale for the choice of products to be taxed or subsidised was the following. Premium petrol consumption accounts for a higher share of expenditure in better-off (top quintile) of households according to the Ghana Living standards Survey (GLSS IV). In contrast, the same survey shows that kerosene consumption is heavily concentrated in the lower income brackets. Gas oil is also the main fuel for the commercial transport system. The better-off rely relatively more on petrol-fuelled private transport. Finally, for considerations of environmental degradation and pollution, LPG consumption could qualify for subsidisation.

In summary, the modified price adjustment mechanism embodied three key principles:

- Full pass through of increases in prices of petroleum in international markets;
- Full pass through of depreciations in the cedi exchange rate, and
- Cross-product price subsidisation.

The first two were to ensure full cost recovery and avoid the accumulation of debts at TOR which, as developments showed, could threaten the banking system itself.

The third was to mitigate the impact, of any required upward price adjustment, on the poor, as well as to encourage the increased use of LPG over wood fuels and charcoal for reasons of environmental conservation. An important requirement of the cross-subsidisation policy is that it be self-financing. In terms of the subsequent analysis that follows, the cross-subsidy account should be in balance over the year. From this perspective, the policy failed to achieve its objective in 2002. Specifically kerosene, gas oil and LPG could have been sold for less than prevailed in 2002 without pushing the account into deficit.

Given the poverty reduction objective, the implementational problems that resulted in the higher than necessary prices of the products of relatively higher consumption by the poor should be identified and appropriate solutions found.

Table 1: Operational Losses at TOR – 2002 (¢ billion)

MONTH	CROSS-SUBSIDIZATION	EXCHANGE RATE DIFFERENTIAL	WORLD MARKET PRICE	TOTAL	CUMMULATIVE TOTAL
January	17,798.65	(2,260.37)	0.00	15,538.28	15,538.28
February	13,242.13	(828.51)	(4,825.42)	7,588.20	23,126.48
March	15,742.08	(3,955.69)	(4,735.61)	7,050.78	30,177.26
April	16,819.83	(9,421.39)	(30,263.24)	(22,864.80)	7,312.46
May	17,943.77	(11,995.82)	(55,575.59)	(49,627.64)	(42,315.19)
June	13,459.39	(13,350.41)	(50,487.49)	(50,378.51)	(92,693.69)
July	16,496.31	(18,659.20)	(49,333.77)	(51,496.66)	(144,190.36)
August	18,324.37	(22,281.72)	(65,442.41)	(69,399.77)	(213,590.12)
September	12,667.69	(22,552.35)	(72,815.14)	(82,699.80)	(296,289.92)
October	15,260.62	(27,636.23)	(117,576.19)	(129,951.80)	(426,241.72)
November	18,955.11	(27,478.85)	(109,649.90)	(118,173.63)	(544,415.36)
December	19,186.99	(30,275.62)	(78,507.52)	(89,596.15)	(634,011.50)
TOTAL	195,896.95	(190,696.16)	(639,212.30)	(634,011.50)	
	S	E	W	D	

From the table, a net addition to the TOR debt of ¢634 billion accumulated. Cross-subsidization actually generated a total surplus of ¢195.9 billion. This implies that “taxed” products generated more resources than the subsidies actually paid out over the 12-month period January – December 2002.

Failure to adjust for exchange rate changes contributed an estimated loss of ¢190.7 billion for the year. And failure to adjust the ex-refinery (and therefore ex-pump prices) for changes in world market prices led to a total loss of ¢639.2 billion. Thus, exchange rate and world market price changes contributed an additional gross debt of ¢829.9 billion.

The cumulative effects of the three components suggest that from the beginning of the second quarter, the ex-refinery prices should have been adjusted as required under the

Automatic Price Adjustment Mechanism in the face of a sharp increase in world market prices of petroleum products.

On January 17, 2003, ex-refinery prices were raised by over 100% on average (the ex-pump prices rose on average by 90% due to the various increases of the specific and ad valorem taxes). This increase, as shown below, was sufficient to bring ex-refinery prices roughly in line with import parity according to the formula, and to revise upward various margins accruing to the refinery and oil marketing companies and distributors. It also built in a positive “k factor” to reflect the inefficiency of TOR relative to refineries abroad, and an implicit charge to begin recovering the debt service charges on the TOR bonds. In approving Budget (2003), Parliament legislated an explicit debt recovery levy (DRL) of ¢640 per unit of sale in place of the implicit charge.

The ex-pump price increases also included the increased yield from the ad valorem excise duty on account of the higher ex-refinery prices – which serve as base for tax. Given the presence of this 15% ad valorem excise duty, increases in ex-refinery prices simultaneous serve to protect TOR from accumulating debt as well as generating tax revenues. The use of one instrument to serve two objectives could prove both inefficient and problematic. Government may wish to re-examine the policy stance.

Table 2: Cross Subsidization, Exchange Rate & World Price Effects (¢ million)				
MONTH	CROSS-SUBSIDIZATION EFFECT	EXCHANGE RATE EFFECT	WORLD MARKET EFFECT	TOTAL
JANUARY, 2003 ¹	15,050.02	(20,218.47)	(75,859.66)	(81,028.11)
JANUARY, 2003 ²	95,605.84	(10,915.72)	(42,869.96)	41,820.16
FEBRUARY, 2003	204,399.88	(27,514.98)	(134,909.62)	41,975.28
MARCH, 2003	220,424.23	(31,409.47)	(210,437.93)	(21,423.17)
TOTAL	535,479.97	(90,058.64)	(464,077.16)	(18,655.83)
1. January 1 – 17				
2. January 18 – 31				

A further amendment to the formula is the use of a three-month rising average of import parities – with conversion of dollar costs into cedis at the exchange rate prevailing on the last day of the preceding month. Use of the statistically stabler average in the computation is expected to smoothen fluctuations in the ex-refinery and consequently ex-pump prices.

Price hikes on world markets in February and March were influenced by the Iraqi war and consequently a temporary amendment has had to be made in the practical application of the adjustment formula to abstract from these hikes as follows:

- For May, computations were to be based solely on the import costs of April;
- For June, the computations were to be based on average input costs of April and May;
- From July onwards, the previous three-month average price will be used.

The National Petroleum Tender Board has been given independent responsibility for the implementation of any price adjustments called for by the formula. And indeed the government has announced publicly that future price adjustments will be made in line with the formula without further government review or authorization.

Subsequent calculations will be made by the National Petroleum Board (NPTB) on the first working day of each month, beginning May 1, 2003. The trigger for price adjustment will be a change in the calculated ex-refinery of plus or minus 2.5 percent.

Technical Appendix

The Tema Oil Refinery (TOR) is responsible for the production/procurement of petroleum products – currently ten in all. As a state owned enterprise (SOE), the price of a product charged by TOR – the ex-refinery price – is administratively determined. This pricing system raises issues among which are:

- The need to ensure that as a production unit TOR is managed efficiently (TOR must be cost-effective); and
- The need to ensure that TOR is not overburdened with below cost ex-refinery prices for political reasons.

The automatic adjustment formula for petroleum product prices agreed with the IMF and first introduced in June 2001 sought to ensure that both of the above concerns are taken care of. It is based on the principle that the ex-refinery price be essentially determined by the import-parity price of the product. Within that framework cross-subsidisation could ensure that petroleum products that are socially sensitive in the sense that they are consumed relatively more by the poorer segments of society are subsidised. In order to make this viable and sustainable, there would be other petroleum products that are taxed, as it were, to generate the requisite resources to fund the subsidies.

Beyond production/procurement, TOR performs other tasks arising from its role as wholesaler. For example, it must have and operate storage facilities. Appropriate mark-ups are thus required to ensure that these other functions can be carried out. The use of the import parity prices, however, is to ensure that TOR does not exploit its monopoly status to charge ex-refinery prices higher than what would cost to import the product. Any warranted difference would thus have to be explicitly determined and justified. More importantly, appropriate remedial action – of improved management or equipment/capital installations or technology – taken.

Let y_{it} be the ex-refinery price (in cedis) of the i^{th} product for month t and

Z_{it} is the corresponding import parity price of the i^{th} product (in cedis)

X_{it} is the import parity price (in US dollars)

V_{it} is the volume of sales

We consider developments in year 2002. Consequently, $i = 1, 2, 3, \dots, 10$. By definition, $Z_{it} = e_t X_{it}$ where e_t is the average exchange rate of the cedi with respect to the US dollar.

The ex-refinery prices in 2002 were for minor variations announced in November 2001 corresponding to $t = 0$. Thus, $\{y_{i0}\}$, $\{Z_{i0}\}$, $i = 1, 2, 3, \dots, 10$ represent the sets of ex-refinery and import parity prices – both in cedis – as at November 2001.

Definition

We define a “subsidised” product as one for which the ex-refinery price was lower than the import parity price as of November 2001. Thus, for subsidised product k ,

$$y_{i0} < Z_{i0}, \text{ (k is kerosene or gas oil or LPG)}$$

Similarly, we define a “taxed” product as one for which the ex-refinery price was set higher than the import parity prices as of November 2001.

For all other products $y_{j0} > Z_{j0}$ (j is premium petrol).

For all others,

$$y_{i0} = Z_{i0}$$

Now consider for any product i and month t the price differential d_{it} given by

$$d_{it} = y_{it} - Z_{it}$$

Now d_{it} can be (by appropriate additions and subtraction) written as

$$d_{it} = (y_{it} - Z_{i0}) + (e_0 - e_t)X_{i0} + (X_{i0} - X_{it})e_t$$

so that

$$d_{it}V_{it} = (y_{it} - Z_{i0})V_{it} + (e_0 - e_t)X_{i0}V_{it} + e_t(X_{i0} - X_{it})V_{it}$$

We define quantities as follows:

$S_{it} = (y_{it} - Z_{i0})V_{it}$ is the cross-subsidy effect

$E_{it} = (e_0 - e_t)X_{i0}V_{it}$ is the exchange rate effect

$W_{it} = e_t(X_{i0} - X_{it})V_{it}$ is the world market price effect

For each product i and month t , these effects arising from cross-subsidisation, exchange rate fluctuations and world market price (in US dollars) changes trace the consequences for debt or otherwise at TOR. Correspondingly, we define for each month t by summing over products,

$$S_t = \sum_{i=1}^{10} S_{it} = \sum_{i=1}^{10} (y_{it} - Z_{i0}) V_{it}$$

$$E_t = \sum_{i=1}^{10} E_{it} = \sum_{i=1}^{10} (e_0 - e_t) X_{i0} V_{it} = (e_0 - e_t) \sum_{i=1}^{10} X_{i0} V_{it} \text{ and}$$

$$W_t = \sum_{i=1}^{10} W_{it} = \sum_{i=1}^{10} e_t (X_{i0} - X_{it}) V_{it} = e_t \sum_{i=1}^{10} (X_{i0} - X_{it}) V_{it}$$

Therefore, the incremental debt in the t^{th} month D_t is given by

$$D_t = \sum_{i=1}^{10} d_{it} V_{it} = \sum_{i=1}^{10} S_{it} + \sum_{i=1}^{10} E_{it} + \sum_{i=1}^{10} W_{it}$$

$$D_t = S_t + E_t + W_t$$

And for the year 2002 as a whole (summing over months):

$$S = \sum_{t=1}^{12} S_t, \quad E = \sum_{t=1}^{12} E_t, \quad W = \sum_{t=1}^{12} W_t, \quad D = \sum_{t=1}^{12} D_t$$

For example, December corresponds to $t = 12$. Hence verify that

$$D_{12} = S_{12} + E_{12} + W_{12}, \text{ which is } (89,596.20) = 19,187.0 + (30,275.6) + (78,507.5).$$

Table A1 provides values for S_t , E_t , W_t , S , E , W , and D for 2002. The table shows that “mispricing” of petroleum products occurred as a result of the failure to implement the modifies Automatic Petroleum Product Adjustment Mechanism. This added a further

¢634 billion to the TOR debt in that year i.e. $(634,011.5) = 195,897.0 + (190,696.2) + (639,212.3)$.

The modification of the original price adjustment formula was to incorporate a principle approved by Parliament. In order to defray TOR's accumulated debts resulting from previous price controls, Parliament approved the principle that of any potential savings, which may accrue from future reductions in world oil, prices would be used to service the TOR debt. Accordingly effective end – March 2002 – the formula was to include a petroleum service surcharge (PDSS). The surcharge was to be set at 95 percent of their decline in import parity prices from the average level prevailing over the one-month period November 27 – December 26, 2001. It has been contended that by so introducing an asymmetry in petroleum product pricing – a downward inflexibility – public support for the adjustment formula was eroded making it politically difficult to implement the formula.