Some Thoughts on Model Building for Developing Countries

by

Daniel O. Boamah*

The paper discusses some issues relating to model building for developing countries within a framework of general principles of model building. The first part sets out the basic principles involved, namely: specification, estimation, testing and evaluation. In the second part, some institutional problems and other issues that make it difficult for a model builder in a developing country to adhere strictly to all the principles are discussed. The paper concludes with some suggestions aimed at alleviating some of these problems.

*Economist, Research Department
CENTRAL BANK OF BARBADOS

August, 1985

Scenario

The financial difficulties which the facing industry create uncertainty about its future. From an industry in which output averaged 157,000 tonnes between 1960 and 1974, the average output declined to 105,000 tonnes between 1975 and 1984. Furthermore the average export price has been declining over the period and rather swiftly within the last five years. Production costs are still increasing, thus eroding the industry's profits and consequently its viability. Without the CSA and subsequently the Lome agreement (see box 1) the industry's financial position would have been worse. However, the members of the EEC and the U.S. have pursued policies within the last decade that have altered the complexion of the world sugar market.

Between 1960 and 1974 sugar output in Barbados declined at an annual average rate of 2.5% from 156,000 tonnes to 110,000 tonnes. In the meantime world production was increasing at a rate of 3.5% while consumption grew at a similar rate. With an average production level of 157,000 tonnes over the period, the CSA quota was easily met. Prior to 1967 sales under the CSA were shared between the U.K. and Canada as provision was made for the release of CSA sugar to Canada when that country could not meet its own demand. After 1967 CSA sugar was sold to the U.K. only. Canada reduced its preference payments and Barbados tried to shift to the United States market.

The guaranteed price under CSA was consistently above world market price except for a few years over the period 1960-74. The Agreement stabilised the industry's earnings and enabled it to remain profitable during the 1960s and early 1970s. But the sugar industry's contribution to overall foreign exchange earnings declined from 53.1% in 1960 to 15% in 1974. Indeed its contribution might have been much lower, were it not for the failure of the ISA to reach an agreement on prices in 1973. With no final decision on prices or quotas, world market prices shot up in 1974.

Export prices increased steadily over the period but so did the costs of producing a tonne of sugar. It took $196.38 to produce a tonne of sugar in 1960 and by 1974 the figure was $436.91. While wages in the industry grew at a rate of 8.2% per annum non-labour costs grew at a slower rate of 6.5%. With production declining by 2.5% per annum, employment also fell from 20.7 thousand in 1960 to 9.5 thousand by 1974. Though wages increased at a faster pace than the average export price and production was falling, the gains in productivity (3.1% per annum) ensured that revenues remained consistently above expenses for the better part of the period. In addition the fall in the numbers employed reduced the industry's wages bill as a proportion of total costs from 49.9% to 45.6% between 1960 and 1974.

Prior to 1974 the CSA reduced the fluctuations in the foreign exchange earnings of the industry. With the end of CSA, a significant cut in the industry's export quota to European countries gave rise to a greater dependence on the volatile world market. As a result the industry began to record more frequent losses. The post 1974 period witnessed a change in the structure of the world sugar market resulting primarily from policies pursued by member states of the EEC and the U.S.

Box 1

CONDITIONS

Under the original Overall Agreement Quota (OAQ), the West Indies Sugar Association was allocated an NPQ (Negiotated Price Quota) of 615,000 tonnes for the British West Indies and Guyana, revised to 737,000 tonnes in 1965. Barbados' share of 128,000 tonnes was increased to 138,000 tonnes, almost 20% of the total regional allocation.

On Britain's accession to the EEC the CSA was replaced by the Sugar protocal of the convention of Lome between the EEC and 46 African, Caribbean and Pacific countries. Under the Lome convention Barbados was allocated an annual quota of 53,400 tonnes of sugar, substantially less than its NPQ. Local producers did not commit themselves to a higher quota because production was declining and world market prices were high at the time. Other West Indian territories also accepted smaller quotas, leaving their guaranteed output 40% lower.

Source: Haynes, C. 1982.

Sugar production in Barbados fell even further between 1975 and 1984. Output averaged just over 100,000 tonnes over the period, but this figure was not reached in four out of the ten years. In the meantime world production continued to grow - at a rate of 2.2% per annum - while consumption though growing more slowly than the 1960-74 period still managed to increase by 2.3% per annum. Nevertheless stocks as a ratio of consumption mounted at 6.7% per annum compared to a decline of 2.7% per annum between 1960 and 1974. World prices reacted negatively to these changing features on the world market.

Sugar prices fell precipitously since the peak year of 1975 and except for 1980 have remained very depressed. The accumulation of sugar surpluses was chiefly responsible for the depressed prices. The creation of excess supplies was a result of the structural change in the world market since the mid-1970s. The EEC became a net exporter of sugar and controlled a quarter of the free market since 1980. This position represented an incredible turn-around when we consider that the EEC was a major importer of sugar up until 1976. In the U.S. import quotas were imposed to defend domestic sugar prices during the period. In addition a shift in consumption to alternative sweeteners also put pressure on sugar exporters in the developing countries.

External Policies

The EEC extended subsidies to its sugar exporters and controlled domestic prices which encouraged increasing levels of production and contributed to destabilising world prices. According to the Economist [August 10-16, 1985] "the European Common Market pay its farmers US20 cents - i.e. more than five times the current world market price - to grow each pound of sugar. With such rewards, European farmers have increased annual production from 10.8 m to 13.3 tonnes since 1977, when the EEC began to export more sugar than it imported". Given that the EEC is not a member of the ISA, such policies give rise to major price fluctuations which the ISA is unable to prevent. But this is not the first time in history that European beet sugar producers have been given subsidies/bounties of proportions significant enough to critically affect world market prices.

According to Beachey [Page 152] "in the autumn of 1896, the continental powers doubled their sugar bounties and sugar prices fell to an all-time low, causing the virtual disappearance of the market for West Indian sugar in the United Kingdom ....". He further stated that a report of the commissioners on the state of the West Indies Sugar Industry presented at the end of August 1897, agreed that the best immediate remedy for the depression in the Sugar Industry 'would be the abandonment of the bounty system by continental nations'.

The U.S., the largest importer in the free market imposed restrictive import quotas in May 1982 to defend its domestic sugar price. Since then the import quota for Barbados dropped from 19.6 tons in 1982 to 17.8 tons in 1985. In addition to imposing import quotas, the U.S. is also subsidising sugar production. According to the Economist [August 10-16, 1985] sugar farmers are getting 17 3/4 cents a pound or about 4½ times the world price. This is encouraging over production and putting pressure on the most efficient producers in the developing countries.

Though the U.S. does not put sugar on the world market like the EEC, domestic prices have remained very high. As a result every kind of alternative to sugar has become artificially competitive. This has led to a decline in the consumption of sugar from 10.8 m tons in 1974 to 7.7 m tons in 1984. As a consequence the substitutes have captured about half the import market.

Price Model

The interaction of production, consumption and stocks is critical to determining the trend which sugar prices follow. Since our smallness cannot influence significantly any one of the three identified factors on the world market, it means that the sugar industry has to take its signals from developments in the international market. These developments would influence the sugar prices, the factor which is of primary concern to the local industry.

We accept the difficulties associated with forecasting the prices of agricultural commodities because of the high level of risk and uncertainty involved in their cultivation. Nevertheless, we employ a price adjustment nodel using a stock disequilibrium approach. According to Hwa[3] for a storable commodity the following equations are sufficient to define the supply of and demand for stock.

(1) $C_t = aP_t + bx_t + u_t,$ a o

(2) $Q_t = cP_t + dY_t + V_t,$ c o

(3) $H^d{}_t = e(p^e_{t+1} - P_t) + fz_t + w_t,$ e o

(4) $H_t = H_{t-1} + Q_t - C_t$

The symbols have these meanings:

C_t = the rate of consumption during time t

Q_t = the rate of production during time t

$H^d{}_t$ = Demand for stock at the end of period t

H_t = Actual stock at the end of period t

P_t = The commodity price at time t

pe_{t+1} = The price level expected to prevail at t + 1

u_t, v_t, w_t = Disturbance terms

x_t, y_t, z_t = Shifting variables

Perspectives*

It is recognised that the Barbados Sugar Industry needs to identify a minimum production level which at least covers the operational costs of the industry. On what basis should this 'critical minimum' be decided? We may consider the value of the foreign exchange earned from the export of sugar. We may want to relate the industry's importance to its capacity to generate employment. Whatever basis we use to argue for the retention of the Sugar Industry, we cannot ignore its financial state.

Gerry Hagelberg consistently reminds us that sugar is a highly cyclical industry. He anticipates a turn-around in the price cycle and so suggests that the industry should be in a position to take advantage of such a turn-around. This situation may coincide with a better exchange rate between the dollar and European Currency Unit [ECU].

David Cuke and Erie Deane believe that the time has come to develop some form of direct subsidy rather than a continuing loan situation. DeLisle Worrel feels that whatever financial mechanism we put in place, we must ensure that it provides the

incentives for the development of a diversified viable agricultural base. He questions the source of the revenues for providing a subsidy to the Sugar Industry. Frank Alleyne sees a different marketing policy as the way forward since the EEC is now a surplus producer and may quite soon have to put its national interests first. Thus exports to the EEC would be affected.

The development plan of Barbados for 1983/88 identifies 120,000 tonnes of sugar as the target for the industry. Hagelberg considers that 120,000 tonnes to 150,000 tonnes of sugar to be a desirable level on the basis that sugar production is a high fixed cost operation. As a result the industry needs to get back to a volume of production which covers its high overheads. He further suggests that simultaneously with looking at price support and subsidies of one kind or another, we must pay attention to economising and cost saving, because we must learn to live at least within the price range of preferential markets.

*The above views were expressed on a "Point at Issue" programme of Voice of Barbados, October 7, 1984. The topic was "The financial crisis of the Barbados Sugar Industry".

Outlook

Any industry which plays no part in determining the price of its output, is in a precarious position. Its revenues cannot be easily manipulated and so strict attention has to be paid to its costs. This gives rise to tremendous emphasis being placed on efficiency of operations and productivity. For the immediate future, it seems that world sugar prices are going to remain depressed. World production levels are gradually improving whereas consumption is growing at a slower rate in the face of competition from alternative sweeteners. These factors combine to make one question the viability of the sugar industry.

Since cost saving seems to be of prime importance in the sugar industry, the need to phase-out some of the least efficient sugar producers may be a pressing one. In light of this it may be extremely difficult to achieve production levels of 120,000 tonnes of sugar. Therefore some consideration must be given to reducing the size of the sugar industry. In some quarters 100,000 tonnes seems to be a more realistic target level for the future.

There is great uncertainty surrounding the factors which determine the final volume of any agricultural produce. Sugar cane is no exception. Rather than target the level of production, the amount of land used for sugar cane should be targetted. Increasing the land under production by five thousand hectares may bear any meaningful economies of scale. As such the

average cost of producing a tonne of sugar may not necessarily decline. Indeed the land that could be brought back under production must be 'marginal land'. As a result the cost of producing a tonne of sugar may increase rather than decline.

If land use is seen to be more critical for the development of agriculture in Barbados then the sugar cane growers and agriculturalists in general must exercise their ability to manage the land effectively. Factors such as effective rainfall and to a lesser extent burning are beyond the control of cane farmers. Since these two factors significantly affect yield, it follows that yield is also an uncontrollable variable.

Therefore, given that increasing land under production may most likely result in increasing average costs, 'hectares planted must be the target, since it is the one significant factor over which the farmers have control. A certain minimum production could still be calculated given that an average yield figure could be estimated from past years. Having identified the average yield a certain portion of land could be allocated to sugar cane so as to meet what would be considered a desirable minimum production level. In good years when yields are high the targetted level would be surpassed and in bad years production would not fall far below the desired levels.

The revenues to be gained from sugar would still be volatile since sugar prices are expected to be volatile. But costs - especially non-labour costs - should be more manageable given that 'hectares planted' would be a known quantity. One may argue that over the last ten years that land under sugar cane has remained very stable. However this does not seem to be a 'reasoned' position based on the optimal allocation of the scarce resource, land.

Sugar Data

Years	World (Million Tonnes)						Domestic				
	Production	Consumption	Ending Stocks	Stocks/ Consumption Ratio	World Prices	('000 Tonnes) Production	Average Export Price	Index Wage Rate	('000 Tonnes) Sugar Exports	('000 Hect's) Area Reaped	('000) Employed in Sugar
1960	49.1	48.0	13.5	28.1	3.1	156	195	15.6	143.3	19.8	20.7
1974	80.0	80.0	17.5	21.9	18.7	110	548	47.0	116.9	16.8	9.5
1975	78.5	77.0	19.1	24.8	30.5	98	835	65.0	85.8	16.1	9.8
1984	95.6	95.6	42.5	44.5	6.5	100	668	135.0	86.5	14.3	7.6
Average Annual Growth Rates											
1960-74	3.5%	3.6%	1.9%	-2.7%	13.7%	-2.5%	7.6%	8.2%			
1975-84	2.2%	2.3%	9.3%	6.7%	-15.7%	0.2%	-2.4%	8.5%			

Source: U.S. Department of Agriculture.
Annual Statistical Digest, Central Bank of Barbados.

Barbados.

REFERENCES

1. Beachey R.W.: The British West Indies Sugar Industry in the late 19th century, Greenwood Press, Publishers 1978.

2. Haynes C.: Sugar and the Barbadian Economy 1946-80, The Economy of Barbados 1946-80, 1982.

3. Hwa E.C.: A Structural Model of Competitive Price Adjustments in the World Markets of Primary Commodities, August 1978. Research Department International Monetary Fund.

4. Murray J.A.J.: The Relationship of the European Economic Community and the World Sugar Market to the Barbados Sugar Industry, May 1985. Mimeo.

5. Schmitz L.: The Sugar Policies of the European Community and the United States and their Impact on the World Sugar Market, April 1985. International Monetary Fund.