The Philippine Review of Economics and Business
Volume XVI, No. 2, June, 1979

A PRELIMINARY FRAMEWORK FOR IMPROVING THE ACCURACY OF AMNEWSS PRICE REPORTS

By

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Introduction

Among the primary functions of the Bureau of Agricultural Economics (BAEcon) is to collect and disseminate market price information on agricultural commodities. The Office of Agricultural Marketing News Service (AMNEWSS), now Agricultural Marketing Services Division, under the Bureau was created by Republic Act No. 4148 with the major objectives of "(1) bringing order into the marketing system in the Philippines, (2) minimizing fluctuations in prices of agricultural products, and (3) making the distribution process more effective to avoid excessive spoilage and waste of perishable products" (3).

Since it started in 1968, AMNEWSS has expanded its price collection activities to cover over 100 different agricultural commodities at 17 public markets and supermarkets in Metro Manila and 42 provincial trading centers. Moreover, prices and marketed quantities of 18 agricultural commodities have been collected in 5 Metro Manila markets and 5 city markets[1] located in the different regions of the country since 1973.

Price information collected from the provincial trading centers are transmitted daily to the operation center in Quezon City through a network of radio stations established by the BAEcon and other government agencies like the National Food and Agricultural Council

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[1]Include Baguio City, Cagayan de Oro City, Cebu City, Davao City and Zamboanga City.

(NFAC), National Census and Statistics Office (NCSO) and National Grains Authority (NGA). The AMNEWSS Daily Price Reports disseminate retail and wholesale price quotations for about 50 agricultural commodities in Metro Manila and in the provincial trading centers. Other AMNEWSS price releases are the Daily Rice and Corn Situation and Weekly Review in Metro Manila and the Monthly Market Situation Report. Outlets of these price releases include about 40 broadcasting radio stations in Metro Manila and in the provinces, national and local newspapers, local and national offices and other interested private entities.

Two attempts had been made to evaluate AMNEWSS. One study was conducted seven years ago to evaluate the media dissemination of market prices of agricultural commodities in the Philippines (1). The other was conducted in Misamis Oriental and neighboring provinces to evaluate the performance and usefulness of radio broadcast programs on farm product prices (9). Efforts have been made to expand and improve AMNEWSS, yet economic analysis to support such expansion and improvement is apparently lacking.

Objectives

The objectives of this paper are: (a) to develop a conceptual framework for determining the expected loss in consumer welfare under different levels of accuracy of price estimates reported and under varying price elasticities of supply and demand; and (b) to apply the model using AMNEWSS data and other secondary sources in estimating expected marginal gain in consumer welfare by improving the accuracy of AMNEWSS price estimates. The framework to be developed will attempt to show the economic basis for improving the accuracy of a particular product's price estimates in terms of expected gain or loss in consumer welfare. Hopefully, this economic model on price information can serve as a basis for improving AMNEWSS price collection activities.

Theoretical Framework

Agriculture is characterized by several producers, sellers and consumers of more or less homogeneous farm products. Thus, a purely competitive market can be realistically assumed in analyzing the markets of most agricultural products. Under this market structure, price information is very important for producers to determine what and how much to produce, and for sellers and consumers to decide where and how much to sell and buy, respectively. Price information becomes valuable if it serves as a basis for production and marketing

decisions. On the other hand, it is socially valueless if no production decisions can be predicted from the information. Neither is it useful nor harmful if it is obtained after marketing decisions have been made and productive resources have already been allocated (7).

The usually long period of time required to produce most agricultural products tends to limit the value of current price information as a basis for production decisions. Farmers' decisions on what and how much to produce may probably be based mainly on trends in farm prices in the past several years rather than on present prices. However, current price information reported by the AMNEWSS are likely to be very important to sellers or inventory holders of storable farm products and to farm producers whose products are ready for sale. Consumers may likewise adjust their consumption expenditures based on current market price information.

Methodology

The Economic Model

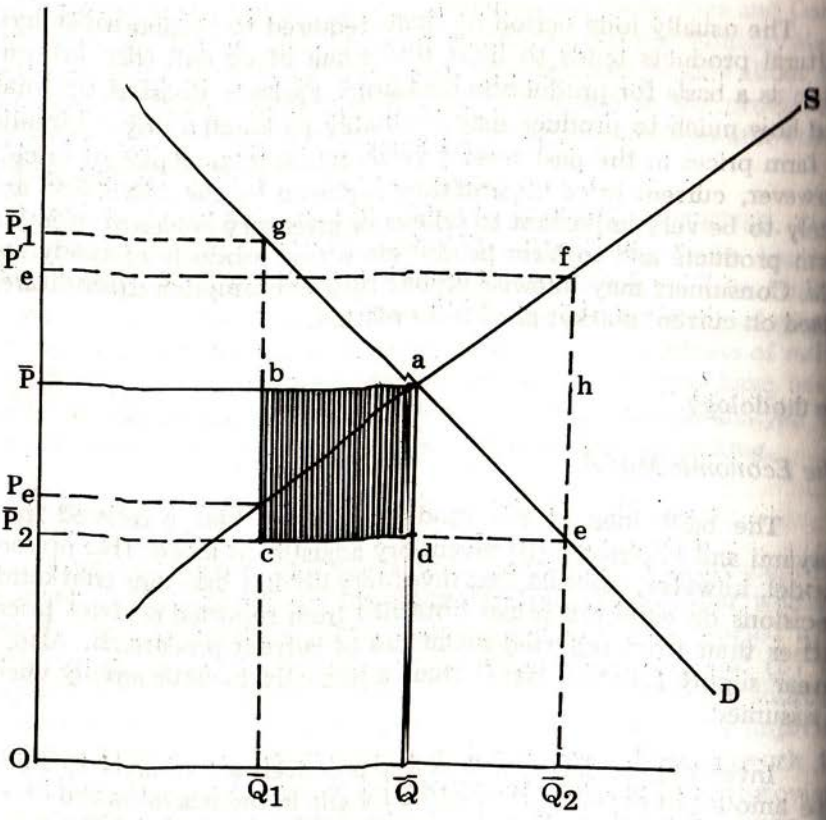
The basic idea of the model presented here is derived from Hayami and Peterson's (5) inventory adjustment model. The present model, however, assumes that inventory holders base their marketing decisions on expected prices obtained from reported product prices rather than from reported estimates of current production. Also, a linear supply function rather than a perfectly inelastic supply curve is assumed.

Inventory holders or sellers and producers are assumed to adjust the amount of products they offer for sale in the market based on reported market prices. It is also assumed that they expect the price of tomorrow to be not very much different from the reported price of today. This assumption implies that the volume of products they offer for sale in the next market day depends on the reported price of today, i.e. $Q_{t+1} = f(P_t)$. The amount of product, sellers bring into the market is equal to the market supply in the very short run, and this perfectly inelastic supply together with the market demand curve determines the market price of the commodity.

Let us assume that $O\bar{P}$ and $O\bar{Q}$ are the true market equilibrium price and quantity (Fig. 1). Now, suppose the price reporting agency reports an overestimated price OP'_e which is greater than $O\bar{P}$ by e* per cent of $\bar{P}P'_e/O\bar{P}$ in the diagram. Sellers then respond to this price information by moving up the supply curve S and placing in the

FIGURE 1

Expected Loss in Consumer Welfare (Shaded Area) Due to Errors in Price Information



market an amount $O\bar{Q}_2$ resulting in a low price $O\bar{P}_2$ and an expected gain in consumer welfare equal the area $a\bar{Q}\bar{Q}_2 e$.

Next, we assume that the market price report is OP_e which is an underestimation of $O\bar{P}$ by e* per cent ($P_e\bar{P}/O\bar{P}$). Under this situation sellers' response to the price report is to supply $O\bar{Q}1$ in the market resulting in a market price $O\bar{P}_1$ and an expected loss in consumer welfare equal to the area $A\bar{Q}\bar{Q}_1 g$. Further assuming equal magnitude and frequency in the overestimation and underestimation of the market price reports, such an error (e* per cent) in price information results in an expected loss in consumer welfare equal to the rectangle abcd. This area is equal to the difference between the expected gain in consumer welfare from overestimation and the expected consumer welfare loss from underestimation of the true market price.

Estimating Expected Consumer Welfare Loss

To derive the formula for estimating the expected loss in consumer welfare due to errors in price information, let:

E_s	:	Elasticity of supply
E_d	:	Absolute value of elasticity of demand
$O\bar{P}$	:	True market equilibrium price
$O\bar{Q}$	:	True market equilibrium quantity
e^*	:	Sampling error or per cent of over or underestimation of true price
ECWL	:	Expected consumer welfare loss

We know that:

$$(1)\quad \frac{dP}{dQ_s} \cong \frac{1}{E_s} \cdot \frac{O\bar{P}}{O\bar{Q}} \qquad (2)\quad \frac{dP}{dQ_d} \cong \frac{1}{E_d} \cdot \frac{O\bar{P}}{O\bar{Q}}$$

are the slopes of the supply and demand curves, respectively. Fig. 1 shows that the distances between the following points are equal:

$$(3)\quad cd = de = ah$$
$$(4)\quad hf = e^*\bar{P}$$

Using equations (1) and (4), ah is equal to:

$$(5)\quad ah = \frac{e^*(O\bar{P})}{dP/dQ_s} = \frac{e^*(O\bar{P})}{O\bar{P}/E_s(O\bar{Q})} \cong e^*E_s(O\bar{Q})$$

therefore,

$$(3')\quad cd \cong e^*E_s(O\bar{Q})$$

Using equations (2), (3) and (3'), we estimate the distance ad:

$$(6)\quad ad = \frac{dP}{dQ_d} \cdot de \cong \left(\frac{1}{E_d} \cdot \frac{O\bar{P}}{(O\bar{Q})}\right)(e^*E_sO\bar{Q})$$

$$ad \cong \frac{e^*E_s(O\bar{P})}{E_d}$$

Finally, we compute for the expected consumer welfare loss (ECWL) which is equal to the rectangle abcd in Figure 1 using equations (3') and (6):

$$(7)\quad ECWL \cong (cd) \times (ad))$$
$$\cong (e^*E_sO\bar{Q}) \times \left(\frac{e^*E_s(O\bar{P})}{E_d}\right)$$

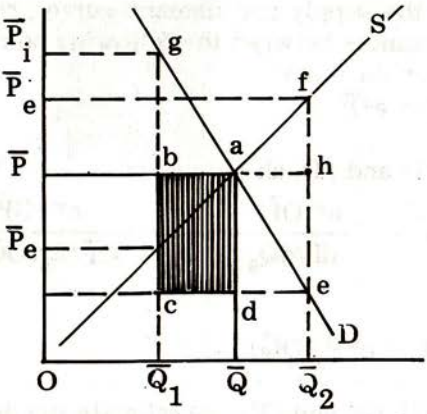
$$ECWL \cong e^{*2}E_s^2 \quad \frac{(O\bar{P})\,(O\bar{Q})}{Ed} = \frac{e^{*2}E_s^2 V}{E_d}$$

where $V \cong (O\bar{P})\,(O\bar{Q})$.

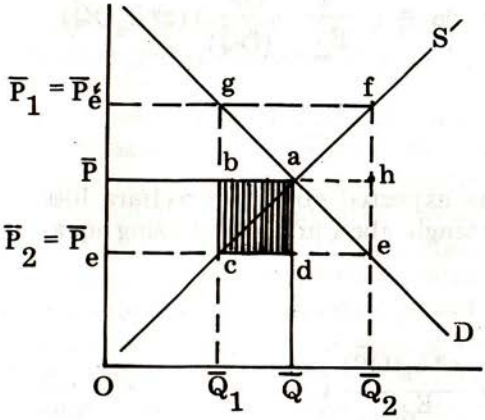
From the last equation, the expected loss in consumer welfare due to errors in price information is directly related to the squares of the sampling error (e*), the elasticity of supply (E_s), and to consumer expenditures (V) for the commodity, but inversely related to the absolute value of the elasticity of demand (E_d). Graphically, this result is shown in Figures 2 and 3. Given the sampling error e*, the

FIGURE 2

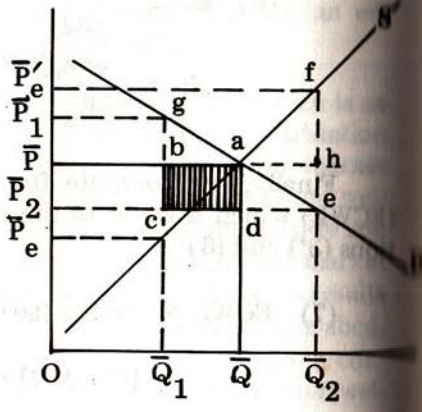
Expected Loss in Consumer Welfare (Shaded Area) Due to Errors of Price Information Under Varying Elasticities of Demand at the Points of Equilibrium of Price and Quantity



a) Inelastic demand



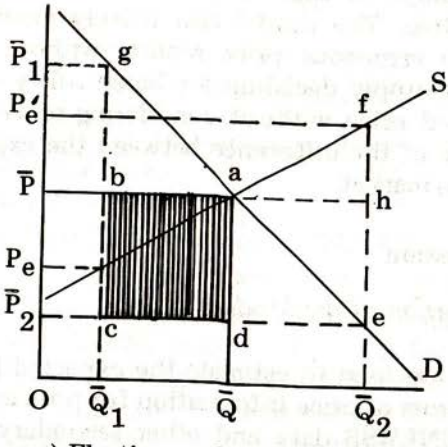
b) Unitary elastic demand



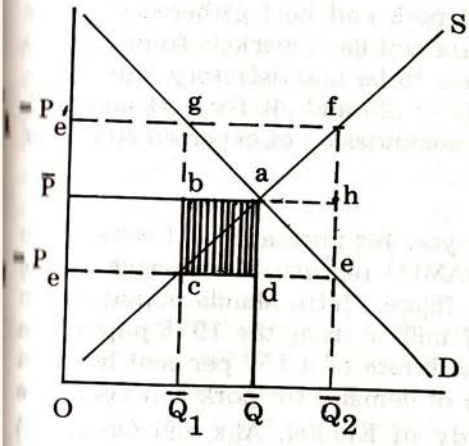
c) Elastic demand

FIGURE 3

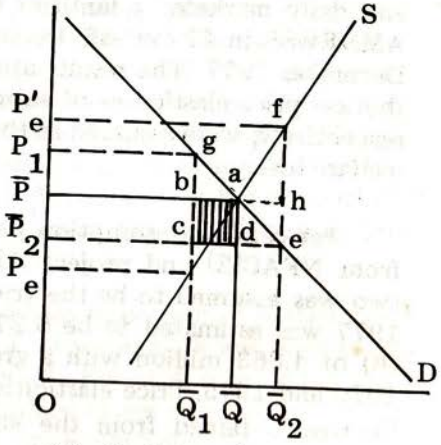
Expected Loss in Consumer Welfare (Shaded Area) Due to Errors of Price Information Under Varying Elasticities of Supply



a) Elastic supply



b) Unitary elastic supply



c) Inelastic supply

elasticity of demand E_d, and consumer expenditure (V), the greater the elasticity of supply, the greater the expected loss in consumer welfare. On the other hand, the greater the elasticity of demand, the less the expected loss in consumer welfare due to errors of market price reports, given e*, E_s and V.

Assumptions and Limitations

Basic in the above analysis is the assumption that the area

under the demand curve is a measure of consumer welfare. As a preliminary attempt to study the effect of erroneous price information, the analysis in this paper is limited to the consumer welfare side with the implicit assumption that its effect on sellers and inventory holders is negligible. The model also naively assumes that sellers are responsive to erroneous price reports without learning in the process, i.e. their supply decisions are based solely on current price report or expected price without considering previous observations on the magnitude of the difference between the expected price and actual price in the market.

Results and Discussion

Empirical Application of the Model

The model was used to estimate the expected loss in consumer welfare due to errors of price information for pork and beef in Metro Manila using AMNEWSS data and other secondary sources. An attempt was made to estimate the price elasticities of supply of these two commodities from data on weighted average daily market price and daily marketed quantities of pork and beef gathered daily by AMNEWSS in Cloverleaf, Divisoria and Paco markets from June to December 1977. The results appear to be unsatisfactory, thus hypothetical price elasticities of supply of .20 and .40 for pork and beef, respectively, were assumed in the computation of expected consumer welfare loss.

Per capita consumption per year for pork and beef were taken from NFAC(2) and project ADAM(4) reports. The average of the two was assumed to be the true figure. Metro Manila population in 1977 was estimated to be 5.277 million using the 1975 population (8) of 4.863 million with a growth rate of 4.157 per cent between 1970 and 1975. Price elasticities of demand for pork and beef were likewise obtained from the study of Kunkel, Alix and Orogo (6) under Project ADAM. They estimated the elasticities from the pooled data of four consumption surveys conducted from 1970 to 1973 by the Special Studies Division of the Ministry of Agriculture. Aggregate demand $O\bar{Q}$ for each commodity was estimated by multiplying per capita consumption per year by the estimated 1977 Metro Manila population. The average Metro Manila price in three selected markets is taken to be the equilibrium price $O\bar{P}$ for each commodity.

Table 1 shows the average per capita consumption of pork and beef per year at 10.95 and 4.82 kilograms, respectively. Aggregate

TABLE 1

Per Capita Consumption Per Year, Average Prices and Aggregate Demand and Expenditures for Pork and Beef, Metro-Manila, 1977

Item	Pork	Beef
Per capita Consumption Per Year, Kilos	10.95	4.82
Average Price Per Kilo, Pesos	12.37	17.21
Aggregate Demand, Million Kilograms	57.772	25.430
Aggregate Expenditures, Million Pesos	714.479	437.573

demand in Metro Manila was estimated to be 57.772 million kilograms for pork and 25.430 million kilograms for beef. Using the average Metro Manila prices of pork and beef from July 1976 to June 1977, the values of aggregate demand for these two commodities are ₱714,479 and ₱437,573 million, respectively.

The data needed to compute the expected loss in consumer welfare are presented here except for the sampling error e* or estimate of errors in price reports. Since AMNEWSS has no report on this or any compilation of the possible magnitude of errors in its price reports, different levels of errors are arbitrarily set for the computation. Likewise, varying estimates of price elasticities of supply and demand for each commodity are also assumed in the computation to see changes in expected consumer welfare loss when these price elasticities change under a given degree of error in the price information.

The estimated annual expected losses in consumer welfare corresponding to different magnitudes of errors in pork and beef price reports are presented in Tables 2 and 3. For each commodity and given error e*, expected consumer welfare losses were computed for three levels and five combinations of price elasticities of supply and demand. As indicated earlier, the average price elasticities of demand were obtained from available studies on demand for pork and beef while hypothetical values were assumed for supply elasticities. The 25 per cent below and 25 per cent above the average elasticities are arbitrarily set to show the effect of changing price elasticity estimates on expected losses in consumer welfare.

The results clearly show that for the same degree of error on pork and beef price reports, expected consumer welfare loss for pork is less than 30 per cent of the expected loss for beef. If the price elasticities of both supply and demand for pork and beef are lower

TABLE 2

Estimated Loss Due to Errors and Marginal Gain From Improving Accuracy of Price Reports for Pork under Varying Elasticities of Supply and Demand, Metro Manila, 1977

Item	Low [a] E_s and High [b] E_d	Low [a] E_s and E_d	Average E_s and E_d	High [b] and Low E_s	High [b] and Low E_d
Price Elasticity of Supply (E_s)	.15	.15	.20	.25	.25
Price Elasticity of Demand (E_d)	.92	.56	.74	.92	.56
Aggregate Expenditure, V (million pesos)	714.48	714.48	714.48	714.48	714.48
Estimated Consumer Welfare Loss [c] (thousand pesos) Corresponding to an Error of:					
$e^* =$ .10	174.74	287.07	386.20	485.38	797.41
.08	111.83	183.72	247.17	310.64	510.34
.06	62.91	103.34	139.03	174.74	287.07
.04	27.96	45.93	61.79	77.66	127.59
.02	6.99	11.48	15.45	19.42	31.90
Estimated Marginal Gain [d] (thousand pesos) in Consumer Welfare Corresponding to Error Reduction					
From — To					
$e^* = .10 - .08$	62.91	103.35	139.03	174.74	287.07
.08 — .06	48.92	80.38	108.14	135.90	223.27
.06 — .04	34.95	57.41	77.24	97.08	159.48
.04 — .02	20.97	34.45	46.34	58.24	95.69

a/ E_s or E_d is 25 per cent below average.
b/ E_s or E_d is 25 per cent above average.
c/ Consumer welfare loss $\cong e^{*2}E_s{}^2V/E_d$ as defined earlier.
d/ Marginal gain is computed by subtracting the consumer welfare of a given error e^* from the next higher level.

TABLE 3

Estimated Loss Due to Errors and Marginal Gain from Improving Accuracy of Price Reports for Beef under Varying Price Elasticities of Supply and Demand, Metro Manila, 1977

Item	Low [a] E_s and High [b] E_d	Low [a] E_s and E_d	Average E_s and E_d	High [b] E_s and E_d	High E_s [b] and low E_d
Price Elasticity of Supply (E_s)	.30	.30	.40	.50	.50
Price Elasticity of Demand (E_d)	.60	.36	.48	.60	.36
Aggregate Expenditure, V (Million Pesos)	437.57	437.57	437.57	437.57	437.57
Estimated Consumer Welfare Loss [c] (Thousand Pesos) Corresponding to Error of:					
e^* = .10	656.36	1,093.92	1,458.57	1,823.21	3,038.68
= .08	420.07	700.11	933.48	1,166.85	1,944.76
= .06	236.29	393.81	525.08	656.35	1,093.92
= .04	105.02	175.03	233.37	291.71	486.19
= .02	26.25	43.76	58.34	72.93	121.55
Estimated Marginal Gain [d] (Thousand pesos) in Consumer Welfare Corresponding to Error Reduction					
From — To					
e^* = .10 — .08	236.29	393.81	525.09	656.36	1,093.92
.08 — .06	183.78	306.30	408.40	510.50	850.84
.06 — .04	131.27	218.78	291.71	364.64	607.73
.04 — .02	78.77	131.27	175.03	218.78	364.64

[a] E_s or E_d is 25 per cent below average.
[b] E_s or E_d is 25 per cent above average.
[c] Consumer welfare loss = $e^{*2}\ E_s{}^2 V E_d$.
[d] Marginal gain is computed by subtracting the consumer welfare of a given error e^* from its next higher level.

(higher) than the average elasticities by 25 per cent, expected consumer welfare loss is reduced (increased) by 25 per cent. The estimated consumer welfare losses or marginal gains in consumer welfare corresponding to a given reduction in error of price reports under a high (25 per cent above average) assumption of supply elasticity and a low (25 per cent below average) estimate of demand elasticity are over four times those estimated under a low supply elasticity assumption and high estimate of demand elasticity.

On the average, expected losses in consumer welfare for pork approximately equal those for beef if the error in pork price reports is twice that in beef price information. This implies that greater care and attention should be exercised in the collection and dissemination of beef prices than pork prices.

Tables 2 and 3 show the estimated marginal gain in consumer welfare from improved accuracy of reported price estimates. The marginal gain is estimated by subtracting the consumer welfare loss of a given error in price report from its next higher level. For example, on the average, a reduction in the error of price reports of pork and beef in Metro Manila from 10 to 8 per cent is expected to increase the welfare of consumers by 139.03 to 525.09 thousand pesos, respectively.

Conclusion

An economic model is developed in this paper to assess the expected loss in consumer welfare arising from errors in price collection and dissemination. The model assumes a purely competitive market structure with producers and inventory holders responding to price information on agricultural products. It further assumes that the area under the demand curve is a measure of consumer welfare.

The procedure for estimating the expected consumer welfare loss due to errors in price reports is presented and the model is applied to AMNEWSS data on pork and beef in Metro Manila together with secondary data from other sources. Expected loss in consumer welfare may be minimized if more efforts are made to improve the accuracy of beef price reports relative to that of pork prices.

In general, the model indicates the importance of having more accurate price information for commodities with higher (lower) price elasticities of supply (demand) and with greater shares in the consumers' budget. It is then necessary to have estimates of price elasticities as bases for determining which agricultural products

should be given priority in price collection and dissemination. The magnitude of errors in the prices collected and reported as well as the costs associated with reducing the magnitude of these errors for all commodities covered by the AMNEWSS should be established as a step towards measuring investment returns of public price information services in the Philippines.

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