

Effect of Egyptian Pound/United States Dollar Exchange Rates on Budget Share of Animal Protein

Mohamed Sebaq* and Mostafa Mandour

Department of Animal Wealth Development, Faculty of Veterinary Medicine, Suez Canal University, Ismailia 41522, Egypt.

*Corresponding author email id: mhs0023@tigermail.auburn.edu

Abstract – Major production inputs of livestock industry in Egypt are mostly imported. The Egyptian Pound (EGP)/USD currency exchange rate affect production costs and in turn animal protein consumption patterns. This investigation aimed to estimate the demand elasticities of animal protein (red meat, poultry and fish) and to assess the effect of EGP/USD exchange rates on its consumption patterns in Egypt during the period from the year 2000 through 2015. Results showed the three meat products are normal goods. Expenditure elasticity revealed that fish is a necessary good while red meat and poultry are luxury goods. An increase in EGP/USD exchange rate by 1 %, lead to a reduction in the budget share spent on red meat and fish by 8.73% and 17.13%, respectively; and an increase in the budget share spent on poultry by 8.40%. EGP/USD exchange rate had a negative effect on the budget share of red meat and fish but a positive effect on the budget share of poultry. Thus the government is encouraged to increase the supply of fish during high exchange rates which is currently occurring after the free floatation decision for the EGP.

Keywords – Animal Protein, Egypt, Elasticity, Exchange Rates, LA/AIDS.

I. INTRODUCTION

Egypt is currently facing unplanned dietary alteration regimen affecting mainly the poor. According to [1] about 72 percent of poor households had reduced their daily animal protein consumption. High prices and low incomes were the main causes for such shift. The new consumption strategies resulted in higher rates of anemia, stunting, and obesity [2]; a serious condition for future generations.

Self-sufficiency from animal protein is not yet achieved and livestock production is dependable on imported raw materials mainly feed, which consequently affect prices and demand patterns. Few studies [3] - [4] used AIDS model for estimating demand patterns of protein. This investigation is the first to consider the currency exchange rates on consumption patterns aiming at providing useful information for policy makers to secure animal protein by estimating the demand elasticities of animal protein (red meat, poultry and fish) and by assessing the effect of EGP/USD exchange rates on the consumption patterns of animal protein in Egypt during the period from the year 2000 through 2015.

II. METHODOLOGY

Since [5] developed the Linear Approximate Almost Ideal Demand System (LA/AIDS) model, it has been used widely in demand analysis of agricultural products. This paper used the LA/AIDS model estimated by Seemingly Unrelated regression with symmetry and homogeneity

restrictions imposed, using SAS/ETS package [6]; to estimate the demand elasticities of animal protein in Egypt along with the relationship between the EGP/USD exchange rate and the consumer behavior.

Retail price data of red meat (beef and mutton), poultry (duck and chicken) and fish (tilapia, mullet, and catfish); collectively called animal protein later on, and per capita consumption, were based on publications of [7] - [8]. Reported monthly prices were simply averaged to be used for the statistical analysis. The currency exchange rates were based on the [9] reports. Assuming red meat, poultry and fish constitute a weakly separable group, LA/AIDS model can be presented as follow:

$$R_{it} = \alpha_i + \sum_{j=1}^3 \theta_{ij} \ln P_{jt} + \beta_i \ln \left(\frac{X_t}{P_t^*} \right) + \mu_{it} \quad (1)$$

Where $i = 1, \dots, 3$ ($1 =$ red meat, $2 =$ poultry and $3 =$ fish); R_{it} is the proportion of the budget spent on i^{th} product at time t , P_{jt} is the price of good j at time t , X_t is the total expenditure on the meat products at time t and P_t^* is stone price index at time t , and μ_{it} is the error.

Stone price index calculated as follow:

$$\ln P_t^* = \sum_{i=1}^3 R_{it} \ln P_{it} \quad (2)$$

To estimate the effect of the EGP/ USD exchange rate on the demand of meat in Egypt, a new variable for the exchange rate is introduced:

$$R_{it} = \alpha_i + \sum_{j=1}^3 \theta_{ij} \ln P_{jt} + \beta_i \ln \left(\frac{X_t}{P_t^*} \right) + \delta_{it} \ln ER_t + \mu_{it} \quad (3)$$

Where $\ln ER_t$ is the EGP/USD exchange rate at time t .

LA/AIDS model is estimated by seemingly unrelated regression imposing the general restrictions of demand which are:

$$\text{Homogeneity: } \sum_{j=1}^3 \theta_{ij} = 0 \text{ for all } i \quad (4a)$$

$$\text{Symmetry: } \theta_{ij} = \theta_{ji} \text{ for all } i \text{ and } j \quad (4b)$$

$$\text{Adding up: } \sum_{i=1}^3 \alpha_i = 1; \sum_{i=1}^3 \delta_i = \sum_{i=1}^3 \beta_i = \sum_{i=1}^3 \theta_{ij} = 0 \quad (4c)$$

Demand elasticities are calculated as follow:

a - Marshallian Own Price Elasticity

$$e_{ii} = -1 + \frac{\theta_{ii}}{R_i} - \beta_i \quad (5a)$$

b - Marshallian Cross Price Elasticity

$$e_{ij} = \left(\frac{\theta_{ij} - R_j \beta_i}{R_i} \right) \quad (5b)$$

c - Expenditure Elasticity

$$e_i = 1 + \frac{\theta_{ii}}{R_{ii}} \quad (5c)$$

d - Hicksian Own Price Elasticity

$$e_{ij}^* = e_{ij} + R_j e_i \quad (5d)$$

III. RESULTS AND DISCUSSION

Results obtained from running the LA/AIDS model for the study period are shown in Table (1). The system weighted R-squared value 82.5% indicated that the model had a good fit to the data. Most of the coefficients are statistically significant at various levels of significance (0.1, 0.05 and 0.01).

Elasticity estimates of LA/AIDS model are presented in Table (2). The own price elasticities of the three meat products were negative in sign indicating that they are normal goods which agreed with [4]. The Marshallian own price elasticities absolute value of red meat, poultry and fish were 0.742, 1.13 and 0.999; respectively, which meant that if the price of red meat increased by 1%, the demand for red meat will decrease by 0.742 % while if the price of poultry increased by 1% the demand of it declines by 1.13% and for fish, if the price increases by 1%, the demand of it drops by 0.999, holding other factors constant. This conformed to the law of demand, where the quantity demanded of the good or service will be reduced if the price of the good or service increased keeping other factors constant. Results agreed with Effat et al. (1993) [10] who reported that some Egyptian families would reduce animal protein consumption and some would quit buying it as a result of higher prices. Results disagreed with [4] who reported that fish got the highest Marshallian own price elasticity.

Expenditure elasticities were of positive sign with the values of 1.16, 1.0 and 0.61 for red meat, poultry and fish; respectively, which meant that if the expenditure on meat products increased by 1% the demand of red meat, poultry and fish will rise by 1.16, 1.0 and 0.61%; respectively. This agreed with [3] who reported that meat groups had relatively high expenditure elasticity, also agreed with Soliman and Nafissa (1995) [11] who reported that animal protein consumption significantly increased when the financial capabilities of families increased.

Expenditure elasticity of fish implied that it is a necessary good while red meat and poultry are luxury goods. This might be attributed to the fact that red meat and poultry are more expensive than fish which agreed with Nguyen et al. (2013) [12] who concluded that more expensive protein tend to be luxury goods. This result disagreed with [4] who reported that fish is a luxury good.

In regards to assessing the effect of the currency exchange rate, results showed that the EGP/ USD exchange rate had a negative effect on budget share spent on red meat and fish, and a positive effect on the budget share of poultry. The absolute values of the exchange rate proportionate effect on red meat, poultry and fish were

0.087, 0.084 and 0.171, which means that 1% increase in the EGP/USD exchange rate causes 8.73% and 17.13% decrease in the budget share of red meat and fish and 8.4% increase in the poultry budget share.

IV. CONCLUSION

The currency exchange rate is important in Egypt and in countries with similar economic conditions which depend on imports for a considerable extent. Egyptian Government's strategy to seal the animal protein gap by importation should be shifted toward supporting local producers by subsidizing feed which constitute more than 50% of production costs. Moreover, government should invest in livestock industry to secure the needs for animal protein; also it is encouraged to develop fishing fleets to increase fish harvest from territorial waters. Further studies on the elasticity of demand of different types of fish available in the local market are recommended.

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AUTHORS' PROFILES


Mr. Mohamed Sebaq
 Place, DOB: Egypt, 10.1.1989. Educational qualification: M.S (Agricultural Economics), Auburn University, USA (2017). Present position: Teaching Assistant, Department of Animal Wealth Development, Faculty of Veterinary Medicine, Suez Canal University, Ismailia 41522, Egypt.

Dr. Mostafa Mandour

Place, DOB: Egypt, 25.10.1982. Educational qualification: Ph.D (Veterinary Economics and Farm Management), Suez Canal University, Egypt (2013). Present position: Lecturer, Department of Animal Wealth Development, Faculty of Veterinary Medicine, Suez Canal University, Ismailia 41522, Egypt.

Table I: Estimated coefficients of LA/AIDS model (1= Red meat, 2= Poultry, 3= Fish; t-ratio in parentheses)

Equation	lnp_1	lnp_2	lnp_3	DQ_i	$lnER$	DW
1	0.204 (2.60)	-0.018 (-0.22)	-0.186 (-4.80)	0.094 (2.70)	-0.087 (-2.29)	2.31
2		0.040 (0.40)	-0.022 (-0.49)	0.0002 (0.01)	0.084 (2.33)	2.01
3			0.209	-0.094	-0.171	--

Table II: Estimated compensated and uncompensated elasticities (1= Red meat, 2= Poultry, 3= Fish)

Equation	δ_i	Compensated elasticities			Uncompensated elasticities			R_i	e_i
		$e_{i,1}^*$	$e_{i,2}^*$	$e_{i,3}^*$	$e_{i,1}$	$e_{i,2}$	$e_{i,3}$		
1	-0.087	-0.068	0.149	-0.081	-0.742	-0.059	-0.360	0.580	1.161
2	0.084	0.482	-0.946	0.116	-0.098	-1.125	-0.125	0.179	1.001
3	-0.171	-0.195	0.086	-0.853	-0.549	-0.023	-0.999	0.241	0.610