International Journal of Business Management and Finance Research
ISSN: 2641-5313
Volume 8, Issue 7, pp. 1-7
2025
DOI: 10.53935/2641-5313.v8i7.558

Modeling Consumer Demand Using a General Ratio Preference Analysis: Theoretical Insights from the Almost Ideal Demand System Framework versus the Double Log Demand Model

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ABSTRACT: *This paper compares the Almost Ideal Demand System (AIDS) with the Double Log Demand Model in analyzing consumer behavior and estimating demand elasticities. Grounded in utility maximization and the axioms of consumer choice, the AIDS model, developed by Deaton and Muellbauer, provides a flexible and theoretically consistent framework that satisfies the homogeneity, symmetry, and adding-up restrictions. It allows for exact aggregation across consumers without assuming linear Engel curves and is widely used due to its empirical adaptability and ease of linear approximation. In contrast, though easier to estimate and interpret, the Double Log Demand Model lacks full theoretical rigor as it cannot be derived strictly from utility maximization. The paper reviews the literature that applies both models to consumption data across different countries, highlighting the strengths and limitations of each in capturing price and income effects. Ultimately, the AIDS model is superior for policy analysis and economic forecasting due to its robustness in approximating consumer preferences, accommodating demographic variables, and allowing hypothesis testing within a consistent theoretical framework.*

***Key Words**: Almost Ideal Demand System, consumer behavior, demand elasticity, double log demand model, price and income effects, utility maximization.*

1. Introduction

Most concepts in this field of study are entirely or, to some degree, based on the argument that consumers and producers are rational agents. The classical theory of consumer demand behavior is based on a utility function $U = U(X_1,...,X_n)$, where $X = [x_i]$ is an *n*- element column vector of quantities bought of various commodities. The rational consumer constantly seeks to maximize utility within their budget constraint. Furthermore, demand theory holds that individual demand for a commodity or service is the outcome of budget-constrained utility. Facing an array of prices for different goods and services, which are fixed for the individual, and with a given income per unit of time, the consumer maximizes utility by choosing a specific combination of goods and services. The utility maximization problem can be represented as

$$\text{s}\,S.t.\ \sum_{i=1}^{n} p_i x_i = M, \qquad (1)$$

Where represents the quantities of goods that the consumer consumes, implies the consumer's subjective evaluation of satisfaction, or utility, derived from consuming those commodities, p_i is the unit price of the commodity x_i, and M is the consumer's total budget per period.

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Vol. 8, No. 7, pp. 1-7
2025
DOI: *10.53935/2641-5313.v8i7.558*

This combination will change as a result of changes in prices or income. Also, the utility function itself may change over time. The utility function may be separable, allowing for decisions to be made for groups of related commodities and services. When generating demand functions from utility functions, the forms of the demand functions depend on the underlying utility function (Osho, 2001). The utility function summarizes some aspects of the consumer's taste or preferences regarding the consumption of various bundles of goods. The utility function has the following essential properties: More is always preferred to less (Osho & Uwakonye, 2004). All goods the consumer chooses to consume at positive prices have the property that, other things being equal, more of any good is preferred to less of it. That is, the marginal utility of any good x_i is positive or

$$U_i = \partial U_i / \partial x_i > 0. \quad (2)$$

At any point, the consumer is willing to give up some of one good to obtain an additional increment of another good. That is, the consumer's indifference curve has a negative slope. Diminishing marginal rate of substitution: All consumers possess a utility function $U = U(x_1,..., x_n)$ that is differentiable everywhere, strictly increasing $(U_i > 0, \ i = 1,..., n)$ and strictly quasi-concave. However, the variable specification of the demand functions generally remains the same. Assuming weak separability, a general utility function can be written as:

$$U = U[\Phi_1(x_{11},.., q_{k1}), \Phi_2(x_{12},..., x_{k2}),..., \Phi_n(x_{1n},.., x_{kn})] \quad (3)$$

which x_{ij} is the *i*th commodity or service in the *j*th group of such commodities or services. The Φ_j represent functional forms for branches of this utility function, which are unobservable due to the originality of utility. Hence, the very general specifications of the demand function can be obtained from equation (1) using the implicit function theorem and Roy's identity. The mathematics of the process yields the following specification for the *i*th commodities:

$$x_i = x_i^M(p_1, p_2,..., p_n, M) \qquad i = 1, 2,\ldots,n. \quad (4)$$

After substituting the Marshallian demand equations above into the original utility function, one obtains the indirect utility function:

$$U^*(p_1,..., p_n, M) \equiv U(x_1^M(p_1,..., p_{n,} M),..., x_{nn}^M(p_1,..., p_{n,} M)). \quad (5)$$

The function $U^*(p_1,..., p_n, M)$ gives the maximum utility value for any given price and money income, $p_1,..., p_n, M$ because it is precisely those quantities $x_1^*,..., x_n^*$ that maximize utility subject to the budget constraint that are substituted into it $U^*(x_1,..., x_n)$.

However, for empirical consumer demand studies, using a flexible form to approximate the consumer's (unknown) indirect utility function is increasingly common. Roy's identity is applied to the approximating form to obtain share equations for estimation, and the parameters of the share equations are used to calculate elasticities and test hypotheses such as separability or symmetry. The results are treated as those underlying the indirect utility function. The form of the group's utility function in equation (5) affects the form of the demand function in equation (4); the form is denoted by x_i. However, the variables included in the specification remain the same, regardless of the functional form. Without prior knowledge of the utility function, the functional form of demand equations is as much an empirical issue as prices and income parameters.

2. A Double Log Demand Model

Under these conditions, relatively flexible functional forms, such as the Cobb-Douglas function, are appropriate. A Cobb-Douglas function is denoted as:

$$q_i(p_1, p_2,..., p_n, y) = \exp(\beta_{0i})(p_1)^{\beta_{1i}}(p_2)^{\beta_{2i}}...(p_n)^{\beta_{ni}}(y)^{\eta_i} \quad (6)$$

By taking the logarithm of both sides of equation (6), the double log function is obtained:

$$\ln(q_i) = \beta_{0i} + \beta_{1i}\ln(p_1) + \beta_{2i}\ln(p_2) + ... + \beta_{ni}\ln(p_n) + \eta_i \ln(y). \quad (7)$$

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This double-log functional form assumes constant elasticities since they are defined as the relative change in consumption of a commodity for an infinitesimal change in expenditure or price. The total (unconditional) expenditure elasticity for the commodity within the *k*th commodity is given:

$$\eta_k = \frac{\partial \ln q_k}{\partial \ln y} \tag{8}$$

A price change in the commodity will directly affect the quantities purchased within the same commodity group. However, given unchanged group expenditure, the price change will also affect the group price index, allocating expenditures between groups. The latter effect will influence all commodities within and outside the same group (Osho & Uwakonye, 2003). Separability does not imply that price changes for commodities in different groups do not affect each other; instead, it means that such effects are channeled through the expenditures within each group. In addition, within-group price elasticity between the *i*th and *j*th commodity groups will be denoted as:

$$e_{ij} = \frac{\partial \ln q_i}{\partial \ln p_j} = \beta_{ij} \tag{9}$$

The following restrictions must hold for consistency with demand theory:

$$\sum_j \beta_{ij} + \eta_i = 0 \quad \text{(homogeneity)} \tag{10}$$

$$e_{ij} = e_{ji} \quad \text{(symmetry)} \tag{11}$$

$$\sum_i \beta_{ij} = 0 \quad \text{(adding up)} \tag{12}$$

Constraints (10), (11), and (12) ensure that the system satisfies the homogeneity, symmetry, and additivity restrictions, respectively. However, it is known that the demand function equation (6) cannot be rigorously deduced from the maximization of the classical utility function. If one or more variables differ from unity, the function cannot satisfy the budget relation in the whole range of the variables involved. However, despite this defect, many use the double-log demand function because of its superior fit, ease of estimation, and the ready interpretation afforded by the estimated parameters. Finally, since demand parameters are estimated from market variables, the double-log function approximates aggregated individual maximizing behavior.

Chen (1998) derives a set of linear and nonlinear restrictions for an n-goods linear, almost ideal demand system, which is symmetric when all prices vary. The consequences of imposing such restrictions on demand elasticities are illustrated using data on United States meat consumption. However, despite the limitations and other assumptions incorporated, their results do not provide a comprehensive picture of the effect of changing income on the demand for meat. It only shows a partial trend of demand changes when the data are strictly obtained and reanalyzed.

Burton et al. (1996) used family expenditure survey data from 1973 to 1993. A Box-Cox double-hurdle model was estimated to examine the participation and expenditure decisions regarding meat consumption, revealing changing preferences for meat in the United Kingdom. Particular attention was given to single-adult households. Key results indicate that employment class and adult gender significantly influenced the United Kingdom's meat purchasing behavior. Still, income affects both decisions in the opposite direction, while education affects expenditure directly. The effects of socioeconomic characteristics on meat demand decisions have varied quite markedly over this period, while some trends, particularly concerning the age and gender of the householder, are discernible.

Dono and Thompson (1994) used Lewbel's composite model to compare the AIDS and Translog demand systems in estimating Italian meat consumption data. Preliminary non-parametric diagnoses suggest that exogenous shifters of prices and expenditure need not be introduced into a parametric model. By contrast, the parametric analysis demonstrates that demographic shifters can account for substantial changes in meat consumption patterns. Although a parametric model without demographic variables performs adequately, likelihood ratio tests indicate that an AIDS model with demographic variables performs significantly better.

Burton (1994) demonstrated that it is possible to estimate the power of non-parametric demand analysis when applied to a specific dataset using the budget hyperplane and alternative definitions of irrational behavior. The study has two objectives: to determine the number of sampling draws required and to calculate the power statistic under four alternative irrationality models for five British meat and fish data sets used

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elsewhere for both parametric and nonparametric analysis. The mean and variance of the estimated power statistics indicate that at least 1,000 samples must be drawn if an accurate figure for power statistics is to be obtained. However, this is often larger than that used in earlier work. The estimated power statistics also highlight earlier empirical results obtained using the same data sets.

Eales and Unnevehr (1994) developed a demand system related to the Almost Ideal Demand System (AIDS) of Deaton and Muellbauer. The inverse almost ideal demand system (IAIDS) retains all of the desirable theoretical properties of the AIDS model except for consistent aggregation. An empirical issue is whether a linear approximation will work as well for the IAIDS as it has for the AIDS model, since quantities are not as highly correlated as prices. An application to the United States meat demand demonstrates that the linear approximation of the IAIDS is excellent, which enhances the ease and range of application. Alston and Chalfant (1993) noted that during the past decade, most agricultural economists have adopted the Linear Approximate Almost Ideal Demand Systems and the Rotterdam model as the demand systems of choice in most applications. The apparent explanation is that the two models are both (second-order) locally flexible and compatible with demand theory. They have identical data requirements and are equally parsimonious in their parameter choices. While the two models are similarly attractive in most respects and appear very similar in structure, they yield different results in specific applications. This involves testing each against the other. In an illustrative application to the United States' meat demand, the almost ideal demand model is rejected, while the Rotterdam model is not.

Sakong and Hayes (1993) elicited a test for preference stability that strengthens existing non-parametric procedures. The test uses indifference curve convexity to restrict compensated consumption bundles. Adding up, non-inferiority, and the Slutsky equation limit the range of the compensated consumption to be boundless. A proposed program simultaneously measures the changes in consumption quantities, satisfying the theoretical restrictions and the expenditure elasticities that minimize the required changes. The program is applied to consumption data and has been shown to detect small changes in preference. Eales (1996) used an inverse of AIDS to test the endogeneity of prices and quantities in the United States meat demand system. The inverse AIDS has all the desirable theoretical properties of AIDS except aggregation from the micro to the market level. Using annual data, prices and quantities appear endogenous within the meat market. Including livestock production costs and technical change indicators as instruments eliminates evidence of demand change in the 1970s.

3. The Almost Ideal Demand System

Through the pioneering efforts of economists such as H. Schultz and J.R.N. Stone, the theoretical works of Marshall, Slutsky, and Hicks have become falsifiable in the logical positivist sense, meaning that the propositions of the theory can be tested empirically and refuted. Recent advances in demand systems research support this observation, as economists continually develop new methods to test consumer theory. In this vein, one can trace the birth of demand systems analysis from Stone's 1958 work to the AIDS model of Deaton and Muellbauer (1980). Following the critical paper by Diewert (1971), several demand system estimation models, known as "flexible functional form", have been developed. The basic method involves approximating the direct utility function, indirect utility function, or cost function using a specific functional form. One of these approaches is Christensen et al.'s (1975) indirect translog model.

$$U = \alpha_0 + \sum \alpha_k \log\left(P_k / X\right) + \tfrac{1}{2} \sum_k \sum_j \beta_{kj} \log\left(P_k / X\right) \log\left(P_j / X\right), \tag{13}$$

where k, j are goods. The demand function from equation (13) is complicated and clumsy to estimate. In contrast, the direct translog model is usually estimated under the practically nonsensical assumption that, for all goods, prices are determined by quantities rather than the other way around.

In 1980, Deaton and Muellbauer proposed and estimated a new model called the Almost Ideal Demand System (AIDS). The AIDS model is now one of the most popular frameworks for estimating price and income elasticities when expenditure or budget data are available. Deaton and Muellbauer (1980) started not from an arbitrary preference ordering, but from a specific class of preferences, by which the theorems of Muellbauer (1975, 1976) permit exact aggregation over consumers: the representation of market demands as if they were the outcome of decisions by a rational representative consumer. They proposed that the cost or expenditure function, which defines the minimum expenditure necessary to attain a specific utility level, can be used to represent consumer preferences, known as the price-generalized logarithmic (PIGLOG) class,

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$$\log c(u,P) = (1-u)\log\{a(p)\} + \log\{b(P)\}. \quad (14)$$

With some exceptions, u lies between 0 (subsistence) and 1 (bliss) so that the positive linearly homogeneous functions $a(P)$ and $b(P)$ can be regarded as the costs of subsistence and bliss, respectively. Next, they take specific functional forms for log $a(P)$ and log $b(P)$

$$\log a(P) = \alpha_0 + \sum \alpha_k \log P_k + \tfrac{1}{2}\sum_k \sum_j \gamma_{kj}^{*} \log P_k \log P_j, \quad (15)$$

$$\log b(P) = \log a(P) + \beta_0 \prod_k P_k^{\beta_k}. \quad (16)$$

After the selection of a specific functional form, the cost function in the AIDS model can be written as

$$\log c(u,P) = \alpha_0 + \sum \alpha_k \log P_k + \tfrac{1}{2}\sum_k \sum_j \gamma_{kj}^{*} \log P_k \log P_j + \beta_0 \prod_k P_k^{\beta_k}. \quad (17)$$

The demand functions can be derived directly from equation (17). It is a fundamental property of the cost function that its price derivatives are the quantities demanded $\partial c(u,P)/\partial P_i = q_i$: Multiplying both sides by $P_i / c(u,P)$ we find:

$$\frac{\partial \log c(u,P)}{\partial \log P_i} = \frac{p_i q_i}{c(u,P)} = w_i, \quad (18)$$

Where w_i is the budget share of good i. Hence, the logarithmic differentiation of equation (17) gives the budget shares as a function of prices and utility,

$$w_i = \alpha_0 + \sum_j \gamma_{ij} \log P_j + \beta_i u \beta_0 \prod_k P_k^{\beta_k}, \quad (19)$$

where

$$\gamma_{ij} = \tfrac{1}{2}\left(\gamma_{ij}^{*} + \gamma_{ji}^{*}\right), \quad (20)$$

For a utility-maximizing consumer, total expenditure X equals $c(u, P)$. This equality can be inverted to give u as a function of P and X, the indirect utility function. Solving equations (17) and (19) and eliminating u, we obtain the budget shares as a function of P and X. These are AIDS demand functions in budget share form:

$$w_i = \alpha_i + \sum_j \gamma_{ij} \log P_j + \beta_i \log\{X/P\}, \quad (21)$$

Where w_i is the expenditure share of commodity i, P_j is the commodity price, X is the total expenditure of the selected goods, and P is the overall price index, which is defined by

$$\log P = \alpha_0 + \sum_k \alpha_k \log P_k + \tfrac{1}{2}\sum_k \sum_j \gamma_{kj} \log P_k \log P_j, \quad (22)$$

By taking three sets of restrictions on the parameters of the AIDS equation (19),

$$\sum_{i=1}^{n} \alpha_i = 1, \quad \sum_{i=1}^{n} \gamma_{ij} = 0, \quad \sum_{i=1}^{n} \beta_i = 0, \quad \sum \gamma_{ij} = 0, \quad \gamma_{ij} = \gamma_{ji}. \quad (23)$$

Equation (23) holds, and equation (21) represents a system of demand functions that add up to total expenditure, which is homogeneous with a degree zero in prices. Total expenditure is taken together, which satisfies Slutsky symmetry. When there is no change in relative prices, budget shares remain constant. Changes in relative prices take effect through γ_{ij}. Changes in expenditure operating through the coefficients, which are summed to zero and are positive for luxuries and negative for necessities (Deaton & Muellbauer, 1980). Deaton and Muellbauer (1980) summarized the following advantages of the AIDS model: It gives an arbitrary first-order approximation to any demand system

i. It satisfies the axioms of choice exactly
ii. It aggregates perfectly over consumers without invoking parallel linear Engel curves
iii. It has a functional form that is consistent with known household-budget data
iv. It is simple to estimate, mainly avoiding the need for non-linear estimation
v. It can test homogeneity and symmetry restrictions through linear restrictions on fixed parameters.

An essential feature of the AIDS model is that the expenditure levels can impact the distribution of shares. It has a flexible functional form, allowing for the testing of theoretical restrictions on demand equations. The AIDS model in share form for a group of n commodities can be written as

$$w_i = \alpha_i + \sum_j \gamma_{ij} \ln P_j + \beta_i \ln(X/P), \qquad i = 1, 2, \ldots, n \qquad (24)$$

Where w_i is market share, X is the total expenditure, $i = j$ is the number of products in the demand system, and P_j is the price of product j in the system. α_i, γ_{ij}, and are parameters. $\ln P$ is defined as:

$$\log P = \alpha_0 + \sum_k \alpha_k \ln P_k + \tfrac{1}{2} \sum_k \sum_j \gamma_{kj} \ln P_k \ln P_j. \qquad (25)$$

In practice, equation (24) is challenging to estimate due to its nonlinearity. A common alternative is to estimate a linear approximation version of the AIDS model. That is, instead of estimating the complete AIDS model in equation (24), its linear approximation is employed by replacing $\ln P$ with $\ln P^*$, where $\ln P^*$ is Stone's Index defined as:

$$\ln P = \sum_i w_i \ln P_i, \qquad i = 1, 2, \ldots, n. \qquad (26)$$

Therefore, (25) becomes:

$$w_i = \alpha_i + \sum_j \gamma_{ij} \ln P_j + \beta_i \ln\{X/P\}. \qquad (27)$$

Marshallian and Hicksian measures of elasticities may be computed from the estimated coefficients of the AIDS model as follows:

$$\varepsilon_{ii} = -1 + \gamma_{ij}/w_i - \beta_i, \qquad (28)$$

$$\varepsilon_{ij} = \gamma_{ij}/w_i - \beta_i (w_j/w_i), \qquad (29)$$

$$s_{ii} = -1 + \gamma_{ii}/w_i + w_i, \qquad (30)$$

$$s_{ij} = \gamma_{ij}/w_i + w_j, \qquad (31)$$

Where and s denote Marshallian and Hicksian elasticities, respectively. The expenditure elasticities can be obtained from the estimated coefficients as well:

$$\eta_i = 1 + \beta_i/w_i. \qquad (32)$$

4. Conclusion

This study highlights the strengths and limitations of two major demand system models: The Almost Ideal Demand System (AIDS) and the Double Log Demand Model in understanding consumer behavior, estimating demand elasticities, and informing economic policy. The AIDS model, developed by Deaton and Muellbauer, stands out for its theoretical rigor, flexibility, and empirical robustness. It satisfies key economic properties such as homogeneity, symmetry, and adding-up, allowing it to reflect realistic consumer decision-making within budget constraints. Moreover, the AIDS model accommodates demographic influences and provides a meaningful framework for aggregating individual behavior into market-level analysis, a feature often lacking in simpler models.

In contrast, while the Double Log Demand Model is widely used for its simplicity and ease of estimation, it falls short in deriving demand functions from utility maximization. Its constant elasticity assumption and limited theoretical structure make it less adaptable to complex economic environments where preferences, prices, and income vary over time (Osho & Nazemzadeh, 2005; Osho & Nazemzadeh, 2004). The implications of this comparison are substantial for economists, policymakers, and market analysts. By adopting the AIDS model, analysts can generate more accurate and theoretically consistent demand forecasts, especially when evaluating the effects of price and income changes or testing policy interventions. Additionally, the model's flexibility in integrating demographic and expenditure patterns makes it highly valuable in agriculture, food marketing, and public economics. Future research should continue refining the model's empirical applications, particularly in emerging economies where consumer data are evolving. Ultimately, the AIDS model represents a critical advancement in demand analysis, offering a powerful tool for academic research and policy formulation.

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References

Adegeye, A. (1988). *A statistical analysis of demand for beef in the Western State of Nigeria*. In *Readings in agricultural marketing*. University of Ibadan.

Alston, J. M., & Chalfant, J. A. (1993). The silence of the lambdas: A test of the Almost Ideal and Rotterdam model. *American Journal of Agricultural Economics, 75*(2), 304–313.

Burton, M. (1994). The power of non-parametric demand analysis when applied to British meat and fish consumption data. *European Review of Agricultural Economics*, *21*(1), 59–71.

Burton, M., Dorsett, R., & Trevor, Y. (1996). Changing preferences for meat: Evidence from UK household data, 1973–93. *European Review of Agricultural Economics, 23*(3), 357–370.

Chen, K. Z. (1998). The symmetric problem in the linear Almost Ideal Demand System. *Economics Letters, 59*(3), 309–315.

Christensen, L. R., Jorgenson, D. W., & Lau, L. J. (1975). Transcendental logarithmic utility functions. *American Economic Review*, *65*, 367–383.

Central Bank of Nigeria. (Various years). *Annual reports and statement of accounts*. Central Bank of Nigeria.

Deaton, A., & Muellbauer, J. (1980a). *Economics and consumer behavior*. Cambridge University Press.

Deaton, A., & Muellbauer, J. (1980b). An Almost Ideal Demand System. *American Economic Review*, *70*, 312–326.

Diewert, W. E. (1971). An application of the Shephard duality theorem: A generalized Leontief production function. *Journal of Political Economy*, *79*, 481–507.

Dono, G., & Thompson, G. (1994). Explaining changes in Italian consumption of meat: Parametric and non-parametric analysis. *European Review of Agricultural Economics, 21*(2), 175–198.

Eales, J. S. (1996). The Inverse Lewbel Demand System. *Journal of Agricultural and Resource Economics, 21*(2), 368–380.

Eales, J. S., & Unnevehr, L. J. (1994). The Inverse Almost Ideal Demand System. *European Economic Review, 38*(1), 101–115.

Hayes, D. J., Ahn, H., & Baumel, C. P. (1991). Meat demand in South Korea: A systems estimate and policy projections. *Agribusiness, 7*(5), 433–446.

Hayes, D. J., Wahl, T. I., & Williams, G. W. (1990). Testing restriction on a model of Japanese meat demand. *American Journal of Agricultural Economics*, *72*(3), 556–566.

Johnson, J. (1984). *Econometric methods*. McGraw-Hill.

Maddala, G. S. (1977). *Econometrics*. McGraw-Hill.

Mdafri, A., & Brorsen, B. W. (1993). Demand for red meat, poultry, and fish in Morocco: An Almost Ideal Demand System. *American Journal of Agricultural Economics, 75*(December issue), 155–163.*

Muellbauer, J. (1975). Identification and consumer unit scales. *Econometrica, 43*(4), 807–809.

Muellbauer, J. (1976). Community preference and the representative consumer. *Econometrica, 44*(5), 979–999.

Osho, G. S., & Uwakonye, M. (2003). The impact of price changes and trends on meat demand in Nigeria. *International Business & Economics Research Journal*, *2*(12).

Osho, G. S. (2001). *Essays on total evaluation of Colombia wheat import demand, forecast evaluation of the United States total wheat trade in Colombia, and the impact of price changes and trends on demand for meat in Nigeria* (Doctoral dissertation, Oklahoma State University).

Solomon, O. G., & Nazemzadeh, A. (2004). Consumerism: Statistical estimation of Nigeria's meat demand. In *Allied Academies International Conference: Academy for Studies in International Business. Proceedings* (Vol. 4, No. 1, p. 47). Jordan Whitney Enterprises.

Osho, G., & Nazemzadeh, A. (2005). Consumerism: Statistical estimation of Nigeria's meat demand. *Journal of International Business Research*, *4*(1), 69–79.

Osho, G. S., & Nazemzadeh, A. (2005). Colombia wheat import demand: An Almost Ideal Demand System. *National Social Science Journal*, *25*(1), 160–176.

Osho, G., & Uwakonye, M. (2004). United States total wheat trade in Colombia: An economic perspective. *International Journal of Business and Public Administration*, *1*(1), 55–66.

Osho, G. S., & Nazemzadeh, A. (2003). Demand trends and seasonality in Colombia wheat import market: An econometric analysis. *Southwest Business & Economics Journal*, *12*, 37–53.

Pollak, R. A., & Wales, T. J. (1981). Demographic variables in demand analysis. *Econometrica, 49*, 1533–1558.

Sakong, Y., & Hayes, J. D. (1993). Testing the stability of preferences: A non-parametric approach. *American Journal of Agricultural Economics*, *75*(2), 269–277.

Studenmund, A. H., & Cassidy, H. J. (1992). *Using econometrics: A practical guide*. HarperCollins.

Tambi, E. (1991). *Price elasticities of demand for beef, poultry, and fish in Bamenda, North-West Province*. Institute of Animal Research, Bambui.

Zellner, A. (1962). An efficient method of estimating seemingly unrelated regressions and tests for aggregation bias. *Journal of the American Statistical Association*, *57*, 348–368.

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