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An economic study of the most important variables affecting consumption of poultry white meat in Egypt

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ABSTRACT

The primary aim of this study was to investigate the most important variables affecting the consumption of poultry white meat (PWM), as well as assessing the current situation of the production capacity of PWM in Egypt. In addition, descriptive statistics was performed for the most important variables affecting the consumption of PWM in Egypt. Besides, the most important variables influencing the consumption of PWM were determined using factor analysis model in the form of Double logarithmic regression during the period of 2000-2020. To achieve the objectives of the study, descriptive and quantitative analysis methods were used, represented by using some of multiple statistical methods and models to estimate the linear regression in double logarithmic form and the factor analysis of the most important variables influencing the consumption of PWM in Egypt. According to the results, the value of white meat amounted about 22.47 billion LE (£L = Egyptian pound) annually, representing 8.86% of the value of agricultural production during 2000-2020. Also, the results showed a significant relationship between exchange rate, per capita PWM, population, time, consumer price of municipal poultry meat and consumption of PWM in Egypt, where a change by 1% in the exchange rate and per capita PWM, population, time and consumer price of municipal poultry meat leads to an increase in the consumption of PWM by about 0.056 thousand tons, which is an inverse relationship consistent with the economic logic in association with the exchange rate variable, as well as an elevated consumption of PWM with about 0.817, 2.396 and 0.045 thousand tons, which is a direct relationship consistent with the economic logic with respect to the per capita variables of PWM, population and time, respectively, as well as the decrease in consumption of PWM by about 0.205 thousand tons, which is an inverse relationship consistent with the economic logic in relation to the consumer price variable for municipal poultry meat (according to the consumer's taste as well).

Keywords: Poultry white meat, Price, Consumption, Factor analysis, Stepwise wise regression.
Article type: Research Article.

INTRODUCTION

The poultry industry in Egypt represents an important pillar and a basic and important supporter of food security to provide protein at suitable prices to consumers. Poultry farming is an industry for large and small breeders and investors (Hussein Hnoosh 2021; Murtadha & Hammod 2022). Moreover, self-sufficiency was achieved by more than 97% as a result of the increased local production, as well as the expansion of new poultry investment projects, manufacturing and storage areas, either by refrigeration or freezing. The value of white meat was amounted to about 22.47 billion LE annually, and about 8.86% of the value of agricultural production during the period 2000-2020. It is also an indicator of economic and social development. In addition, the per capita share of white meat was estimated about 21.5 kg annually. It must be referred to this industry absorbs over 2.5 million workers, which led to an interest in studying what are the factors affecting the consumption of white meat in Egypt. The research problem is that although there is stability in the self-sufficiency of PWM, which is about 97%, there are significant

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losses for poultry breeders due to the high cost of feed, medicines, and labor, which led to a rise in poultry prices, which threatens stability in self-sufficiency and forces many small poultry farmers to leave this industry. As a result of losses and their inability to start a new cycle, especially since most of them work on the loan system, it requires attention to study the most important variables affecting the consumption of PWM in Egypt. The main objective of the study is to assess and measure the most important variables affecting the consumption of PWM in Egypt. To achieve this, the following sub-objectives were studied:

1. Identifying the current situation of PMP (PMP) in Egypt during the period of 2000-2020.
2. Identifying descriptive statistics for the most important variables used in the factor analysis model for PWM in Egypt during the period of 2000-2020.
3. Using factor analysis model of PWM in Egypt.
4. Measuring the most important variables influencing the consumption of PWM in Egypt.

MATERIALS AND METHODS

To achieve the objectives of the study, the descriptive and quantitative analysis methods were used, represented by using some multiple statistical methods and models to estimate the linear regression in double logarithmic form and the factor analysis model of the most important variables affecting consumption of PWM in Egypt during the period of 2000-2020. Factor analysis is a statistical method which aimed to interpret the coefficients of positive correlations, where statistical significance is established between various variables. In other words, factor analysis is a mathematical process that aims to simplify the correlations between the various variables included in the analysis, leading to the common factors that describe the relationship between these variables. Thus, factor analysis is a statistical method for analyzing multiple data that are linked to each other with different degrees of summary correlation in the form of independent classifications based on qualitative bases for classification, and these classification bases are examined according to both of the economic theory and the scientific logic. Where Solomon Diamond defines the objectives of factor analysis as forming and testing hypotheses, and determining the smallest number of specific factors that can explain the relationships between a large number of real phenomena and to what extent each of these factors affects each variable? He also explained that the function of factor analysis is to reduce the components of correlation tables to the lowest number possible to facilitate their interpretation. Eyzanck (1953) also showed that factor analysis has three basic objectives that must be achieved, which are describing variables, proving hypotheses, and proposing hypotheses from the initial data. Three points of view are linked to these goals, which are the nature of factors, the identification of those factors and the rotation, which are the same goals for any branch of statistics. Factor analysis tools include the following: methods of factor analysis, the problem of determining the number of factors, rotation of the axes, the definition of factors, factors rank, reproducibility of factors, and methods of analysis. In addition, the correlation matrix was analyzed by Principles' of Hotelling Method (1929) Component. Moreover, Kaiser's Orthogonal Rotation was also conducted, and the researchers chose the following conditions for accepting the factor as following: the latent root be equal to one because this degree is the most common, and at a statistical probability level of 0.05. The model depends on building structural equations that solve simultaneously using time series and ordinary least squares OLS with one, two or three stages.

Thus The multiple model depends on the following structural equation:

$$Y_t = \beta_0 + B_1X_{1t} + B_2X_{2t} + B_3X_{3t} + B_4X_{4t} + B_5X_{5t} + B_6X_{6t} + B_7X_{7t} + B_8X_{8t} + B_9X_{9t} + B_{10}X_{10t} + B_{11}X_{11t}$$

where β0 = constant term, t = time (trend factor), the dependent variable (Yt) was represented in consumption of PWM, while the independent variables were represented in (X_1) consumer price of PWM, (X_2) per capita PWM, (X_3) consumer price of municipal poultry meat, (X_4) consumer price of red meat, (X_5) Consumer price of fish, (X_6) exchange rate, (X_7) population, (X_8) national income, (X_9) import price of frozen white meat, (X_{10}) import price of frozen red meat, and (X_{11}) time. In addition, The research used many published and unpublished data issued by the Economic Affairs Sector, the Ministry of Agriculture and Land Reclamation through the use of various preparations for the Bulletin of Agricultural Statistics for Poultry wealth and the publication of the food balance, as well as the publication of prices of materials, food products and services for the Central Agency for Public Mobilization and Statistics, in addition to the assistance of some research, published in scientific journals and academic letters related to the topic of the study.

RESULTS AND DISCUSSION

This section of study includes results and discussion according to research objectives as follows:

Results regarding the First objective, which provides for identifying the current situation of poultry meat production (PMP) in Egypt during the period of 2000-2020.

Tables 1 and 2 which display summary statistics for poultry meat, are considered as one of the most important food commodities, since the average production value for poultry meat amounted to about 22.47 billion LE or about 8.86% of the value of agricultural production during 2000-2020, and it is also an indicator of economic and social developments. The animal production sector in general and the production of poultry meat in Egypt in particular have an important place. Thus this part of the research aimed to identify the current situation of PMP in Egypt during 2000-2020 by studying several points represented in evolution of the value of each Agriculture production, poultry meat and chicken meat production, and finally evolution of production and consumption of chicken meat in Egypt.

Development of the value of national agricultural production

Table 1 indicates that the average value of agricultural production during 2000-2020 was estimated at 253 billion L.E., and by studying the evolution of the value of national agricultural production. It was found that this average reached its maximum value in 2020 (about 596 billion L.E.), while the lowest value at the beginning of the study period was about 71.7 billion L.E.

Development of the value of PMP

Table1 shows that the average value of poultry meat amounted to 22.5 billion LE during 2000-2020, and it was found that this average lies between the lowest and highest value, which amounted to 3.5 billion LE in 2000 and 67 billion LE in 2020.

Table 1. Relative importance of total value of poultry meat production (PMP) in Egypt during 2000-2020.

years	Agri. Pro million LE	Total poultry meat million LE	%	Total chicken million LE	Rate (%)	Rabbits million LE	Ducks million LE	Geese million LE	Pigeons (pair) million LE	Turkey million LE
2000	71664	3477	4.85	2398	68.98	261.3	309	88.19	387.9	32.06
2001	74740	4458	5.96	3284	73.67	284.7	318	94.50	432.8	43.36
2002	84260	6266	7.44	4617	73.68	634.0	368	103.27	485.0	59.18
2003	96853	6404	6.61	4862	75.92	378.0	419	115.98	576.9	51.51
2004	111835	7588	6.78	5583	73.58	483.2	491	154.60	809.1	66.64
2005	126971	7748	6.10	5415	69.89	524.8	599	180.25	926.7	102.18
2006	137419	7182	5.23	4602	64.08	649.2	726	203.98	932.2	69.03
2007	155945	8404	5.39	5590	66.52	747.0	747	218.76	1024.9	76.34
2008	185666	10371	5.59	6713	64.72	825.3	1105	317.65	1279.2	131.61
2009	189438	11106	5.86	7269	65.45	825.6	1116	319.25	1436.3	14.02
2010	209354	13067	6.24	8613	65.91	903.0	1250	362.24	1789.6	149.67
2011	249989	14842	5.94	9873	66.52	1060.8	1287	451.97	1982.2	186.75
2012	267424	16508	6.17	10891	65.98	1226.4	1455	461.59	2257.3	216.73
2013	282434	21793	7.72	1512	6.94	1522.1	1645	523.60	2729.4	256.50
2014	305414	24786	8.12	17191	69.36	1610.1	1838	578.46	3242.0	327.07
2015	318332	27026	8.49	18805	69.58	1681.0	1951	613.12	3525.1	450.54
2016	356958	30185	8.46	20808	68.94	2097.7	2515	643.92	3538.4	581.24
2017	469202	36474	7.77	25207	69.11	2297.4	2873	9871.73	4424.1	800.66
2018	500413	46814	9.36	34252	73.17	2552.7	3056	1023.34	5149.8	780.33
2019	534244	55983	10.48	48181	86.06	443.3	2711	677.74	2925.0	1044.78
2020	595666	67112	11.27	60423	90.03	273.5	2132	698.01	2226.0	1359.37
Average	253534	22474	8.86	14576	64.86	1013.4	1377	842.96	2003.8	323.79

Source: MALR, Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, Central Administration of Agricultural Economy, Bulletin of Poultry Wealth Preparation, Food Balance Bulletin, Cairo, various issues.

Development of the value of chicken meat production

In addition, the data in the same table also indicate that the average value of chicken meat amounted to about 14.6 billion LE during 2000-2020, and this average lies between the lowest and highest limits, which amounted to about 2.4 billion LE in 2000 reached 60.4 billion LE in 2020. Furthermore, the value of chicken meat represents about 64.86% of the value of PMP.

The development of production and consumption of chicken meat in Egypt

Table 2 shows that the average production of chicken meat in Egypt during 2000-2020 was estimated by 954 thousand tons. The amount of meat produced in Egypt apparently has been steadily increasing from about 548 thousand tons in 2000 to about 2033 in 2020. It appears that the average domestic consumption is estimated by 974.95 thousand tons during 2000-2020. The lowest value of consumption in 2000 was about 548 thousand tons, while it reached its maximum in 2020 by about 1951 thousand tons. As a result of fluctuation in both production and consumption of chicken meat, the self-sufficiency ratio reached the lowest in 2014 by about 91%, while reached its highest in 2002 by about 104%. Moreover, it appears that the average population is estimated by 80 million people during 2000-2020. It was minimum in 2000 with about 63 million people, while reached its maximum in 2020 with about 102 million people. As for the average per capita of chicken meat, it varied between 7.36 kg in 2000 as a minimum and about 13.12 kg in 2020 as a maximum, with average estimated about 8.85 kg during 2000-2020.

Results regarding the second objective, which provides for identifying the descriptive statistics for the most important variables used in the factor analysis model for PWM in Egypt during the period of 2000-2020

Table 3 shows the descriptive statistics of the variables that used in the factor analysis model for PWM in Egypt during the period of 2000-2020, which the dependent variable was represented in consumption of PWM and the independent variables were represented in consumer price of PWM, PWM consuming per capita, the consumer prices of municipal poultry meat, red meat and tilapia, exchange rate, population, national income, import price of frozen white meat and frozen red meat, and time. Once the average consumption of chicken was about 974.95, and its maximum value was 1951 thousand tons, its minimum value was 548 thousand tons (± SD = standard deviation = 367.86). In addition, the average price of chicken was 16.98 LE kg^{-1}, with a maximum of about 32.92 LE kg^{-1} and a minimum of 5.12 LE kg^{-1}, with a standard deviation 9.64. Furthermore, the average per capita share of poultry meat was 8.7 kg $year^{-1}$ and its maximum value was 13.3 kg year-1, while its minimum value was 5.5 kg $year^{-1}$, (± SD = 2.21). Moreover, the average price of municipal chicken was 19.87 LE kg^{-1}, with a maximum of about 40.8 LE kg^{-1} and its minimum was 6.84 LE kg-1 (± SD = 11.81).

Besides the average price of red meat was about 62.43 pounds kg^{-1}, with a maximum of 146.76 LE kg^{-1} and a minimum of 16.37 LE kg^{-1} (± SD = 46.44). The average price of tilapia was estimated at 16.35 LE kg^{-1}, while its maximum was 32.95 LE kg^{-1} and a minimum at 6.98 LE kg^{-1}, (± SD = 9.34) and a minimum of 3.48 LE kg^{-1} (± SD = 4.68). Equally important, the average population was 80.38 million people, its maximum was 102 and a minimum of 63.98 (± SD = 11.58). Also, the average national income amounted to 2.21 billion LE, with a maximum of 8.14 billion LE, and a minimum of 0.32 billion LE (± SD = 2.4). Moreover, the average import price of frozen chicken was 24 LE kg^{-1}, with a maximum of 78.27 LE kg^{-1} and a minimum of 7.24 LE kg^{-1} (± SD = 20). In addition, the average of import price of frozen red meat was estimated at 31.76 LE kg^{-1}, while its maximum was 79.28 LE $kg^{-1}$and its minimum 5.56 LE kg^{-1} (± SD 25.82). It becomes clear that from Jargue-Bera value, that both of the available consumption of chicken meat, the exchange rate, and the import price of frozen chicken were follow a normal distribution. Furthermore, the value of the standard deviation indicates that the available consumption of chicken meat is the most volatile, while the per capita consumption of chicken meat is the least volatile (Table 3).

Results regarding the third objective, which provides for using factor analysis model of PWM in Egypt

Correlation Matrix

Table 4 shows the coefficients of correlation matrix between the variables, which is the first step to examine the relationships between them in the factor analysis, where the relationship between the variables is more than 0.30, which indicates the possibility of using the main components method in the analysis. We also found that the majority of the values are significant at 0.05.

Table 2. Some productive and economic variables for chicken meat in Egypt during 2000-2020.

Year	Production	Consumption	Gap	Self- sufficiency %	Pure food	Population	Per capita
			Thousand ton			million	Kg
2000	548	548	0	100	466	63	7/36
2001	734	731	3	100	621	65	9/61
2002	989	986	3	100	838	66	12/70
2003	899	898	1	100	763	67	11/34
2004	828	828	0	100	704	69	10/26
2005	845	843	2	100	632	70	9/03
2006	608	618	(10)	98	433	71	6/07
2007	705	707	(2)	100	495	73	6/79
2008	629	588	41	107	412	74	5/53
2009	671	691	(20)	97	484	76	6/36
2010	744	770	(26)	97	539	78	6/92
2011	830	830	0	100	851	80	7/30
2012	822	857	(35)	96	600	82	7/36
2013	953	1003	(50)	95	702	84	8/39
2014	1035	1070	(35)	97	734	86	8/56
2015	1028	1119	(91)	92	768	89	8/63
2016	1007	1093	(86)	92	750	91	8/24
2017	1044	1142	(98)	91	783	95	8/24
2018	1325	1371	(46)	97	941	97	9/70
2019	1759	1830	(71)	96	1255	99	12/68
2020	2033	1951	82	104	1338	102	13/12
Average	1954/10	974/95	(21)	97/86	706/62	80	8/85

Note. ( ) refer to negative values; Source: MALR, Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, Central Administration of Agricultural Economy, Food Balance Bulletin, Cairo, various issues.

Table 3. Descriptive statistics of the important variables that used in the model during 2000-2020.

	Y	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10
Mean	974.95	16.98	8.70	19.87	62.43	16.35	8.11	80.38	2.21	24.04	31.76
Max.	1951.00	32.9	13.3	40.80	146.76	32.95	17.87	100.6	8.14	78.27	79.28
Min	548.00	5.12	5.50	6.84	16.37	6.98	3.48	63.98	0.32	7.24	5.56
Std. Dev.	367.86	9.64	2.21	11.81	46.44	9.34	4.68	11.58	2.40	20.10	25.82
Jarque-Bera	8.85	2.19	1.69	2.09	2.84	2.54	6.13	1.51	5.36	5.94	2.96
Observations.	21	21	21	21	21	21	21	21	21	21	21

Source: Results of the statistical analysis of SPSS program.

Table 4. Correlation matrix of the most important variables that affecting on consumption of PWM in Egypt during the period 2000-2020.

		X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}
Correlation	X_1	1.000	0.129	0.986	0.974	0.972	0.819	0.968	0.954	0.947	0.975	0.899
	X_2	0.129	1.000	0.162	0.193	0.262	0.418	0.242	0.298	0.329	0.143	0.023
	X_3	0.986	0.162	1.000	0.991	0.984	0.860	0.990	0.979	0.966	0.986	0.906
	X_4	0.974	0.193	0.991	1.000	0.983	0.897	0.996	0.984	0.974	0.992	0.904
	X_5	0.972	0.262	0.984	0.983	10.000	0.883	0.983	0.988	0.979	0.965	0.859
	X_6	0.819	0.418	0.860	0.897	0.883	10.000	0.903	0.910	0.880	0.876	0.770
	X_7	0.968	0.242	0.990	0.996	0.983	0.903	10.000	0.990	0.974	0.983	0.907
	X_8	0.954	0.298	0.979	0.984	0.988	0.910	0.990	10.000	0.976	0.964	0.861
	X_9	0.947	0.329	0.966	0.974	0.979	0.880	0.974	0.976	10.000	0.958	0.832
	X_{10}	0.975	0.143	0.986	0.992	0.965	0.876	0.983	0.964	0.958	10.000	0.915
	X_{11}	0.899	0.023	0.906	0.904	0.859	0.770	0.907	0.861	0.832	0.915	10.000
Sig. (1-tailed)	X_1		0.288	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	X_2	0.288		0.241	0.201	0.126	0.030	0.146	0.095	0.073	0.268	0.461
	X_3	0.000	0.241		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	X_4	0.000	0.201	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000
	X_5	0.000	0.126	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000
	X_6	0.000	0.030	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
	X_7	0.000	0.146	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000
	X_8	0.000	0.095	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000
	X_9	0.000	0.073	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000
	X^{10}	0.000	0.268	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000
	X_{11}	0.000	0.461	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

Source: Results of the statistical analysis of SPSS program.

Bartlett's Test

Bartlett's test is used to test whether the original correlation matrix is a unit matrix or not. If this matrix is not a unit matrix, this indicates that there are relationships between the variables, and this is what is required when using the main components method. Table 5 indicates that the value of Bartlett's test equals 552.079, which indicates that the test is statistically significant at 0.01. Therefore, we conclude that the original correlation matrix is of the unit matrix type. We also noticed from the table that the value of Kaiser-Meyer-Olkin (KMO 1974) is equal to 0.875, as its statistical significance. Therefore, it is acceptable, since the minimum value for KMO is 0.60 and this means that the measurement is good, and that the factor analysis has reduced the factors with high quality.

Table 5. KMO and Bartlett's Tests.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		**0.875**
Bartlett's Test	Approx. Chi-Square	552.079
	df	55
	Sig.	0.000

Source: Results of the statistical analysis of SPSS program.

Communalities

Table 6 shows the amount of communalities for the variables that represent the percentage of variance that is explained by the extracted factors for these variables. If the amount of communalities is high, this indicates that the extracted factors explain a high percentage of the variance of the variables (Table 6). Thus, the extracted factors explain a high percentage of the variance of the variables.

Determining the main components of the model using Kaiser and Cattell test

Kaiser test was used to determine the factors whose distinct roots exceed than correct one. Table 7 depicts the total variance explained, which the first factor has distinct roots more than the correct one, and it explains about 86.507% of the total variance, as well as the use of Cattell's test for the selection of factors using the Scree Plot. Fig. 1 showed that the diffusion pattern is clearly refracted after the first factor, that is, between the first and second factors, changing its direction to the horizontal, and from this it becomes clear that the first factor explains most of the variance in comparison with the rest of the factors and this factor can be adopted according to Cattell's view, who agreed with Kaiser view.

Table 6. Distinctive roots of principal components and additive variance after rotation Communalities.

variables	Initial	Extraction
X_1	1.000	.966
X_2	1.000	.983
X_3	1.000	.990
X_4	1.000	.996
X_5	1.000	.977
X_6	1.000	.880
X_7	1.000	.995
X_8	1.000	.984
X_9	1.000	.966
X_{10}	1.000	.985
X_{11}	1.000	.878

Note: Extraction Method: Principal Component Analysis; Source: Results of the statistical analysis of SPSS program.

Table 7. Total variance explained.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative (%)	Total	% of Variance	Cumulative (%)	Total
1	9.516	86.507	86.507	9.516	86.507	86.507	9.506
2	1.085	9.863	96.370	1.085	9.863	96.370	1.860
3	0. 170	1.545	97.915				
4	0. 140	1.276	99.191				
5	0. 031	0. 278	99.469				
6	0. 028	0. 257	99.726				
7	0. 015	0. 138	99.864				
8	0. 006	0. 056	99.920				
9	0. 005	0. 043	99.963				
10	0. 003	0. 029	99.992				
11	0. 001	0. 008	100.000				

Note. Extraction Method: Principal Component Analysis. a. When components are correlated, sums of squared loadings can not be added to obtain a total variance. Source: Results of the statistical analysis of SPSS program.

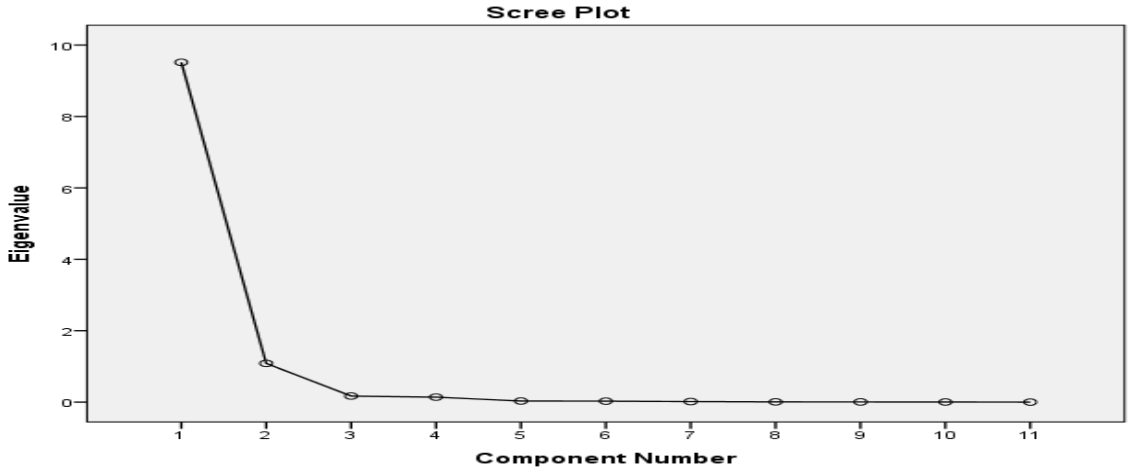

Fig. 1. The Scree Plot; Source: Results of the statistical analysis of SPSS program.

The degree of saturation of the factors

Table 8 depicts the degree of saturation belonging to the first factor. Thus it has strong relationships with ten out of eleven variables, which can be called the basic and alternative factors that affect the consumption of white

poultry meat. It becomes clear that population variable has the highest saturation by 0.997, then consumer price of red meat, consumer price of municipal chicken meat, consumer price of fish, national income, import price for frozen red meat, import price for frozen white chicken meat, consumer price of PWM, exchange rate, time, with a degree of saturation amounted to 0.996, 0.991, 0.990, 0.988, 0.987, 0.979, 0.974, 0.910, 0.905, respectively. This is logical with the current situation. In addition, Table 8 illustrates that the second factor has strong relationships with only one variable, which is the per capita share of white chicken meat with a saturation by about 0.959.

Table 8. Rotated Component Matrix.

Variables	Component	
	1	2
X_7	0.997	
X_4	0.996	
X_3	0.991	
X_8	0.990	
X_5	0.988	
X_{10}	0.987	
X_9	0.979	
X_1	0.974	
X_6	0.910	
X_{11}	0.905	
X_2		0.959

Note: Extraction Method: Principal Component Analysis; a. 2 components extracted; Source: Results of the statistical analysis of SPSS program.

Results regarding the fourth and the last objective, which provides for measuring the most important variables affecting the consumption of PWM in Egypt.

Table 9 shows the most important variables that entered into the regression equation between consumption for PWM, Whoever the per capita share of PWM, X_2.

Table 9. The most important variables affecting the consumption of PWM in Egypt after excluding other variables.

Model	Variables Entered	Variables Removed	Method
1	X_6	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
2	X_2	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
3	X_7	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
4	.	X_6	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
5	X_{11}	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
6	X_3	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
7	X_6	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

Source: Results of the statistical analysis of SPSS program.

Consumer price of municipal poultry meat X_3, exchange rate X_6, population X_7, time X_{11} and the method of exclusion is done by excluding the variables that are larger than 0.100. In addition, variables with a probability value of F test is less than 0.05. Table 10, estimates the consumption function of PWM in the double logarithmic form, and the model was formulated in the following mathematical form:

$\log Y = \text{Log } a + B_2 \text{ Log } X_2 + B_3 \text{ Log } X_3 + B_6 \text{ Log } X_6 + B_7 \text{ Log } X_7 + B_{11} \text{ Log } X_{11}$

where:

Y= consumption for PWM (thousand ton^{-1})

X_2 = per capita share of PWM (kg $year^{-1}$).

X_3 = consumer price of municipal poultry meat (LE kg^{-1}).

X_6= exchange rate (LE/$), X_7 = population (thousand people), X_{11} = time.

Table 10. Values of the double logarithmic regression coefficients for the most important variables affecting consumption of PWM in Egypt.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Durbin-Watson		2.230
		B	Std. Error	Beta			R Square	F	Sig.
1	(Constant)	2.464	0.074		33.249	0.000	0.717	48.193	0.000
	X_6	0.585	0.084	0.847	6.942	0.000			
2	(Constant)	1.973	0.088		22.394	0.000	0.913	94.195	0.000
	X_6	0.445	0.053	0.643	8.394	0.000			
	X_2	.660	0.104	0.487	6.353	0.000			
3	(Constant)	-5.871-	0.524		-11.199-	0.000	0.994	916.775	0.000
	X_6	-0.029-	0.035	-0.042-	-.837-	0.414			
	X_2	0.817	0.030	0.603	27.020	0.000			
	X_7	1.653	0.110	0.705	14.978	0.000			
4	(Constant)	-5.473-	0.219		-25.043-	0.000	0.994	1398.054	0.000
	X_2	0.805	0.026	0.594	30.587	0.000			
	X_7	1.569	0.046	0.670	34.469	0.000			
5	(Constant)	-4.059-	0.459		-8.850-	0.000	0.996	1459.806	0.000
	X_2	0.844	0.024	0.623	35.115	0.000			
	X_7	1.263	0.099	0.539	12.773	0.000			
	X_{11}	0.056	0.017	0.137	3.335	0.004			
6	(Constant)	-7.285-	1.370		-5.317-	0.000	0.996	1422.665	0.000
	X_2	0.808	0.026	0.596	31.522	0.000			
	X_7	1.966	0.299	0.839	6.586	0.000			
	X_{11}	0.049	0.015	0.120	3.277	0.005			
	X_3	-.150-	0.061	-0.282-	-2.463-	0.025			
7	(Constant)	-9.280-	1.450		-6.399-	0.000	0.998	1491.432	0.000
	X_6	-0.056-	0.023	-0.081-	-2.439-	0.028			
	X_2	0.817	0.023	0.603	35.985	0.000			
	X_7	2.396	0.315	1.022	7.611	0.000			
	X_{11}	0.045	0.013	0.109	3.390	0.004			
	X_3	-0.205-	0.058	-0.385-	-3.546-	0.003			

Source: Results of the statistical analysis of SPSS program.

By estimating the model using the Step-Wise Regression analysis method in the double logarithmic form during the period of 2000-2020, equation 1 appears the significant effect of the exchange rate on the consumption of PWM in Egypt, where the results showed that a change of 1% in the price of the exchange leads to an increase in the consumption of PWM by about 0.585 thousand tons, which is inconsistent with the economic logic. In addition, F value indicates the statistical significance at 1%. Moreover, By studying equation 2, we can find the significant effect of the exchange rate and the per capita share of PWM on the consumption of PWM in Egypt, where the results showed that a change of 1% in the exchange rate and per capita share of PWM lead to an increase in the consumption of PWM by 0.445 and 0.660 thousand tons, respectively. In addition, the value of the coefficient of determination (R^2) indicates that about 91.3% of the changes that occur in the availability of consumption PWM are due to factors which reflect in the exchange rate and the per capita share of PWM. F value indicates the statistical significance of the model.

Equation 3 exhibits the significant relationship of exchange rate, per capita share of PWM, and the population on the consumption of PWM in Egypt. The results showed that a change of 1% in the exchange rate leads to an increase in the consumption of PWM by about 0.029 thousand tons, which exhibits an inverse relationship and is consistent with the economic logic, as well as an increase in the consumption of PWM by about 0.817and 1.653 thousand tons per capita of PWM and the number of the population, respectively. R^2 value refers 99.4% of the changes that occur in the availability for consumption of PWM, are due to exchange rate factor, the per capita share of PWM and the population.

In addition, F value indicates the statistical significance of the model. Moreover, equation 4 shows the significant effect of the per capita share of PWM, population on the consumption of PWM in Egypt by about 0.805 and 1.569 thousand tons, respectively. The direct relationship is consistent with the economic logic. R_2 indicates that

about 99.4% of the changes that occur in the availability for consumption of PWM are reflects by the per capita factor of meat white poultry and population. F value indicates the statistical significance of the model. Equation 5 illustrates that there is a significant effect of per capita share of PWM, population, and time on the consumption of PWM in Egypt at level of 5%.

Alteration of 1% in the per capita share of PWM, population, and time leads to increasing in the consumption of PWM by about 0.844, 1.263 and 0.056 thousand tons, respectively which is consistent with the economic logic. Determination factor (R^2) indicates that about 99.6% of the changes that occur in the availability for consumption of PWM are due to per capita poultry white meat, the number of population and time. F value indicates the significance of the model at level of 5%. Equation 6 shows the significant effect of per capita share of PWM, population, time, consumer price of municipal poultry meat on the consumption of PWM in Egypt, where the results showed that a change of 1% in the per capita share of PWM and the population and time leads to an increase in the consumption of PWM by about 0.808, 1.966 and 0.049 thousand tons, respectively and consistent with the economic logic.

In addition, a change by 1% in consumer price of municipal poultry meat leads to decrease in the consumption of PWM by about 0.150 thousand tons, which is an inverse relationship consistent with the economic logic. Determination factor (R^2) indicates that about 99.7% of the changes that occur in the available consumption of PWM are due to selected factors. F value indicates significance of the model. Equation 7 exhibited the significant relationship of coefficients. It is considered as the best equation, since it includes a large number of the most important variables affecting consumption of PWM. Furthermore, it is consistent with the economic logic.

The results showed that a change of 1% in exchange rate and consumer price of municipal poultry meat, lead to decrease in consumption of PWM by about 0.056 and 0.205 thousand tons, respectively, with an inverse relationship. It is consistent with economic logic, as well as a change of 1% in a per capita share of PWM, population, time lead to increase in consumption of PWM by about 0.817, 2.396 and 0.045 thousand tons, respectively. Thus there is a direct relationship between them and is consistent with economic logic. In addition, determination factor (R^2) indicates that about 99.8% of the changes that occur in the available consumption of PWM are due to the previous factors. F value indicates the statistical significance of the model at 1% level.

CONCLUSION

Depending on the results, there are some recommendations for decision-makers illustrated in providing production requirements for the local poultry industry, especially corn, as it is an essential component of poultry nutrition, through horizontal agricultural expansion for feed production and establishing farms for poultry production. Beside, giving farmers appropriate price to encourage them to cultivate important feed crops. In addition, providing accurate data of poultry industry for researchers to put suitable alternatives to make PWM available to consumers at an appropriate price.

REFERENCES

Al-Shuwaikh, DH & Radwan, HM 2021, Determining factors for the demand for white meat in Egypt. The Scientific Journal of Agricultural Sciences, Beni Suef University, 3: 2.

Bob, EA & El-Amin, EA 2013, "Measuring the impact of economic variables on trade exchange in Sudan", El-Nilein University.

Eysenck, HJ 1953, The scientific study of personality. *British Journal of Statistical Psychology*, 6: 44-52.

Hussein Hnoosh, LJ 2021, The level of knowledge of poultry fields workers in Najaf Province, Iraq with preventive practices against bird flu disease. *Caspian Journal of Environmental Sciences*, 19: 581-587

Kaiser, HF 1960, The application of electronic computers to factor analysis. *Educational and Psychological Measurement*, 20: 141-151.

Kaiser, HF 1974, An index of factor simplicity. *Psychometrika*, 39: 31-36.

Hotelling, H 1929, Stability in competition. *The Economic Journal*, 39: 41-57.

MALR 2022, Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, Central Administration of Agricultural Economy, Bulletin of Poultry Wealth Preparation, Food Balance Bulletin, Cairo, 164 p.

Muhammad, HN & Al-Najjar, MJ 2018, "Requirements to modernize domestic marketing of poultry in Egypt", *The Egyptian Journal of Agricultural Economics*, 28: 2.

Murtadha, JI & Hammod, AJ 2022, Studying the adding of sheep and cows rumen liquid to drinking water as a probiotic and its effect on productive traits and economic indicator of meat broiler. *Caspian Journal of Environmental Sciences,* 20: 275- 281.

Salman, TD 2012, Factor analysis and methods of analysis and determining the number of factors. University of Baghdad, College of Physical Education.

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