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The Future of the Egyptian Fish Exports under the Local & International Changes

Abd Al-Azeim Mostafa [1], Ashraf Youness [2], Mohamed Al-Shahid [2] and Ragab Ali [2]

[1] Department of Agricultural Economics – Faculty of Agriculture - Fayoum University.
[2] Department of Agricultural Economics, Faculty of Fish Resources, Suez University, Suez, Egypt
[2] PhD Student at Human Development and Economics, Faculty of Fish Resources, Suez University, Suez, Egypt

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ABSTRACT

The research problem indicates that despite the importance of the Egyptian fish exports and the existence of many components which support its competitive attitude in the international markets but commodity and geographical concentration for the Egyptian fish exports have been noticed over the last few years. These points out to the importance of identifying the developments influencing Egypt's fish exports and forecasting its future.

The research aimed mainly at forecasting the Egyptian fish exports so as to propose a group of policies and mechanisms suitable for developing these exports and increase their geographical and commodity variations from various fish varieties.

By studying the species distribution for the Egyptian fish exports, it became clear that the most important exports of the fish varieties are the fresh, chilled, and frozen fish followed by the various types of shrimps, crustacean and Mollusca then comes the processed fish (frozen, salted, or cut & packaged) in addition to a limited contribution of live and ornamental fish exports.

By presenting the most important features of the geographical distribution of the Egyptian fish exports for the average period (2005 – 2020) at the level of the countries, the most important countries imported the Egyptian fish at the Arab level is Lebanon whereas the most important countries at the European level was Italy, and it became clear that there is a large geographical concentration in the Egyptian fish

Through forecasting the expected future quantity of the Egyptian fish exports for Period (2021-2025) ranged between 47.3 thousand tons as a minimum in 2020 and 60 thousand tons as a maximum limit in 2025. The forecasting values, ranged through in the ARIMA model between 58.4 thousand tons as a minimum limit in 2020 and 85.5 thousand tons as a maximum limit in 2025. The forecasted values using the Simultaneous equations model ranged between 52.8 thousand tons as a minimum limit in 2020 and 74.7 thousand tons as a maximum limit in 2025.

1. Introduction

The Egyptian fisheries is considered among the most important wealth which gives Egypt relative advantages especially with the availability of many water surface areas in Egypt and the government policy towards increasing the production in the fish farms over the past years. In light of increasing the international demand for the fish products and the increase in the prices, it becomes important to; work on developing the Egyptian fish exports, increase the international prices, work on developing the Egyptian fish exports, increasing the number of the target markets, and increase the number of the fish varieties. These objectives are subjective with the new negotiations by the World Trade Organization related to; the Egyptian fish production potentials, the expansion in the fish breeding, and the technological level used in the production and hunting operations.

Hence, it's importance to predict the future of the Egyptian fish exports so as to introduce the policies and mechanisms suitable for developing these exports in the

* Corresponding author. Ashraf Youness
E-mail addresses: ashraf.youness@frc.suezuni.edu.eg
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light of these important new local and international changes Saeid (2020).

Research Problem

Developing the fish exports and increasing the number of the target markets are considered as the most important challenges facing the Egyptian fish exports during the current and future periods. Despite the importance of the Egyptian fish exports and the existence of many basics that support its competitive attitude, it's noticed that there is a geographical and commodity concentration of the Egyptian fish exports. These points out to the importance of identifying the new changes influencing Egypt's fish exports and forecasting its future in the light of these changes.

Research Objectives

This research aims at forecasting the Egyptian fish exports so as to propose a group of policies and mechanisms which are suitable for the development of these exports and increasing their geographical and commodity coverage from the various fish varieties. Based on this main objective, comes the following group of the secondary objectives:

- Highlight the general features to develop the Egyptian fish exports.
- Highlight The species distribution of Egyptian fish exports.
- Highlight the geographical distribution of Egyptian fish exports.
- Highlight the important new developments related to the future of Egyptian fish exports.

2. Research Method & Sources of Data

The research used the qualitative and quantitative analysis methods where the qualitative method was used in representing the research introduction, objectives and in explaining some concepts and variables related to the research. The research used the quantitative methods to measure the variables and phenomena related to the research problem where a group of tests, standards and statistical samples were used in the research which is explained as follows:

1) Simultaneous Equations Model

The simultaneous equations model is defined as the sample in which the equilibrium value can't be specified for at least one of its internal variables without using all the equations it contains simultaneously.

- The values of the dependent variable (y) is not specified only through the independent variables (x1, x2, …) but also some values of the independent variable (x) are specified in turn through the dependent variable (y).
- This means that the values of the dependent variable (y) and values of the independent variable (x) are specified instantaneously together at any time.

Mt = ao + a1yt+Et1 1

yt = bo + b1 Mt + b2I t 2 + Et2 2

The above-quoted two equations (1 and 2) show that (M_t) in the first equation is a dependent variable and that (y_t) is an independent variable. At the same time, (M_t) is an independent variable whereas (y_t) is a dependent variable.

2) Forecasting Methodology using Box & Jenkinz Methodology (ARIMA):

All the economic applications assume that the time series enjoy the feature of stationarity which can be judged by the time series chart. Therefore, the autoregressive integrated moving average (ARIMA) which is the self-slope model integrated with the moving averages when used in forecasting then the time series must be stable.

- Stability of the Time Series: the time series is considered as stable in case of achieving the following three conditions:

1. The Mean has a fixed value which doesn't rely on time that is:

$$E(\chi_t) = \mu$$

2. The Variation of the time series must equal to a fixed value which doesn't depend on time as follows:

$$\mathrm{var}(\chi_t) = \delta_{\chi}^{\,2}$$

3. The co-variance mustn't depend on the time but depends of the differences between the two times (Lag Time) as follows:

$$Cov\left(\chi_t, \chi_{t-s}\right) = E\left[\chi_t - \mu\right]\left[\chi_{t-1} - \mu\right]$$

- AR Autoregression: This can be written in the following form:

$$Y_T = B_0 + B_1 Y_{T-1} + B_2 Y_{T-2} + ... + B_P Y_{T-P} + e_T$$

Where: Y_t represents the current values of the dependent variable.

$Y_{T-1}, Y_{T-2}, Y_{T-P}$ represent the values of variable (Y) which are time lag during the period (T).

B_0, B_1, B_2, B_P : regression Equation Coefficients.

The self-regression Sample points out that the current values for the dependent variable Y_T depends on the previous values of the dependent variable $Y_{T-1}, Y_{T-2}, Y_{T-1}$

- Moving Average Model (MA)

This can be formulated as follows:

$$Y_T = W_0 + e_T - W_1 e_{T-1} - W_2 e_{T-2} ..... - W_q e_{T-q}$$ which represent values of the forecasted dependent variable (Y).

$e_{T-1}, e_{T-2}, e_{T-q}$ represent the residuals values for the remnants from estimating the dependent variable (Y_T)

W_0, W_1, W_2, W_q represent the Weights.

e_T represent the random variable.

From the model, we find the current values of the dependent variable Y_T depend on the previous values for the remnants: $e_{T-1}, e_{T-2}, e_{T-q}$

- Integrated Autoregression and Moving Average Model (ARIMA)

The previous two models can be integrated to form one model called (ARIMA) where the new model becomes as follows:

$$Y_T = B_0 + B_1 Y_{T-1} + B_2 Y_{T-2} + ... + B_P Y_{T-P} + e_T$$
$$+W_0 + e_T - W_1 e_{T-1} - W_2 e_{T-2} ..... - W_q e_{T-q}$$

This model is called (ARIMA) with (q, d, p) levels, where; the (P) refers to the level of the autoregression model, the (d) refers to the integration level for the stability of the time series, and the (q) refers to the level of the moving-average model (Meyler *et al.,*1999).

As for the sources of data, the research relied basically on published and un-published secondary data which are issued by the related authorities such as the Central Agency for Public Mobilization and Statistics, ministry of agriculture and land reclamations, ministry of trade and industry, and the Egyptian customs authority. The research also used some data published on the internet in addition to the studies & bulletins issued by the concerned authorities, institutes and the different.

4. Research Results and discuscsion

1. Development of the Egyptian Fish Exports

Table (1) shows an increase in the value of the Egyptian fish exports from 3969 thousand dollars in 2005 to 42568 thousand dollars in 2020 with an increase equaled to 38599 thousand dollars accounted for 973% increase which shows the great development in the value of the Egyptian fish exports during this period.

By studying the trend of the value of the Egyptian fish exports shown in Table (2), it's found that the linear form is the suitable mathematical form to express the development in the value of the Egyptian fish exports where it has the highest (F) value. Table (1) also shows the existence of a statistically significant increase at the (0.01) probability level estimated at 2702.6 thousand dollars with annual average change equals 12.7%. The coefficient of determination R2 equals 0.95 which means that 95% of the increase in the value of the fish exports during the study period is due to the time factor.

Table (1) also shows that the quantity of Egypt's fish exports increased from 5124 thousand tons in 2005 to 54351 thousand tons in 2020 with an increase equaled 49227 thousand tons at a rate of increase equal 961% which in turn shows the great development in the quantity of the Egyptian fish exports during this period.

By studying the Trade for quantity of the Egyptian fish exports shown in Table (2) it's shown that the linear form is the suitable mathematical form for expressing the development of quantity of the Egyptian fish exports where it has the highest (F) value. There is also a statistically significant yearly increase at 0.01 probability level of 3171.6 thousand tons at annual average change equals 15.9%. The coefficient of determination R2 is equal to 0.91 that is 91% of the increase occurring in the quantity of the fish exports during the study period is due to the time factor during that period.

Table 1. Development of the Egyptian Fish Exports for Period (2005-2020)

Years	Value of Exports in (Thousand Dollars).	Quantity of Exports in (Tons)
2005	3969	5124
2006	3365	4016
2007	4450	4409
2008	10818	6121
2009	13488	4768
2010	15004	10538
2011	23356	10796
2012	18238	11054
2013	22698	19719

2014	28634	24258
2015	26160	26182
2016	38352	29818
2017	36295	33455
2018	33045	37091
2019	39125	43259
2020	42568	54351
Average	22473	20310
Quantity Increase for Period (2005-2020)	38599	49227
Percentage Increase for Period (2005-2020).	973	961

Source: International Trade Database www.trademap.com

Variable	General Time Trend Equation	Coefficient of Determine	Calculated (t) Value	Average Yearly Change (%)*	Value of Calculated (F) in some Arithmetical Forms.		
					Linear Form	Logarithm Form	Squared Form
Total value of Fish Exports.	Y= 500+2702.6X	0.95	(16.5)**	12.8	272.6	41.2	116.3
Total Quantity of Fish Exports.	Y = 6648 + 3171.6X	0.91	(12.15)**	15.9	147	23.1	33.2

Table 2. Results of the Trend Equations for the Egyptian Fish Exports for Period (2005-2020)

(**) Significant at Probability Level of (0.01), (-) means non-significant.

(*) Averaged Yearly Change = (Regression Coefficient / General Average) * 100

Y = Estimated value for the dependent variable. (X) = Number of Years

Source: Compiled from Table (1).

2. Development of Exports of most important Egyptian Fishes Varieties

Data shown in Table (3) shows the varieties distribution of the Egyptian fish exports during the Period (2005-2020) where the most important fish exports varieties are; fresh, chilled and frozen fish. This is followed by the exports the various types of shrimps, crustacean and Mollusca then the processed fish (frozen, salted or cut & packed) in addition to a limited contribution from the living fish exports and the decoration fish.

Data in the same table shows the existence of a significant increase in the export of the fresh, chilled and frozen fish where the exported quantities increased from 2522 tons in 2005 to 49900 thousand tons in 2020 with an increase estimated at 47378 thousand tons at a rate equals 1897%. The exported values increased from 2323 thousand dollars in 2005 to 25362 in 2020 with an increase of 23039 accounted for 992% increase.

As for the exports of shrimp and crustacean, the exported quantities were increased from 1025 thousand tons in 2005 to 1714 thousand tons in 2020; whereas the exporting value increased from 1080 thousand dollars in 2005 to 1314.3 thousand dollars in 2020 with an increase equaled 12024 thousand dollars and at a rate equaled 1113%.

As for the processed fish exports, the exported quantities were dropped from 1574 tons in 2005 to 899.8 thousand tons in 2020; whereas the exporting value increased from 557 thousand dollars in 2005 to 2392 thousand dollars in 2020 which is equaled to 1835.5 thousand dollars increase accounted for 330% increase. This is mainly because the Egyptian fish industry during the study period was influenced by many conditions and variables related to the political and economic circumstances took place in Egypt including the high rates of inflation and the local currency value reduction which resulted an increase in the manufacturing costs and more difficulties which face the fish factories in Egypt. These effects reduced the effect of the increase of the exporting price and the increase in the exports' value was only 330% during the study period despite the reduction in the exported quantities was 34%. This points out the importance of adopting new policies and mechanisms suitable for supporting the fish industry in Egypt because of its effective role in increasing the value added to the exports especially with the directions given by the country in expanding the establishment of fish farms and increasing the fish exports and their manufactured products (Barrania *etal.,*1999).

Hence, it can be concluded the existence of cases of commodity concentrations in the exports of the Egyptian fish especially in the fresh fish where this points out the importance of the work on introducing an increase in the diversity in the exported varieties of the Egyptian fish especially those processed varieties and the shrimp, crustacean and Mollusca.

Table 3. The Variety Distribution for Egyptian Fish Exports during the Period (2005 – 2020)

Years	Fresh, Chilled or Frozen Fish		Shrimp, Crustacean and Mollusca with different types		Living Fish & Ornamental Fish		Processed Fish (Salted, Cut and Packed)		T O T A L	
	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value
2005	2522	2323	1025	1080	3	9	1574	557	5124	3969
2006	2565	2247	747	718	1	2	703	398	4016	3365
2007	2865	3383	826	813	1	5	717	249	4409	4450
2008	4726	8393	971	1647	9	50	415	728	6121	10818
2009	3695	11059	600	1580	8	19	465	830	4768	13488
2010	9435	11572	545	2623	28	29	530	780	10538	15004
2011	9287	16792	1010	5347	24	58	475	1159	10796	23356
2012	10064	14249	810	2809	33	265	140	915	11054	18238
2013	17522	18546	835	2230	809	1161	553	761	19719	22698
2014	19234	19379	915	2716	3613	5503	496	1036	24258	28634
2015	20946	13729	381	3153	4500	6888	736	2386	26182	26160
2016	22658	22755	400	3405	5920	9301	950	2891	29818	38352
2017	28370	24887	700	4201	3575	5370	890	1837	33455	36295
2018	30082	20734	1525	8949	2080	1684	3078	1687	37091	33045
2019	40182	23147	1491	11913	1012	1860	818	2175	43259	39125
2020	4900	25362	1714	131.4	2113	2046	899.8	2392.5	54321	42568
Average	17128	14910	906	4143	1483	2141	841	1298	20310	22473
Amount of increase for Period (2005 -2020)	47378	23039	688.9	12.24	2110	2037	-674.2	1834	49227	38599
Rate of increase for Period (2005 -2020)	1879	992	67	1113	70333	22633	-43	330	961	973

Notice; some of processed fish are subordinated to custom duties which are outside Chapter (3). These products were listed in calculating the value and quantity of processed fish exports.

Source: International Trade Database: www.trademap.com

3. Geographical Distribution of Egyptian Fish Exports according to the most important importing Countries

Data presented in Table (4) shows the geographical distribution of the Egyptian fish exports for Period (2005 – 2002) at the level of the countries which represent the most important future countries for Egyptian fish exports within the Arab region. These Arab countries are; Lebanon which accounted for 16.2% followed by the UAE with 11.6% of the Egyptian exports. At the EU region; Italy ranked first with 7% of the exports and Spain ranked second with 4% of the exports.

Table 4. Geographical Distribution of Egypt Fish Exports as average for Period (2000-2019)

Bloc	Important Countries inside the Bloc	Average	Average Contribution (%)
Arab Countries	Lebanon	2679.5	16.2
	Emirates	1918.6	11.6
	Palestine	1736.7	10.5
	Kuwait	1571.3	9.5
	Jordan	1521.7	9.2
	Remaining Arab Countries	2315.6	14
	Total Arab Countries:	11743.4	71
European Union Countries.	Italy	1157.8	7
	Spain	661.6	4
	France	496.2	3
	Portuguese	330.8	2
	Greece	165.4	1
	Remaining European Countries	165.4	1
	Total European Countries:	2977.2	18
African Countries		827.0	5
South Eastern Asia		330.8	2
America		82.7	0.5
Al-Merksor		16.5	0.1
Remaining World Countries		562.4	3.4
T O T A L		16540	100

Source: International Trade Database www.trademap.com

It can be noticed that there is a large geographical concentration in the Egyptian fish exports to the Arab countries. This is due many reasons. The most important of which is closeness to transport distances to Arab countries compared with the other blocs in addition to the similarities in consumer preferences regarding the taste of the fish products (Salim and Abd Al-Rahman, 2020). It can be also referred to the presence of commercial treaties which contribute to increasing the opportunity for their penetration to these markets.

4. Latest Events related to Future Fish Exports

The foreign trade for the Egyptian fish is influenced by many of the international and local factors at both exports and imports levels, where it is possible to notice these factors in the short run regardless whether the influence is direct or indirect.

4.1 The Progress in the Negotiations of the World Trade Organization related to the Fisheries and the Marine Boundaries

Lately, there were many of the unfair practices performed by some countries which had an influence on the foreign trade of fish where some countries supported their producers and then saturating the markets of the developing countries, including Egypt, with less expensive products. Consequently, the national production was exposed to the dumping risks with the imported fish products and thus increasing the imports and limiting the production and reducing the exports.

Examples of these unfair practices performed by these countries:

- Performing unfair fishery operations in the territorial water boundary for the developing countries through a high technological standard of ships and fishery equipment.
- Excessive support to the marine fishery companies to enable them to offer their products at fewer prices than the competitors in the international markets and dumping the markets and harming the local production for the countries.
- Providing un-declared subsidies to the illegal fishery.
- Establish fabricated fisheries outside the territorial waters.

The issue of prohibiting subsidies for fisheries was a hot topic for negotiation between the member countries of the WTO during the rounds for agriculture.

Undoubtfully, these practices influence, directly, the foreign Egyptian trade in terms of dumping the Egyptian market with fish products which are less than the price from the local product on the one hand, and increasing the competition faced by the Egyptian fish exports in the international markets in terms of price on the other hand.

Looking at the Egyptian attitude concerning the negotiations related to banning some forms of support directed to the fisheries, Egypt insisted on its attitude concerning not accepting any concessions which allow for intervention in the scope of the territorial waters for the developing countries or stating the country's programs and developing the fish farms and concentrating on cancelling and banning the support directed to promote the excessive potentials in fishing; and cancelling the subsidies provided to the illegal and un-organized fishing and targeting the widespread industrial fishery which work outside the scope of the territorial waters for the countries and providing the fish stock and monitoring the fishing activities and supporting the potentials of the developing and countries in the scope of permanent fishing and promoting the potentials and the human skills to monitor and evaluate the fish stock and monitor the fishery activities.

4.2 Dominant Technological Standards in Fishing and Fish Farming in Egypt

The efficiency and quality of fish production (either through fish farming or fishery operations from natural fishery) depends on the standard of the used technology where the more the fish farming and the fishery operations dependent of the modern technology, the higher the production we can get and at the same time, guarantee continuous and high-quality production. Looking into the Egyptian case, we can confirm that the fishing and the fish farming standards in Egypt are considered medium standards compared with other world countries.

But in light of the country's trend towards expansion in the fish farming investments, we can notice the presence of gradual improvement in the technological standards used in the fish farms. Table (5) shows an increase in Egypt's imports from the fish production needs of high technology from 616 million EGP in 217 to 1026 million EGP in 2020 where most of the imported commodities were of this type of modern tools and equipment which are the computer-controlled systems in the fish farms at rate of 36.7% then comes the electronic control panels at rate 28.5%.

Table 5. Development of Egypt's Imports from Fish Production High Technology Equipment for Period (2017-2020)

Product	2017	2018	2019	2020	Average	% of the Average
Total fish production high technology equipment.	616	608	938	1026	797	100
Computer-based Systems in Fish Farms.	180	175	378	436	292	36.7
Electrical & Wireless Couplers and Air Sensors.	228	205	287	296	254	31.9
Electronic Control Panels for Fish Farms	184	200	252	271	227	28.5

Source: ESCWA Organization Database: https://unctad.org/

There is no doubt that improving and developing the technological standards for the fish farming operations effectively contributes to the foreign trade of the Egyptian fish in terms of improving the production levels and then limiting imports and at the same time increasing the export opportunities for the international markets.

4.3 The Egyptian Fish Production Capabilities

The Egyptian fish production capabilities for fish farming or fishing from the natural fishery are considered as the effective factors which influence the foreign trade for the Egyptian fish both in terms of imports or exports. Information shown in Figure (1) show the increase in the fish production capabilities in Egypt during the Period (2005 – 2020) where the volume of the fish production in Egypt reached 2.1 million tons in 2020 compared to 0.88 million tons in 2005.

The reasons for the increase in the Egyptian fish production capabilities during this Period are primarily due to several reasons such as the expansion in the investments related to the establishment of the fish farms in Egypt in addition to increasing the productivity of the lakes through disinfecting them and raising their efficiencies.

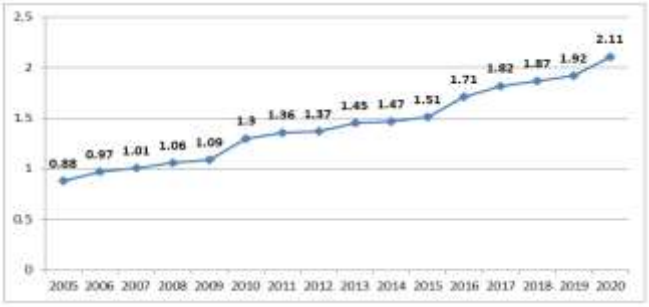

Figure 1. volume of fish production in Egypt for period (2005-2020)

There is no doubt that the increase in the Egyptian fish productive capabilities contributes effectively in influencing the foreign trade for the Egyptian fish through the following two ways: the first way related to limiting the imports and the second way is related to increasing the exported quantities and therefore; it is important to work on increasing these capabilities to improve the efficiency of the foreign trade for the Egyptian fish and increasing their role in supporting the national economy in the promising economic and protective activities in Egypt.

5. Forecasting the Future of the Egyptian Fish Foreign Trade

The main target for forecasting the Egyptian fish exports is to determine the policies and the mechanisms suitable for developing these exports and increasing their geographical and commodity variations from the various fish varieties (Youness Shebl and Bahloul, 2019).

5.1 Describing the Formation of the Instantaneous Equations Model to Forecast the Future of the Egyptian Fish Foreign Trade

5.1.1 The Model Hypotheses

The following are the hypotheses of the instantaneous equations model for forecasting the quantity of the Egyptian fish exports and imports:

- Increasing the Egyptian fish exports contributes to improving the trade balance and increases the added value for the national economy.
- Increasing the fish local production contributes to increasing the supply and limits the imports and increases the exports and improves the commodity brands for the exported fish varieties.

5.1.2 Forming the Instantaneous Equations Model

Through performing attempts to form the instantaneous equations model for those variables, some of the proposed variables didn't prove their statistical significance and some of these variables didn't match with the economic theory. After performing several attempts, the model was formed from the following variables:

- (Y1t): The Quantity of Egypt's fish exports.
- (Y2t): The Quantity of Egypt's fish imports.
- (Y3t): The Fish Production Index.
- (X1): Volume of Fish Production in the most important International Markets in (Million Tons)
- (X2): Policies of the Egyptian Trade towards the foreign fish trade.
- (X3): The per capita of GDP in US Dollars

- (X4): Exchange Rate of the Egyptian Pound.
- (X5): The producers' prices index.

Table 6. Variables of the Instantaneous Model related to the foreign trade for Egyptian Fish for Period (2005 –2020)

Years	Quantity of Egypt's Fish Exports in Thousand Tons (Y1)	Quantity of Egypt's Fish Imports in Thousand Tons (Y2)	Fish Production index - Base Year (2010) (Y3)	Volume of Fish Production in Important International Markets in Million Tons (X1)	Egyptian Trade Policies towards Fish Foreign Trade (X2)	Per capita GDP in Dollars (X3)	Exchange Rate (X4)	Producers' Price Index (X5)
2005	5.1	188	67.69	14.5	0	1186.4	5.78	51.69
2006	4.0	208	74.62	14.9	0	1397.4	5.73	64.62
2007	4.4	221	77.69	15.2	0	1667.3	5.64	63.69
2008	6.1	123	81.54	15.1	0	2044.5	5.43	69.54
2009	4.8	148	83.85	14.9	0	2331.3	5.54	71.85
2010	10.5	182	100	15.3	0	2646.0	5.62	84
2011	10.8	178	104.62	15.4	0	2791.8	5.93	88.62
2012	22.1	174	105.38	15.2	0	3229.7	6.06	89.38
2013	19.7	100	111.54	15.1	0	3262.7	6.87	95.54
2014	24.3	125	113.08	15.6	0	3379.6	7.08	97.08
2015	26.2	141	116.15	15.7	1	3562.9	7.69	100.15
2016	29.8	160	131.54	14.9	1	3519.9	10.03	115.54
2017	33.5	151	140	15.4	1	2444.3	17.78	124
2018	37.1	93	143.85	15.8	1	2537.1	17.77	127.85
2019	43.3	93	144.25	15.9	1	3019.2	16.77	128.25
2020	54.4	93	144.91	15.4	1	3501.3	15.77	130.91

(1) www.trademap.org

(2) Central Agency for Public Mobilization and Statistics, Price Index Bulletin, Various Issues.

(3) Central Agency for Public Mobilization and Statistics, Yearly Statistics Book, Various Issues.

(4) Food & Agriculture Organization of the United Nations (FAO): Http://www.fao.org/statistics

(5) International Bank Databases: www.albankaldawli.org

The model variables shown in Table (6), were divided into Endogenous Variables and exogenous variables as follows:

The Endogenous Variables: These are the variables whose balancing values are estimated from inside the model. They are clarified by the values of (Y) variables: (Y1t ،Y2t ،Y3t).

The Exogenous Variables: These are the variables whose values are determined from outside the model. They are clarified by the values of the following variables: (X1, X2, X3, X4, X5).

5.2 Results of the Instantaneous Equation Model

The previous description shows that the instantaneous model is over-identified and therefore the Three Stage Least Squares Method (3SIS) is the best used method to represent the important model results (Heshem and Younis Shebel, 2020) as follows:

5.2.1 Impact of some Model Variables on Egyptian Fish Exports

Equation (1) in Table (7) in which the instantaneous model hypothesizes that the quantity of the Egyptian fish exports (Ylt) is dependent on the following variables: quantity of Egypt's fish imports, the fish production index for the base Year 2010 (Y3t), volume of fish production in the important international markets in million tons (X1) and the Egyptian trade policies towards the fish foreign trade (X2).

The Table shows the existence of a direct correlation between the Egypt's fish quantity of exports (Y1t) and Egypt's fish imports quantity (Y2t) where by increasing the quantity of exports, the supply is reduced and then the imports increase. But the statistical significance of this relationship has not been proved, this may be explained because the exported fish varieties such as bream and grouper fish in addition to some crustaceans are varieties to which local demand is not high whereas the local demand on varieties such as tilapia and gray mullet is high.

The same Table (7) shows a directly statistically significant relationship at (0.05) probability between the quantity of Egypt's fish exports (Y1t) and the fish production index (Y3t) where by the increase in the fish production (which is reflected by the record number of production) increases the Egyptian fish exports which is an agreed upon relationship from the economic logic.

Table (7) also shows that the quantity of Egypt's fish exports (Y1t) is characterized by existence of an inversely statistically significant relationship with the volume of the fish production in the important international markets in million tons (X1).

The results shown in the same Table shows that there is no great influence on the Egyptian exports by fish production in the international market and the potential of this production in competing the Egyptian fish production in the international markets. This is due to the increase of the international demand for Egyptian fish and an increase in averages international imports growth.

The results in the same Table (7) also shows a negative influence for the trade policies on the Egyptian fish exports due to the fluctuations of these policies between the openness policies and the protective policies which aim at increasing the supply of the fish in the local market and preserving the stability of the prices. This points at the importance of the focus on the coordination between policies of encouraging the exports and policies concerning increasing imports to provide the local supply with suitable prices.

Table 7. Estimation of the Instantaneous Equations Model Results for the important variables related to the foreign trade for the Egyptian fish for Period (2005 – 2020)

1) Egyptian Fish Exports Equation:
$Y1t = 19.6 – 0.1\ Y2t + 0.3\ Y3t - 1.9\ X_1 + 9.3\ X_2$
$(0.62)^{-}$ $(-1.7)^{-}$ (2.7)* $(-0.3)^{-}$ (2.8)*
R-2 = 0.89 **F= (31.7)****
2) Egyptian Fish Imports Equation:
$Y2t = 183.2 – 3.7\ Y3t + 1.2\ X3 – 22\ X4 + 41\ X2$
$(2.7)^{*}$ $(1.6)^{-}$ (-2.3)* $(2.3)^{*}$ $(2.02)^{*}$
R-2 = 0.54 **F= (5.4)***
3) Equation of the Fish Production Index:
$Y1t = 8.5 + 1.02\ Y1t – 0.98\ Y2t + 1.1\ X_5$
$(1.7)^{-}$ $(2.1)^{*}$ (2.3)* $(18.8)^{**}$
R-2 = 0.95 **F=(101.3)****

Source: Results of the Statistical Analysis for Table (5).

5.2.2 Impact of some Model Variables on Egyptian Fish Imports

Equation Number (2) in Table (7) in which the instantaneous model assumes that the quantity of Egypt's fish imports (Y2t) is function in; the fish production index with the base year 2010 (Y3t), the per capita GDP in Dollars (X3), and the Egyptian Trade Policies towards the fish foreign trade (X2).

The Table also shows the existence of a statistically significant inverse relationship at probability level (0.05) between the quantity of Egypt's fish imports (Y1t) and the fish production index (Y3t) where the local reduction in fish production results in increasing the Egyptian fish imports which is consistent with the economic theory.

The same Table (7) shows the presence of an inverse relationship between the quantity of Egypt's fish imports (Y2t) and the exchange rate (X4) where by reducing the value of the local currency, it reduces the demand for the Egyptian fish imports because of the rise in the imports burden and the reduction in the buying potential for the consumers which is consistent with the economic theory. Also, in the same table shows the positive influence of the openness trade policies on the increase in the Egyptian fish imports which aim at increasing the supply and to limit the increase in the prices.

5.2.3 Impact of some Model Variables on Egypt's Fish Production

Equation (3) in Table (7) in which the instantaneous equation model assumes that the production index of fish for the base Year 20120 (Y3t) is a function in; the quantity of Egypt's fish exports, quantity of Egypt's fish imports (Y2t), and the producers' price index (X5).

The same Table (7) shows the presence of statistically significant positive relationship at (0.05) probability level between each of the fish production index (Y3t) and quantity of Egypt's fish exports (Y1t) where the Egyptian fish exports contributes to increasing the quantity of production which is consistent with the economic theory.

The same Table (7) shows the presence of a statistically significant inverse relationship at (0.05) Probability Level between the fish production index (Y3t) and the quantity if Egypt's fish imports (Y1t) where the increase in the Egyptian fish imports contributes to the reduction of quantity of production which is also consistent with the economic theory.

5.3 Forecasting the Expected Future Values for Fish Exports using the Simultaneous Model compared to some other Forecasting Methods

The quantity of exports and imports were forecasted as they are the variable under investigation through three different forecasting methods where the first forecasting method was the Trend Equations which is a single equation model that explains the one direction effect of the independent variables on the dependent variable. The second forecasting method is represented in the ARIMA model. The third forecasting method is the Simultaneous Equations Model which is a two-model represent the several equations model which reflect the mutual influence between the dependent variable and the independent variables; and the relationships between the relationships between independent variables with each other and their effect

on the dependent variable.

In light of the interrelated influence between the factors influencing the Egyptian fish exports and between many of other factors, where usually the one equation model ignores some of the interrelated relationships which differentiate most of the economic phenomena in the scope of the agricultural economy simultaneously.

Therefore, it can be concluded that it's not worth to relying on the results of forecasting using the one equation method and it's preferable to identify the other expected consequences for the other variables related to the Egyptian fish exports using methods that guarantee using these relationships. In order to consider these influences which are known in the economy with the interrelated relationships where it is not possible to do this through single equation sample. Hence, it's necessary to build a multi-equations model, the most important of which is the Simultaneous Equation System which takes into consideration the interrelated influence of the various variables simultaneously. Then, we can rely mainly on the forecasting using the simultaneous equations method to a greater extent than forecasting using the Trend Equations.

Table (8) shows the forecasted values through the Trend Equations for the quantity of the Egyptian fish exports for Period (2021-2025) which ranged between 47.3 thousand tons at a minimum in 2020 and 60,000 ton as maximum in 2025. The forecasted values ranged through the ARIMA between 58.4 thousand as a minimum for 2020 and 85.5 thousand tons as maximum in 2025.

Table 8. The Forecasted Values for the Egyptian Fish Exports during Period (2021- 2025) in (Million Dollars)

Years	Trend Equations	ARIMA	Simultaneous Model
2021	47.3	58.4	52.8
2022	50.4	65.5	58.0
2023	53.6	73.1	63.3
2024	56.8	81.1	68.9
2025	60.0	89.5	74.7

Source: Statistical Analysis using; State Graph, EViews and SPSS Programs for Table (22) data & Table (6) in Appendix.

As shown above, as for exports, all models forecasted an increase in exports but the simultaneous equations model forecasted higher values taking into consideration the interaction between the various factors.

Hence, we can say that we must not rely on the results of forecasting the one equation method but it is preferable to identify the expected influences of the other variables related to the Egyptian fish exports using methods that guarantee the considerations of these relationships. In order in insert theses influences which are always defined in the economy as Interactive Relationships, then it is not possible do this through one equation model. This requires forming a multi-equations model that the most important of which is: The Simultaneous Equation model which takes into consideration the simultaneous mutual influence of the variables and then we can greatly rely on forecasting using the method of the simultaneous equations better than forecasting with the Trend Equations.

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