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Determinants of sheep production in Libya

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محددات إنتاج الأغنام في ليبيا

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الملخص:
استهدفت الدراسة المتغيرات المحددة التي تؤثر على إنتاج الأغنام في ليبيا. بيانات السلسلة الزمنية خلال الفترة 1984 إلى 2023 والتي استخدمت لتقدير نموذج **ARDL**. كشفت النتائج أن المتغيرات المستقلة انتاج الشعير **X_1** و مساحة انتاج الشعير **X_2**كانت مستقرة في المستوى. في حين أن متغير التابع انتاج الاغنام **Y** والمتغيرات المستقلة متغيرات الامطار **X_3**، ومساحة المراعي **X_4** كانت مستقرة في الفرق الأول . اشارت نتائج التقدير في المدى القصير إلى أن التأثيرات السابقة للمتغير انتاج الشعير **X_1** في **X_1 (-1)**،**X_1 (-2)**، **X_1 (-3)**، **X_1 (-4)** لها تأثير سلبي ومعنوي على المتغير التابع انتاج الاغنام . أكثر من ذلك، فإن التأثيرات السابقة للمتغير مساحة انتاج الشعير **X2** , **X_2 (-1)**، **X_2 (-2)**، **X_2 (-3)** لها تأثير إيجابي وذو معنوي إحصائيا. وأبعد من ذلك، فإن التأثير السابق للمتغير**X_3** الامطار **X_3 (-1)** له تأثير إيجابي ومعنوي أيضا على المتغير التابع. أكثر من هذا، التأثيرات السابقة للمتغير **X_4** مساحة المراعي التي كانت **X_4 (-1)**،**X_4 (-2)** لها تأثير إيجابي وذو معنوي إحصائية على المتغير التابع. فيما يتعلق بحالة التقديرات الخاصة الاجل الطويل فإن النتائج توصلت إلى أن المتغيرات **X_1** انتاج الشعير له تأثير إيجابي ومعنوي عند مستوى معنوية 5٪. النتيجة تعكس ان زيادة المتغير المستقل بوحدة واحدة تؤدي إلى زيادة المتغير التابع انتاج الاغنام بمقدار 2.647. بالنسبة للمتغيرات الأخرى، كانت سلبية التأثير على المتغير التابع ومعنوية بنسبة 10٪ و 5٪ و 1٪ على التوالي. هذه النتيجة تعني أن زيادة المتغيرات **X_2** مساحة انتاج الشعير،**X_3** الامطار ،**X_4** مساحة المراعي بوحدة واحدة أدت إلى انخفاض في المتغير التابع انتاج الاغنام بمقدار 2.08، 0.19، 3.5 على التوالي في الاجل الطويل. أما بالنسبة لمعامل تصحيح الخطأ **Ect**(-1)، فكانت قيمته 1.827- ، حيث تشير إلى تسريع النظام إلى التوازن وكانت بنسبة 182.7٪ من التوازن الذي تم تصحيحه خلال الفترة.

الكلمات الدالة: إنتاج الأغنام ، انتاج الشعير، مساحة زراعة الشعير، هطول الأمطار، مساحة المراعي، اردل مودل, ليبيا.

Abstract
The study targeted the determinants of variables affecting sheep production in Libya and used time series over the period 1984 to 2023 to estimate the ARDL model. The study findings revealed that the independent variables X1, barley production, and X2, barley production area, were stationary at the level. While the dependent variable, Y sheep production, rainfall X3, and X4 pasture area were stationary in the first difference. The results in the short run indicate that previous effects of barley

production that are X1 (-1), X1 (-2), X1 (-3), and X1 (-4) have a negative and significant effect on the dependent variable, sheep production. Moreover, the previous effects of the X2 barley production area variable that are X2 (-1), X2 (-2), and X2 (-3) have a positive and significant effect on the dependent variable, sheep production. Further to that, the previous effect of the X3, which was X3(-1), has a positive and significant effect on the dependent variable. More than this, the previous effects of X4 that were X4 (-1) and X4 (-2) have a positive and significant effect on the dependent variable. Regarding the long-run case, the findings demonstrate that variable X1 had a positive and significant effect at 5%. This result reflects an independent variable increase by one unit that leads to an increase of the dependent variable by 2.647. As for other variables, they were negative and significant at 10%, 5%, and 1%, respectively. This result means that increased variables X2, X3, and X4 with one unit led to a decline in the dependent variable by 2.08, 0.19, and 3.5, respectively in long-run. As for the error correction term ECT (-1), whose value was 1.827, it refers to speeding the system to equilibrium by 182.7% of the equilibrium, which is corrected during the period.

Keywords: Sheep production, Barley production, Cultivated Barley Area, Rainfall, Pastures Area, ARDL, Libya.

Introduction

Agriculture is a tool for achieving stability and food security, and it works continuously to achieve the desired and aspired development faraj (2026). Also, it plays a prominent role in the economies of states in an attempt to implement development targets in particular poor states because it contributes 40% of their participation in GDP. Furthermore, it attracted about 80 percent from workmen. Moreover, it affects 70 percent of citizens in rural areas as a major source of earnings World bank (2007). Agriculture also faces food needs for the population due to increased consumption resulting from increased population pressure Godfray et al (2010). In addition, the industrial sector uses raw materials and agricultural products as production inputs for its industry Worku (2023). Moreover, the agricultural export acquires financial resources that support investments in the sector and increase farmers' livelihoods Faraj (2020).

Sheep are pastoral animals and one of the ruminant species that have been tamed for breeding for production in many regions and different climatic environments according to the social and economic heritage. They are important in terms of conducting academic research FAO (2026). The livestock actively help producers with living conditions and contribute to GDP in developing countries. Moreover, it provides food for citizens as a result of the increase in population and provides opportunities for jobs and then earning incomes, especially for the poor among them Herrero (2013). More of that, it is important in relation to the production of meat, milk, and leather and economic revenues to their employees Wang et al (2024).

The sheep have been breed in Africa historically before 7,000 years ago in the traditional system, which left its original home because of the problem of climate change and drought and settled in Libya since 6500-6800. The sheep in Libya were classified as exclusive fat-tailed. It also can adapt to climate environmental conditions and the ability to live and resist diseases Baazaoui et al (2024). FAOSTAT showed that sheep developed from 4 million heads in 1984 to nearly 7.528 million heads in 2023 FAO (2026). This development came from the efforts made by successive Libyan governments to provide food sources locally to achieve self-sufficiency in their products.

Research Problem

Sheep breeding in Libya is one of the old occupations and still an income source for farmers. The Libyan state has invested in animal wealth projects involving the establishment of sheep projects as well as increasing spacious pastoral spaces and providing support to farmers. These efforts have led to agricultural development events through growth in livestock rates in general and sheep in particular. Despite these efforts, FAO statistics from their database indicated that there were fluctuations in production from one year to another and did not achieve self-sufficiency from its meat. Sheep breeding is one of the food security tools in steady supply and prices that are reflected in the source of farmers income. The production determinants play an essential role in the increase and decline in production that are

interwoven and unclear and more sensitive regarding its short-run changes that affect the long-run stability that reflects an unstable trend in production. On what is mentioned above, the problem of researching is the instability of production from one year to another and how it is affected by the prices of inputs, pastures, climatic factors, and unclear how to deal with this issue to address these changes and its ability to achieve the long production balance. Therefore, this study came to identify the determinants of sheep farming and their impact in the short and long term, to understand the adaptation mechanism to deal with shocks to achieve a stable production balance for the long-run.

The research objectives

Through volatility in the production of sheep from year to year, this research aims to determine the current status of sheep and its determinants through:

1. Highlight the extraction of economic indicators that explain the characteristics of these variables.
2. Determine the most important variables and their impact percentage.
3. Develop recommendations based on the results of the study.

The importance of the research

The importance of the research stems from the importance of sheep in providing humans the necessary needs of protein, iron, zinc, and calcium, as well as an income source for breeders and an important source of food security. Therefore, the importance of search lies in the following points:-

1. Understanding the reality of sheep production.
2. Provide recommendations for decision makers.
3. Stirring points for discussion in front of researchers.
4. Participate in enriching experimental studies to fill the studies gap.

Previous Studies

Mohamed-Brahmi et al (2024) studied climate change and its impact on food security. The study sought to use 94 sheep breeders in Tunisia. Through views, the study concluded that changes in the lack of rain and high temperatures affect increased sheep production and high production costs under these transformations and their impact on the continuity in breeding. Another study by Biswal et al (2021) sought to explain the relationship between sheep and high temperatures. The study inferred that it must be their full awareness of the effects and consequences of higher temperatures and what it will be during the coming years. This awareness takes the utmost measures to be taken to raise strategic and operational decisions for operation and production in cooperation with producers, agricultural extension agents, and researchers to avoid these high-temperature risks to ensure the highest production efficiency.

Faraj (2026) dealt with determining the positive and negative effects of temperature and rainfall variables on increasing sheep production in Egypt. The study used the NARDL model to analyze data from 1998 to 2023. The results revealed that the negative change in high temperature positively and significantly affects sheep production while the changes in heavy rain have a negative impact on sheep production. Furthermore, Wang et al (2011) focused on the importance of rainfall in affecting grass cover and its impact on sheep production performance in the desert steppe region in China. The study used a randomized complete block design for the purpose of conducting the study. The study indicated that rainfall had a similar effect on all grazing treatments regardless of grazing pressure. The study also explored that the biomass of fodder, which is affected by the wide variation in the amount of rainfall, is the decisive factor in the efficiency of sheep production. More than that,Leweri et al (2021) focused on the important role of rain in East Africa to adapt cattle producers to rainfall, especially small producers. The study followed the evaluation of farmers' views that have been surveyed about 241 families and 52 participants in the participatory rural assessment about the change and its impact on animal wealth in Tanzania in Ngorongoro Conservation Area. The results of the evaluation discovered that about 71% of producers have awareness of climate change, especially regarding rain and its implications for animals. In this regard, 75% of the participants stressed that rain rates as well as drought were the most influential and unequivocal factors to change in the preparation of livestock, whether cows, sheep, or goats. The study confirmed that families cannot protect them from sudden changes to the climate when increasing the

number of animals. In this context, the study recommended that future research deal with the feasibility of livestock profit raising in cases of climate change.

El Sabry et al (2023) has studied sheep's methods to understand sheep production because it's an important occupation in subtropical and arid areas. It was also interested in the impact of pastoral space on the breeding of sheep. The study revealed that sheep and care methods are still not aware. The study reported the pastoral area is a significant factor in its impact on cattle productivity. I also noted that there are different requirements for behavioral responses for each breed of sheep. Nwaogu et al (2025) aimed to evaluate the impact of different grazing methods on the characteristics of soil and biodiversity in the forest-grassland transition zone in the Imo River watershed, Nigeria. . The study covered two seasons (2023 and 2024) to test ANOVA to examine the various impacts of the grazing methods on the vegetation parameters. The findings indicated that for the forbs, all the species coverage was at least 10% higher under light grazing compared to heavy grazing. In addition, the study stressed that these results would be more useful to small producers than to the biggest ones. Wang et al (2025) sought to understand the behavior of cattle animals with different grazing methods to find consistent interaction between them. The study used a grazing method within the fence to find out congestion in grazing by changing the behavior of animal nutrition on the intensity of pasture grass. The study pointed out that cattle behavior in the same period through rotational grazing improves the health of herbal land and reflects it on cattle production. The study conducted by Keno et al(2021 measured the linkage between types of feed and twenty lambs (18 ± 0.22 kg initial weight) in solitary isolation within the barns. The experience used several varieties, such as local barley straw (high grain and straw yields), Traveller (high straw yielder), and high grain yielder. Nutrition results found that straw varieties vary in raising their lambs growth and should be attended to when using barley types.

In the same context, Sormunen- Cristian (2013) testing the impact of barley on the intake and weight of lamb carcasses. The study has used a group of females and males from the sheep. Lamban has been fed in six sets. Experience has been implemented and returned over three years, 1995 to 1997, with the same approach to comparison of meals with male and female lamb. The nutrition process was to nourish 192 shelves, and the ages were an average of 74 days and 20.6 kg in weight. The study indicated that the growth rate and the weight of the carcass were higher in the barley. It also indicated that the use of whole grains is more efficient than using manufactured grain. On the other hand, Arrebola et al analyzed a relationship between the lambs production increase in Merino sheep in Spain and the rate of rain. Six farm units have been studied with 3871 sheep for four years. Multinomial logistic regression has been employed to see the impact of the annual rain rate on the percentage of ewes lambing performance for each year. The analytical results of the study found that there is a strong effect of rain on the percentage of ewes lambing performance. However, the study showed that in the case of scarce rainfall in 2005 and 2006, there was a small overall percentage of ewes lambing performance rates in light rain.

Despite these studies, which addressed the study of the direct relationship between sheep production determinants in the short and long run but did not study dynamic approaches over time and how to comply with short-run shocks, evaluate them, and deal with the matter of the excessive response to the production of sheep to face climate transformations and the rest of the production determinants.

Methodology and Study Data

Study Date As

for sources and collection data, the study was mainly based on secondary data obtained from the statistical and economic publications issued by the Arab Organization for Agricultural Development and the Food and Agriculture Organization of the United Nations, as well as the use of many Arab and foreign scientific references. Use some previous research and study.

Model specification

The relationship between the quantity of output and the quantities of different inputs used in a function called the production function which this function describes the manner and extent to which a particular product depends on the quantities of production elements used at a given level of technology and in a given period of time. The production function expressed as follows Mohamed and Faraj (2022)

$$Y = f(X1, X2, X3, Xn) \quad \ldots\ldots (1)$$

Where,

Y= quantity produced during a given period of time;
X1, X2, X3,..... Xn) = quantities of different variables used in production.

Next, the relationship between the variables is estimated using the ARDL model, the specific formula for the variables under investigation is as follows:

$$SP_t = \alpha_0 + \sum_{i=1}^{\rho} \beta_i SP_{t-i} + \sum_{j=0}^{q1} \delta_{1j} bp_{t-j} + \sum_{j=0}^{q2} \delta_{2j} bca_{t-j} + \sum_{j=0}^{q3} \delta_{3j} Ra_{t-j} + \sum_{j=0}^{q4} \delta_{4j} Pa_{t-j} + \mu_t \quad \ldots\ldots (2)$$

where:
SP_t = Sheep production dependent variable at time t;
α_0 = Intercept term;
i = Lag index for dependent variable;
β_i = Coefficients of lagged dependent variableSP_{t-i} ;
j = Lag index for independent variable;
ρ, q = Optimal laq lengths for dependent and independent variables
δ_j= coefficients of lagged and current values of independents variables;
BP = Local barley production;
BCA = Barley acreage;
RA = Rainfall;
PA = Pasture area
εt = Error term (White noise error limit).

The error correction equation for the ARDL model can be written in the following format:

$$\Delta SP_t = \alpha 0 + \sum_{i=1}^{P-1} \theta_i \Delta SP_{t-i} + \sum_{j=0}^{q_{1-1}} \delta_{1i} \Delta Bp_{t-j} + \sum_{j=0}^{q_{2-1}} \delta_{2i} \Delta Bca_{t-j} + \sum_{j=0}^{q_{3-1}} \delta_{3i} \Delta Ra_{t-j} + \sum_{j=0}^{q_{4-1}} \delta_{4i} \Delta Pa_{t-j} + \eta ECT_{t-1} + \varepsilon t \quad \ldots\ldots (3)$$

where:
Δ = First difference ;
θ_i = Short –run coefficients of lagged dependent variable;
δ = Short –run coefficient of lagged for each independent variable;
ECT_{t-1}= Error Correction Term should be statistically significant with a negative sign ;
η = Speed of adjustment;
εt = Error term.

The ARDL model is also in long-run can be formulated in the following format:

$$Y_t = \alpha + \delta_1 BP + \delta_2 Bca + \delta_3 Ra + \delta_4 Pa + \varepsilon t \quad \ldots\ldots (4)$$

where:
Y_t = Dependent variable;
α = Long-run intercept;
$\delta_1, \delta_2, + \delta_3, \delta_4$ = Long-run coefficient of independent variables;
BP , Bca, Ra, Pa = Independent variables;
εt = Error term.

Results and Discussion

The stationary test is an important statistical tool to check whether the variables under the autoregressive model are stationary or non-stationary. This process ensures employing suitable and effective models and not falling into the false relations between the study variables Cheng-Sze et al (2021). The ADF test is one of the most important tests used to detect the stationary of time series for variables before appreciation

Faraj (2025). It was developed by the Dickey and Fuller (1981) and it could handle a more complex model as compared with the Dickey-Fuller test Sau-Rong et al (2020).
Results of Table 1 indicated that the variables were different degrees of integration, where the independents variables X1, and X2 were stationary at the level. While the dependent variables Y and independents variables X3, and X4 are stationary in the first difference. The study concluded that, based on this result, it can apply an ARD L model method due to different integrated.

Table1ADF unit root test

Variables	ADF Test at Level		ADF Test at First difference		Decision
	t-Statistic	Prob.*	t-Statistic	Prob.*	
SP	-2.391511	0.1506	-6.096315	0.0000	I(1)
BP	-3.859233	0.0054	-	-	I(0)
CBP	-3.425889	0.0163	-	-	I(0)
RA	-2.333383	0.1670	-8.207786	0.0000	I(1)
PA	-2.121336	0.2377	-7.359086	0.0000	I(1)

Eviews 12 Outputs

To select the optimal lag length using the VAR autoregression, it tests several lag lengths and selects the best one that has the lowest values for several criteria, such as Akaike's information criterion (AIC), Schwarz's Bayesian information criterion (SBIC), and the Hannan and Quinn information criterion (HQIC) Farag et al (2021). On the other hand, the process of capturing the number of previous lags assists us in judging the appreciation of the best model and avoiding the over fitting problem. The optimal lag result is found to be lag 5 according to AIC's criteria that bring fewer values from the other criteria. Therefore, the best model for estimating short-term and long-term relationships is (5, 5, 4, 3, and 3) as shown in figure 1.

Table 2 VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	101.0985	NA	2.84e-09	-5.491340	-5.269147	-5.414639
1	171.7386	117.0608	2.13e-10	-8.099347	-6.766192*	-7.639142
2	188.6339	23.17078	3.71e-10	-7.636225	-5.192107	-6.792516
3	214.7417	28.34554	4.49e-10	-7.699524	-4.144443	-6.472311
4	240.8772	20.90845	7.42e-10	-7.764413	-3.098369	-6.153696
5	314.9798	38.10989*	1.50e-10*	-10.57027*	-4.793268	-8.576053*

Eviews 12 Outputs

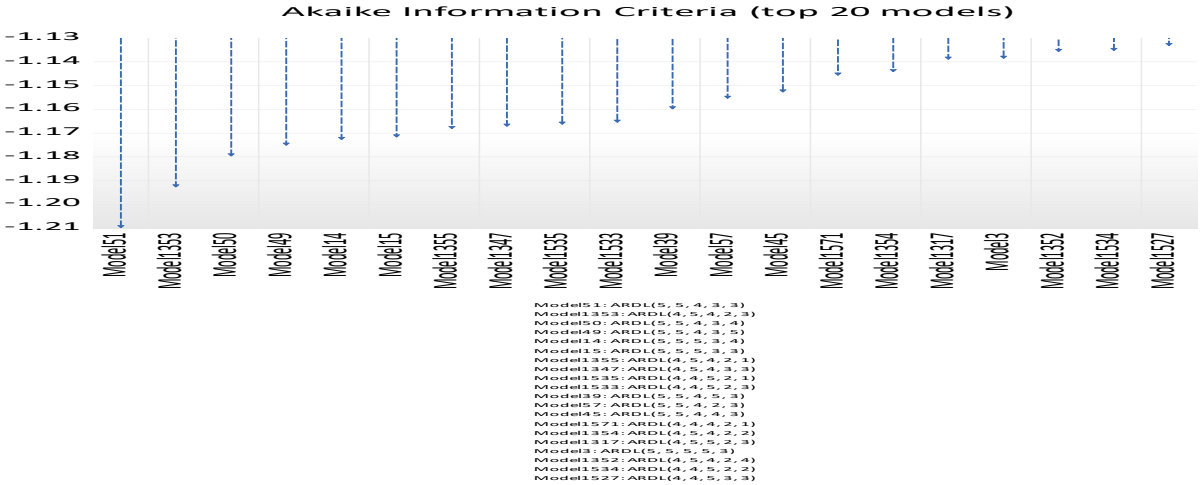

Figure 1 Akaike Information Criteria Optimal Model

Bound Test Result

The study findings found that the value of the F-bound test is between the critical values of the lower and upper bounds (borders) at the level of 0.05. This result is inconclusive and does not mean at all that there is no cointegration between the variables. Thus, it will rely on the error correction term (-1), which is used in many studies such as Bahmaini-Oskooee (2001) to determine whether there is cointegration or not because it is a more accurate way to check (Kremers et al., 1992; Banerjee et al., 1998; and Faraj, 2020), and it is a more reliable and effective method for proving cointegration and a confident instrument to check whether there is a long-run relationship or not. The study results found that it was negative in its sign and statistically at 0.01. Therefore, the study depends on this result, which confirms that there is a cointegration relationship among these variables. It means that there are long-run relationships among variables.

Table 3 F-Bounds Test

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	3.417794	10%	2.2	3.09
K	4	5%	2.56	3.49

Eviews 12 Outputs

Short and Long-Run Results

The results of the study in a short-term assessment reflect current interactions for independent variables on the variable and appreciation of the situation. The results from the table show that previous effects in X1 (-1), X1 (-2), X1 (-3), and X1 (-4) have a negative and significant effect on the dependent variable. In addition, the previous effects of X2 (-1), X2 (-2), and X2 (-3) have a positive and significant effect on the variable. Also, The same thing for X3 (-1) has positive significant effect on the dependent variable. More than this, the previous effects of X4 that were X4 (-1) and X4 (-2) have a positive and significant effect on the dependent variable sheep production.

On the long-run appreciation results, which reflect the reach of variables to equilibrium after disposing of all the changes in the short-run. Table 4 revealed that the independent variable X1 had a positive and significant effect at 5%. This result reflects an independent variable increase by one unit that leads to an increase of 2.647. As for other variables, they were negative and significant at 10%, 5%, and 1%, respectively. This result means that increased variables X2, X3, and X4 with one unit led to a decline in the variable by 2.08, 0.19, and 3.5, respectively in long-run.

Regarding the interpretation of the result of ECT (-1), which refers to speeding the system to equilibrium by 182.7% of the equilibrium, which is corrected during the period. That means that there is an excess and exaggerated correction and an oscillation around it to reflect the speed of the adjustment. The value is relatively high (-1.87) is an indication of high speed in the case of modification and adaptation, this result indicates that sheep production during the study period exceeds the equilibrium before returning later and eliminates disturbances resulting from changes in production determinants, which indicates that farmers are more sensitive to these changes and their rapid reactions to production disturbances, which leads to improving production at a level of speed higher than the required speed to return to equilibrium despite there is a level of fluctuation around the equilibrium.

Table 4 Short and Long-run Estimation Results ARDL (5, 5, 4, 3, 3)

Short-run Results			
Variable	Coefficient	t-Statistic	Prob.*
D(X1)	-0.028614	-0.068240	0.9469

D(X1(-1))	-3.870227	-4.433850	0.0013
D(X1(-2))	-2.965931	-4.431542	0.0013
D(X1(-3))	-2.041117	-3.799082	0.0035
D(X1(-4))	-0.565325	-2.829219	0.0179
D(X2)	0.682620	1.660447	0.1278
D(X2(-1))	3.434512	4.158827	0.0020
D(X2(-2))	2.383131	3.854416	0.0032
D(X2(-3))	1.295922	2.951031	0.0145
D(X3)	-0.036450	-0.811110	0.4362
D(X3(-1))	0.274038	3.967231	0.0027
D(X3(-2))	0.104694	1.782509	0.1050
D(X4)	-0.372620	-0.475149	0.6449
D(X4(-1))	2.980261	2.803996	0.0187
D(X4(-2))	1.709194	2.497170	0.0316
CointEq(-1)*	-1.827636	-5.546183	0.0002
Long-run Results			
Variable	Coefficient	t-Statistic	Prob.*
X1	2.647360	2.297069	0.0445
X2	-2.086003	-1.940222	0.0811
X3	-0.191759	-3.132663	0.0106
X4	-3.525648	-3.355283	0.0073
C	38.34046	4.316721	0.0015

Eviews 12 Outputs

Diagnostic tests

The tests are meant to evaluate and validate the statistics of the model with estimation. The tests revealed that the model does not have any problems and is suitable for estimation. Thus, there is no serial correlation 0.88 and natural distribution 0.72 and did not have a Heteroskedasticity problem 0.078. In the same context, the stability test noted that there are no structural changes between variables during the study, and the coefficients were within the limits of critical lines.

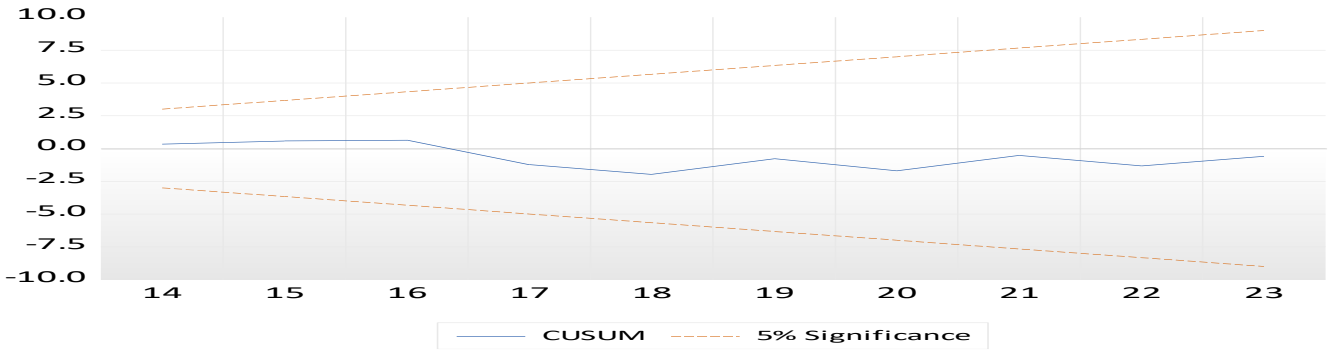

Figure 2 Cusum stability test

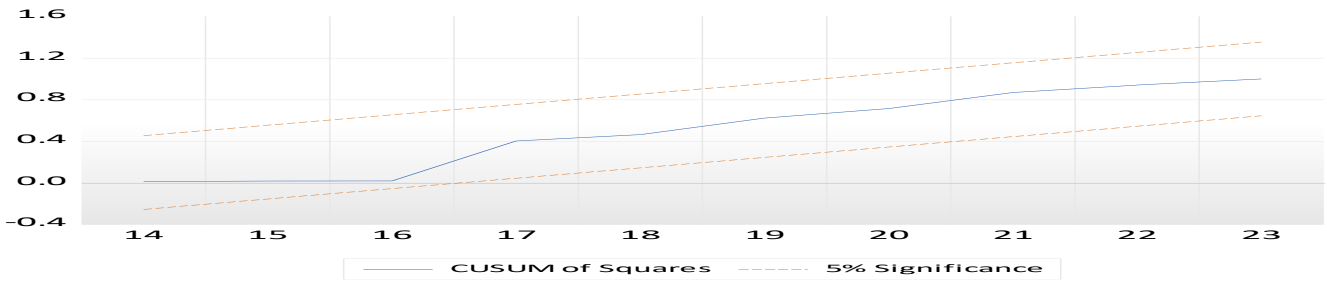

Figure 3 Cusum of Squares stability test

The model also has prediction power, where Theil's inequality coefficient was worth 0.04, which is close to zero. It means that the expected values are close to the true values. More of that, the value of Variance Proportion value was close to one 0.94. On the other hand, the value of Bias Proportion is close to zero 0.04. Therefore, the model is suitable and predictively efficient in its predictive operations.

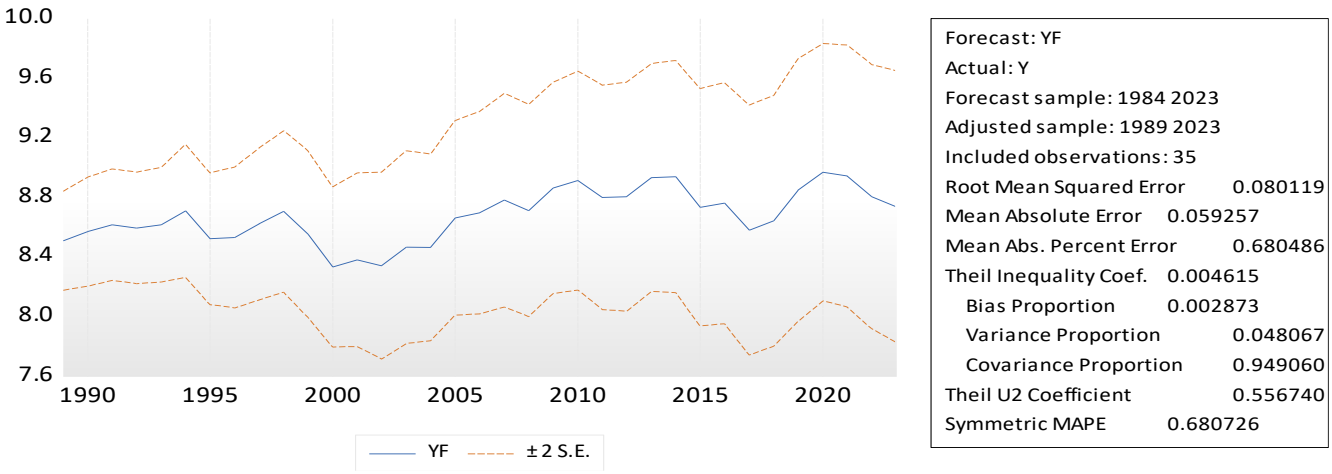

Figure 3 Predictive Power of the Ardl Model

Conclusion

The study sought to determine the variables affecting sheep production in Libya during 1984–2023 by using the ARDL model. The study indicated that independent variables X1 and X2 were stationary at the level. While the independent variable Y, X3, and X4 are stationary in the first difference. Moreover, the previous effects in X1 (-1), X1 (-2), X1 (-3), and X1 (-4) have a negative and significant impact on the dependent variable. In addition, the previous effects of the X2, X2 (-1) variable (-1), X2 (-2), and X2 (-3) have a positive and significant effect on the variable. The same thing for X3 (-1) has positive effect on the dependent variable. More than this, the previous effects of X4 that were X4 (-1) and X4 (-2) have a positive and significant effect on the dependent variable. As for the long-run result, it revealed that the independent variable X1 had a positive and significant effect at 5%. This result reflects an independent variable increase by one unit that leads to an increase of the dependent variable Y by 2.647. As for other variables, they were negative and significant at 10%, 5%, and 1%, respectively. This result means that increased variables X2, X3, and X4 with one unit led to a decline in the dependent variable by 2.08, 0.19, and 3.5 respectively in long-run.

Recommendations

The study had recommended many recommendations that barley production should be high quality, and reduce inefficient use to increase production and verify their efficiency in nutrition to reduce their negative complications in the short run and continue to support investing in high-quality barley production in long-run. The study also recommends an increase cultivated barley area crops because of their impact on increased production after a period of time and maintaining continuity in influencing on increasing production in the long term. In addition, it expanding pastoral spaces with takes decisions and procedures, reducing its effects in long-run.

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