GREEK SUPPLY FUNCTIONS FOR LIVESTOCK AND RED MEAT

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1. INTRODUCTION

It is considered to be known that in free economies, where the law of supply and demand for products is functioning the side of demand is controlled by the consumers and the side of supply is controlled by the producers.

The amount of information degree that exists, concerning the market conditions, the price formation, the quality and variety of products, is different prevailing the consumer' s over the producer' s. We would suppose that consumers can adjust to new wants and market conditions with great difficulty, in a short time.

All this is more apparent in the meat market either because the consumers' peculiarities and habits vary, or the policy applied by the government often changes enlarging the difference concerning the degree of consumers' and producers information or because the inelasticity of supply and demand for these products is very great.

A basic characteristic of the existing condition in the meat market in Greece is that, the supply is not big enough to satisfy the continually increasing demand (the result of which is that although the number of slaughtered animals in thousands of heads, keeps increasing every year, resulting to a shortage of animal capital, the total final demand is satistfied to a great extent by the imported quantity of fresh and frosen meat). A direct result from all the above mentioned is that most of the researchers deal with demand than supply, where in the latter the statistical data available is not complete and even gathering information by sample survey is very difficult.

Considering the above facts about Greek market, the present research, might be the only one, as far as we know, which tries to deal with analysis and explanation of red meat supply functions in Greece, using trustworthy data exclusively published by N.S.S.G. (National Statistical Service of Greece).

2. THE MODEL

We assume that at any point in time, a quantity of livestock becomes available for two uses :

i) for slaughter, in order to meet current domestic demand and

ii) for replenishing or increasing inventories of livestock in order to meet future demand for meat.

In a period of time shorter that the production period for the particular type of livestock, the aggregate available quantity considered, cannot obviously vary in response to current price and feed cost. This quantity of livestock available during a period t, Kt, can be written approximately as a linear function of inventories at the beginning of the period ($Z_{i,t-1}$) :

$$K_t = a + b.Z_{i,\,t-1} \tag{2.1}$$

where b ⟩ 0. A part of the available quantity will be used be to increase livestock inventories, while the remaining part will be used be for slaughtering.

Total supply for slaughter, will be written as a function of the difference between the quantity of livestock available during the period t (K_t) and the inventories at the beginning of the period (t - l) as follows :

$$S_{it} = K_t - c \cdot Z_{1,\,t-1} \tag{2.2}$$

If (2.1) is substituted in to (2.2), the result is

$$S_{it} = a + b.Z_{i,t-1} - c \cdot Z_{i,\, t-1} = a + (b\text{-}c) \,.\, Z_{i,\, t-1}$$

or

$$S_{it} = A + B \cdot Z_{i,\, t-1}$$

where $A = a$, $B = b - c$

with $B > 0$

It is reasonable to assume that the main factor sthat determine the «desired» livestock inventories (Z^*_{it}) are the expected meat price (P^*_{it}) and the expected cost of feed (PZ^*_{it}). [Hallam (1978), [2] Suits 1962, [5]]
This relationship may be approximated by a linear function of the form

$$Z^*_{it} = d + e.P^*_{it} + q.PZ^*_{it} \tag{2.4}$$

If this is so, a higher expected meat price or a lower expected cost will held more effectivelly to make a correct prediction. In other words, we would expect $e > 0$ and $g < 0$.

Very little is known about the way expectations are formed. An assumption often considered adequate is that current price (P_{it}) and feed cost (PZi_t) may be used, as substitutes for expected price and cost, especially when the time period implied in the subscript t is relatively large. Thus, the following may be written as (TRYFOS, 1974, [6]).

$$Z^*_{it} = d + e.P_{it} + g.PZ_{it} \tag{2.5}$$

The relationship between actual inventory and desired inventory will be written as,

$$Z_{it} - Z_{it-1} = h.(Z^*_{it} - Z_{i,t-1}) \qquad (2.6)$$

where $0 < h \leqslant 1$, indicating a «partial adjustment» of actual inventory to deviations from desired inventory.

Substitution of (2.5) in (2.6) results in

$$Z_{ti} = hd + h.P_{it} + h.g\, PZ_{it} + (l\text{-}h).Z_{i,\,t-1})$$

or

$$Z_{it} = C + D.P_{it} + E.PZ_{it} + G.Z_{i,\,t-1} \qquad (2.7)$$

where $C = h.d, D = h.e, E = h.g, \ G = 1 - h$

and it is assumed that

$$D > 0, \quad E < 0, \quad 0 < G < 1$$

In order to complete the model, we assume that the variable (P_{it}) «prices received by farmers» is influenced by the number of slaughtered animals (S_{it}), by the cost feed (PZ_{it}) anf by the prices at the previus period ($P_{ti,\,t-1}$). That is

$$P_{it} = H.S_{it} + M.PZ_{it} + N.P_{i,\,t-1} \qquad (2.8)$$

where $H < 0, M > 0$ and $N > 0$. (a priori conditions)

Therefore, the general model becomes,

$$S_{it} = F_1(\overline{Z}_{i,\,t-1})$$

$$Z_{it} = F_2(\hat{P}_{it}, PZ^*_{it}, \overline{Z}_{i,\,t-1}) \qquad (2.9)$$

$$P_{it} = F_3(\hat{S}_{it}, \overline{P}Z^*_{it}, P_{i,t-1})$$

where, $i = 1,2$

$1 =$ Bovines

$2 =$ Lamps, sheep and goats

$*$ = Exogenous variables

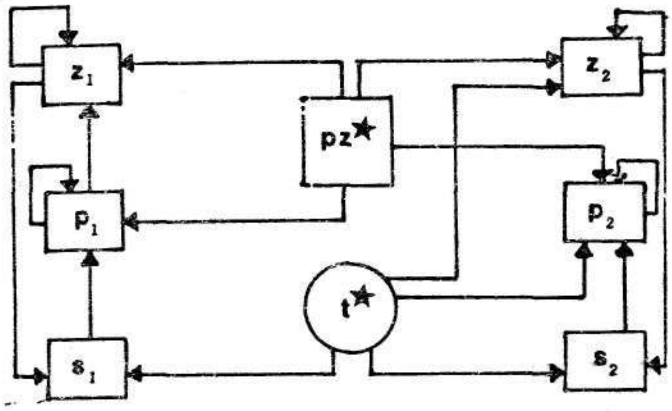
— = Predetermined variables

The analytical expressions of $(2.9)_1$ to $(2.9)_3$ are the (2.3), (2.7) and (2.8) correspondingly.

The expected signs of the parameters involved are,

Variable's	$Z_{i,\,t-1}$	$B > 0$	by equation (2.3)
»	P_{it}	$D < 0$	by equation (2.7)
»	PZ_{it}	$E < 0$	
»	$Z_{i,\,t-1}$	$0 < G < 1$	
»	$S_{i,t}$	$H < 0$	by equation (2.8)
»	PZ_{it}	$M > 0$	
»	$P_{i,\,t-1}$	$N > 0$	

The behavior of the mode (2.9) in terms of a flow-chart is the following.



DIAGR. 2.1

The behavior of the model.

The variables are defined as follows :

Bovines : (Oxen, bulls, heifers, cows, calves)

S_{1t} = Total slaughtered (Number of heads)

Z_{1t} = Existing animals »

P_{1t} = Annual index of bovine prices received by farmers

PZ_t = General annual index of prices paid by farmers

Lamps, sheep and goats :

S_{2t} = Total slaughtered (Number of heads)

Z_{2t} = Existing animals (Number of heads).

P_{2t} = Annual index of lamps-sheep-goats prices received by farmers.

T = time.

The data used in the estimations are presented in tables 2.1 to 2.4

TEBLE 2.1

LIVESTOCK CAPITAL (Zit)
Animals on December 31

Number of heads		
Year	Bovines Z_1	Lamps sheep and Goats Z_2
1966	1.114.882	11.773.425
1967	1.121.248	11.915.598
1968	1.060.301	11.729.776
1969	1.014.535	11.734.629
1970	965.967	11.664.993
1971	996.673	11.871.107
1972	1.062.644	12.167.656
1973	1.239.004	12.838.738
1974	1.246.961	12.752.126
1975	1.189.177	12.968.288
1976	1.118.968	12.865.057
1977	1.039.114	12.583.825
1978	977.420	12.541.859
1979	933.968	12.574.531
1980	881.946	12.803.377
1981	831.328	12.669.357

TABLE 2.2

SLAUGHTERED ANIMALS(S_{it})

Number of heads		
Year	Bovines S_1	Lamps Sheep and Goats S_2
1966	508.651	9.405.498
1967	523.466	9.553.830
1968	552.041	9.431.648
1969	604.980	10.033.832
1970	570.684	10.000.544
1971	543.660	10.105.965
1972	518.118	10.227.036
1973	476.997	10.555.422
1974	609.224	11.148.680
1975	659.493	11.500.144
1976	657.706	11.642.689
1977	624.808	11.674.288
1978	597.537	11.744.375
1979	562.193	11.869.108
1980	548.514	11.755.320
1981	518.172	11.694.184

TABLE 2.3

INDIVIDUAL ANNUAL INDICES
OF PRICES RECEIVED BY FARMES (Pit)
Base period 1970 = 100,0

Year	Veal P_1	Lamp P_2
1966	81,97	85,91
1967	82,14	82,99
1968	79,76	83,68
1969	84,10	87,63
1970	100,00	100,00
1971	107,46	104,39
1972	113,36	117,79
1973	146,07	141,41
1974	165,58	177,32
1975	173,36	191,07
1976	188,45	242,79
1977	209,02	279,99
1978	229,95	314,57
1979	298,50	411,17
1980	346,33	519,42
1981	490,20	693,50

TABLE 2.4

GENERAL ANNUAL INDEX
OF PRICES PAID BY FARMERS (PZt)
Base period 1970 = 100

Year	General index PZ
1966	94,78
1967	92,79
1968	95,54
1969	98,00
1970	100,00
1971	101,13
1972	104,17
1973	123,41
1974	166,44
1975	183,79
1976	199,13
1977	224,81
1978	242,73
1979	291,52
1980	392,68
1981	484,68

The methtods used in the estimation are the following,

(i) OLS = Ordinary Least Squares

(ii) AR_1 = Autoregressive Least Squares

(iii) 2SLS = Two - stage Least Squares

(iv) AR_1, 2SLS=Autoregressive two-stage Leat Squares, (Wallis (1973), [8]).

3. ESTIMATES OF LIVESTOCK SUPPLY AND STOCK FORMATION EQUATION IN GREECE (OLS/AR_1)

For the two livestock categories, using the annual data for the period 1966 - 1981, that have been presented previously the following estimates have been obtained.

1. Bovines

$$Z_{1t} = 151258 + 2367{,}28.P_{1t} - 2443{,}15.PZ_{1} + 0{,}884896.Z_{1,\, t-1} \qquad (3.1)$$

$$[0{,}824597] \quad [2{,}40523] \quad [2{,}69782] \quad [5{,}60056]$$

$R^2 = 0{,}799627$, $F = 19{,}6233$, $DW = 1{,}7033$, LOG OF $L/H = -182{,}626$

$$S_{1t} = 6425{,}62.t + 0{,}479532.Z_{1,\, t-1} \qquad (3.2)$$

$$[2{,}17546] \quad [16{,}9196]$$

«AR_1»

$R^2 = 0{,}989184$, $F = 1281{,}40$, $DW = 1{,}4121$ $\quad p = 0{,}48575$ $\quad t(P) = 2{,}11983$,
LOG OF $L/H = -176{,}651$

$$P_{1t} = 72{,}0190 - 0{,}00015165.S_{1t} + 0{,}404882.PZ_{1} + 0{,}768228.P_{1,\, t-1}$$

$$[3{,}18686] \quad [3{,}61535] \quad [2{,}47679] \quad [3{,}31918]$$

«AR_1» (3.3)

$R^2 = 0{,}995999$, $F = 951{,}399$, $DW = 2{,}006$ $\quad \rho = -0{,}796243$
$t(\rho) = 3{,}87414$, LOG OF $L/H = -56{,}6454$

II. Lamps, sheep, and goats

$$Z_{2t} = 4266740{,}0 + 61608{,}7.t - 1509{,}47.PZ_t + 0{,}637180.Z_{2,\ t-1} \quad (3.4)$$
$$[1{,}65179] \quad [1{,}46026] \quad [1{,}20914] \quad [2{,}83765]$$

«OLS»

$R^2 = 0{,}755920$, $F = 15{,}4528$, $DW = 1{,}6138$, LOG L/H $= -204{,}472$

$$S_{2t} = 121272.t + 0{,}793210.Z_{2,\ t-1}$$
$$[9{,}40638] \quad [75{,}9757] \quad (3.5)$$

«OLS»

DW $= 1{,}7522$, LOG OF L/H $= -203{,}438$

$$P_{2t} = 292{,}687 + 9{,}69652.t - 0{,}0000374196 \cdot S_{2t} + 0{,}872296.PZ_t + 0{,}478953.P_{2,\ t-1}$$
$$[3{,}99756] \quad [3{,}79432] \quad [4{,}50099] \quad [5{,}53120] \quad [3{,}08503]$$

«AR_1» (3.6)

$R^2 = 0{,}999105$, $F = 3126{,}37$ $DW = 3{,}0256$, $\rho = -0{,}731894$
$t(\rho) = 3{,}77299$ LOG OF L/H $= -50{,}7966$

4. ESTIMATES OF LIVESTOCK SUPPLY AND STOCK FORMATION EQUATIONS IN GREECE, (2SLS/AR_1 2SLS)

I. Bovines

$$Z_{1t} = 160892 + 2163{,}11.P_{1t} - 2349{,}751PZt + 0{,}876692.Z_{1,\ t-1}$$
$$[0{,}869325] \quad [1{,}98670] \quad [2{,}25767] \quad [5{,}50021]$$

DW $= 1{,}5838$ «2SLS» (4.1)

$$S_{1t} = 6425{,}62.t + 0{,}479533.Z_{1,\ t-1}$$
$$[2{,}175546] \quad [16{,}9196]$$

$$R^2 = 0{,}989184, \quad F = 1281{,}4, \quad DW = 1{,}4121 \quad \rho = 0{,}48575$$
$$t(\rho) = 2{,}11983 \quad \text{Log of } L/H = -176{,}651 \qquad (4.2)$$

$$P_{1t} = 72{,}6305 - 0{,}000152228 . S_{1t} + 0{,}398797 . P_{2t} + 0{,}774738 . P_{1,\ t-1}$$
$$[3{,}06504] \quad [3{,}51417] \quad [2{,}43162] \quad [3{,}33407]$$
«AR_1 2SLS»(4.3)

$$DW = 2{,}0078, \quad \rho = -0{,}802177 \quad t(\rho) = 3{,}55338,$$
$$\text{Log of } L/H = -56{,}6548$$

II. Lamps, sheep and goats

$$Z_{2t} = 4266740 + 61608{,}7 . t - 1509{,}47 . PZ_t + 0{,}637180 . Z_{2,\ t-1}$$
$$[1{,}65179] \quad [1{,}46026] \quad [1{,}20914] \quad [2{,}83765] \qquad (4.4)$$

$$R^2 = 0{,}755920, \ F = 15{,}4528, \ DW = 1{,}6138, \ \text{Log of } L/H = -204{,}472$$

$$S_{2t} = 121272 . t + 0{,}793210 . Z_{2,\ t-1}$$
$$[9{,}40638] \quad [75{,}9757]$$

$$DW = 1{,}75522, \quad \text{Log of } L/H = -203{,}438$$

$$P_{2t} = 347{,}953 + 11{,}1785 . t - 0{,}000043576 . S_{2t} + 0{,}924033 . PZ_t + 0{,}420283 . P_{2,\ t-1}$$
$$[4{,}16200] \quad [3{,}867724] \quad [4.58926] \quad [5.17978] \quad [2.35850]$$
(4.6)

$$DW = 2{,}8677, \ \rho = -0{,}707806, \ t(\rho) = 3{,}52091$$ «AR_1 2SLS»
$$\text{Log of } L/H = -51{,}3394$$

where,

$\overline{R}^2$ = Adjusted for degrees of freedom coefficient of multiple determination.

F = F — Statistic.

DW = Durbin - Watson sratistic.

LOG OF L/H = Log of Likelihood function.

p = Autocorrelation coefficient.

$t(\rho)$ = t - statistic for ρ

The numbers into the parentheses are the corresponding t-statistics of **the** estimates.

From the above results, we see that the absolute levels of the estimated coefficients show unimportant changes when using the method of 2SLS in comparison with the method of OLS.

It is obvius that the signs of the estimated coefficients agree with the «a priori conditions» that we put at the specification of the model. Where a variable is missing an equation, it means that the results were not significant. So we can say that, according to the final results for example the planned livestock of lamps-sheep and goats is not influenced considerably by received farmer's prices for meat.

The forecast ability of the estimated equations is very satisfactory and in most of the cases the «points of the curve» of the theoritical data concide with the **real** data.

5. THE MODEL DYNAMIC SIMULATION

In tables 5.1 and 5.2 we present the dynamic simulation indices of the estimated model with the methods of OLS and 2SLS respectively, which show the forecasting ability of the model.

TABLE 5.1

Dynamic Simulation with the method OLS)AR$_1$

	r	RMSE	MAE	ME	RC	U	UM	US	UO
Z_1	0,2821	$0,1226 \cdot 10^{6}$	$0,1073 \cdot 10^{6}$	$-0,9458 \cdot 10^{4}$	0,4242	0,05807	$0,5961 \cdot 10^{-2}$	0,1045	0,8895
S_1	-0,5253	$0,6366 \cdot 10^{5}$	$0,5179 \cdot 10^{5}$	$0,4108 \cdot 10^{2}$	-1,4270	0,0556	$0,4163 \cdot 10^{-6}$	0,2624	0,7376
P_1	0,3848	$0,1966 \cdot 10^{2}$	$0,1642 \cdot 10^{2}$	-0,6660	0,9733	0,04481	$0,7179 \cdot 10^{-2}$	$0,4507 \cdot 10^{-2}$	0,9833
Z_2	0,8446	$0,2466 \cdot 10^{6}$	$0,2092 \cdot 10^{2}$	$-0,2198 \cdot 10^{3}$	1,0430	$0,9956 \cdot 10^{-2}$	$0,7945 \cdot 10^{-6}$	0,1257	0,8743
S_2	0,9646	$0,2295 \cdot 10^{6}$	$0,1916 \cdot 10^{5}$	$0,3254 \cdot 10^{3}$	1,0070	0,01053	$0,5243 \cdot 10^{-5}$	0,02589	0,9741
P_2	0,9968	$0,1399 \cdot 10^{2}$	$0,1110 \cdot 10^{2}$	-0,5444	1,0050	0,02317	$0,1629 \cdot 10^{-2}$	0,01121	0,9872
absolute mean	0,6663				0,9799	0,03378	0,00256	0,08903	0,9085

where,

U = Theil' s inequality coefficient.

UM = Fraction of error due to bias.

US = Fraction of error due to different variation.

UC = Fraction of error due to different co-variation.

PC = Regression coefficient of actual on predicted.

ME = Mean error.

MAE = Mean absolute error.

RMSE = Root mean squared error.

r = Correlation coefficient.

TABLE 5.2

Dynamic simulation with the method 2SLS/AR_1-2SLS

	r	RMSE	MAE	ME	RC	U	UM	US	UC
Z_1	0,3347	$0{,}1188 \cdot 10^{6}$	$0{,}1040 \cdot 10^{6}$	$-0{,}1043 \cdot 10^{5}$	0,4976	0,0563	$0{,}7697 \cdot 10^{-2}$	0,1061	0,8862
S_1	-0,4673	$0{,}6209 \cdot 10^{5}$	$0{,}5030 \cdot 10^{5}$	$-0{,}5519 \cdot 10^{3}$	-1,3390	0,0542	$0{,}7900 \cdot 10^{-4}$	0,2928	0,7071
P_1	0,9851	$0{,}1946 \cdot 10^{2}$	$0{,}1627 \cdot 10^{2}$	-1,7930	0.9743	0,04436	$0{,}8487 \cdot 10^{-2}$	$0{,}4100 \cdot 10^{-2}$	0,9874
Z_2	0,8446	$0{,}2456 \cdot 10^{6}$	$0{,}2092 \cdot 10^{6}$	$-0{,}2198 \cdot 10^{3}$	1,0430	$0{,}9956 \cdot 10^{-2}$	$0{,}7945 \cdot 10^{-6}$	0,1257	0,8743
$\dot{S}_2$	0,9646	$0{,}2295 \cdot 10^{6}$	$0{,}1946 \cdot 10^{6}$	$0{,}5254 \cdot 10^{3}$	1,0070	0,01053	$0{,}5243 \cdot 10^{-5}$	0,02589	0,9741
P_2	0,9968	$0{,}1416 \cdot 10^{2}$	$0{,}1105 \cdot 10^{2}$	-0,8045	1,0110	0,02408	$0{,}3228 \cdot 10^{-2}$	0,03022	0,9666
absolute mean	0,7655				0,97865	0,05316	0,00324	0,0974	0,8992

It is known that generally for a lever of U the lower the levels of UM and US in relation with the lever of UC, the better the simulation of the system is. -{ TEIL (1966), [7], ASH and SMYTH (1973), [1], SMITH (1976), [4]) j.

Comparing the results of tables (5.1) and (5.2) we conclude that our simulated model hehaves better using the estimates of the 2 SLS method.

In order to see how well our model reproduces reality, we present graphically the actual and the simulated data of some endogenous variables of the model.

(Diagr. 5.1, 5.2 and 5.3).

Note that continuous - line means actual data and the dotted - line means simulated data. Table 5.3

6. CONCLUSIONS

It has long been* recognized that short-run livestock supply is related to prices and feed cost in previous periods, rather that to current prices and costs.

The explanation is, that a relatively long production period elapses before livestock can be brought to the market.

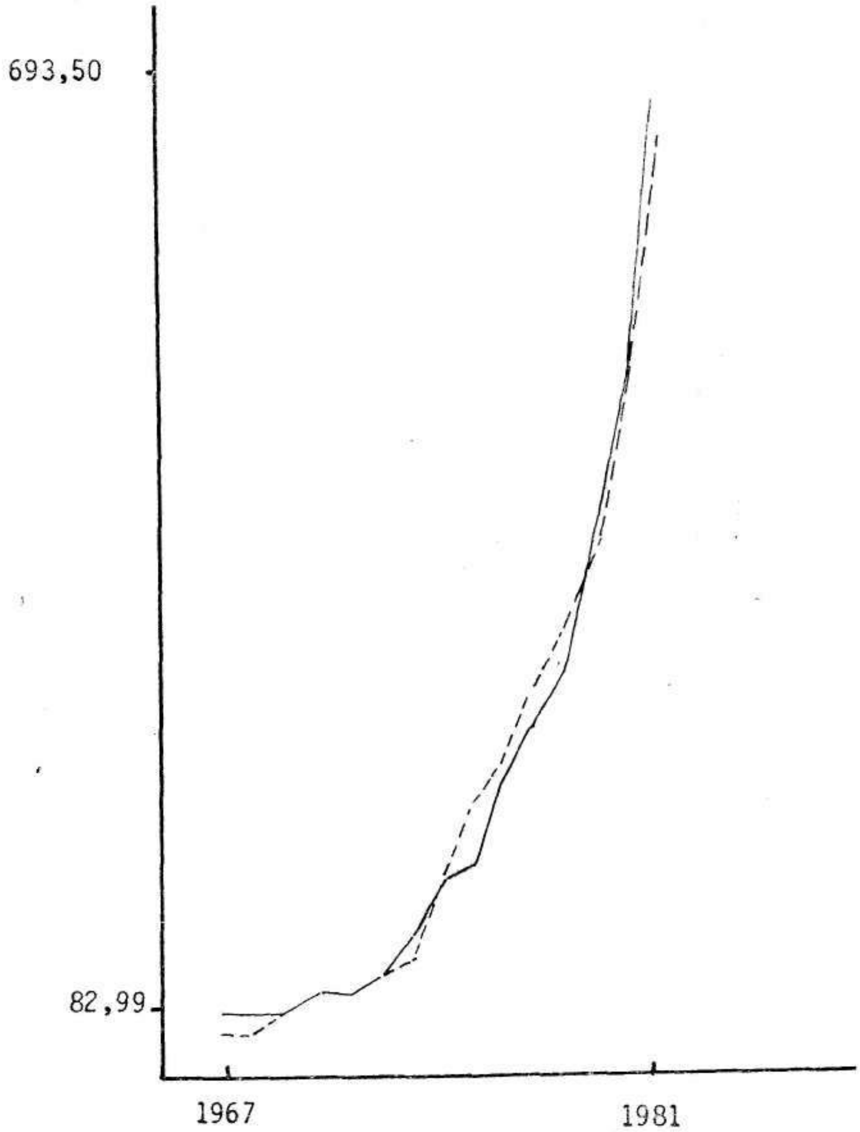
A rise in price, for example, cannot be accompanied by an immediate increase in supply. It is also recognized that current livestock inventories will increase when preferable prices and feed costs are expected.

In addition to its forecasting ability the simulated model is particularly useful, when forming a fiscal policy.

We can analyse the results of a possible policy by examining the dynamic multipliers. In tables (5.3) and (5.4) we present the multipliers of the endogenous variables of our model, which are due to disturbances in the exogenous variable of the general price index that farmers pay. In diagr. 5:4 - 5.9 we present graphically these multipliers.

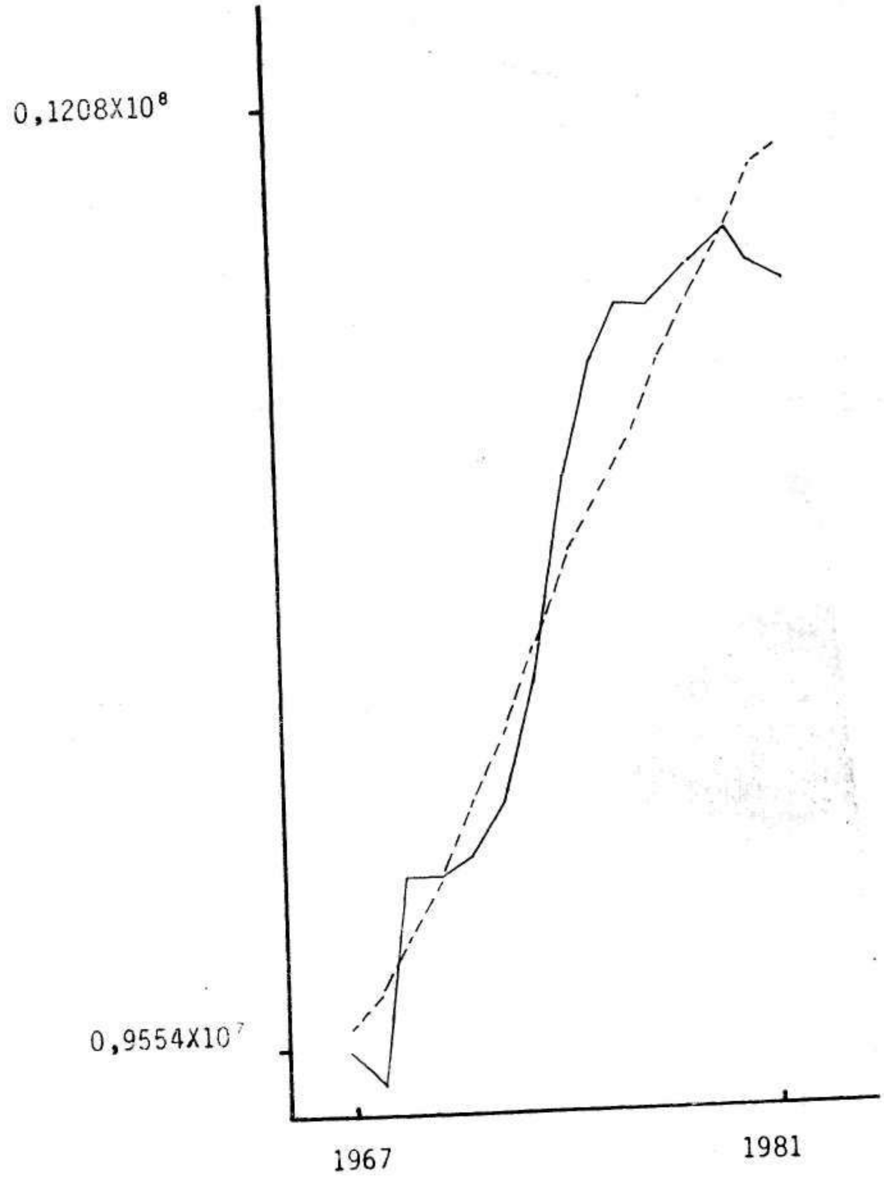
(DIAGR. 5.1)

Received farmers' prices of bovines



(DIAGR. 5.2)

Received farmer's prices of lamps-sheep-goats



(DIAGR. 5.3)

Supply meat of lamps-sheep goats

The disturbances refer firstly to the PZ increase, of 5 %, for the year 1967 only (table 5.3) and secondly to a similar increase but for the whole time series of PZ (table 5.4)

With the dynamic multipliers, we can examine the behavior of the model and forecast the change of its variables.

For examble, an increase in PZ, will result into an increase of lamp-sheep-goats prices received by farmers', decrease of livestock inventory and supply of lamps-sheep-goats, and into an increase of Bovines prices received by farmers.

Finally, we can say that the present econometric model for the behavior of supply for livestock and red meat, quite satisfactory and can be used either for forecasting the variables involved or for making nany policy predictions.

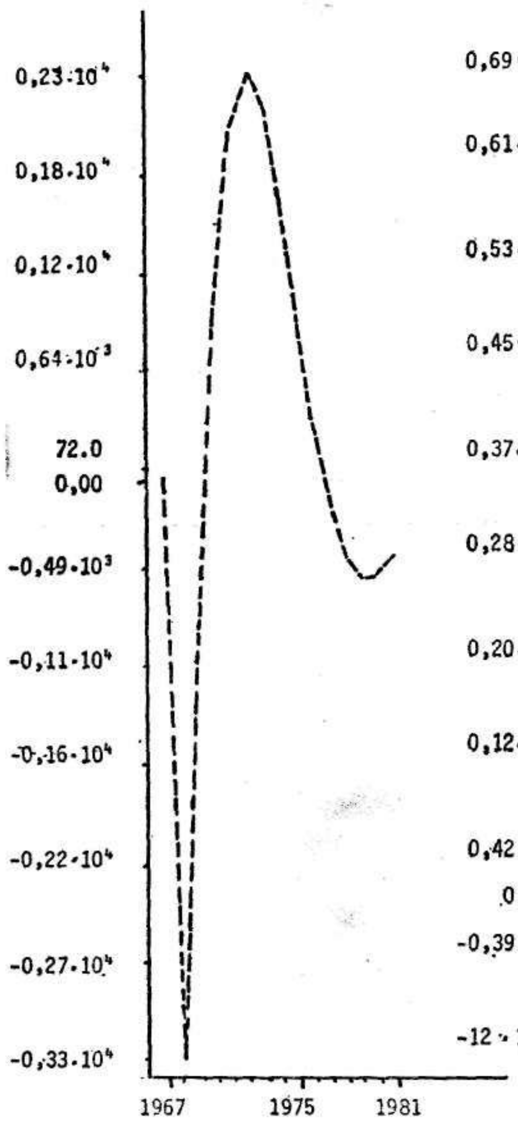
TABLE 5.3
Dynamic multipliers. Continuous increase of PZ, 5%

Year	S_1	Z_1	P_1	S_2	Z_2	P_2
1967	0	-14150	3,7931	0	-14400	8,7889
1968	-6782	-10910	5,8763	-11390	-16400	8,6042
1969	-5233	-5280	7,303	-12960	-17900	8,7094
1970	-2533	1000	8,038	-16900	-18900	8,8968
1971	483	6680	8,170	-15000	-19700	9,065
1972	3201	10740	7,92	-15600	-20900	9,303
1973	5152	11820	7,812	-16100	-22300	10,317
1974	5668	9210	8,508	-17700	-26800	12.797
1975	4417	7211	9,584	-21200	-30900	14,796
1976	3459	6439	10,869	-24500	-34700	16,487
1977	3087	6125	12,433	-27600	-39100	18,517
1978	2938	7190	14,025	-31000	-43300	20,348
1979	3488	6990	16,154	-34300	-49500	23,516
1980	3355	2902	12,834	-39300	-61200	29,733
1981	1392	-714	24,819	-48600	-75200	37,008

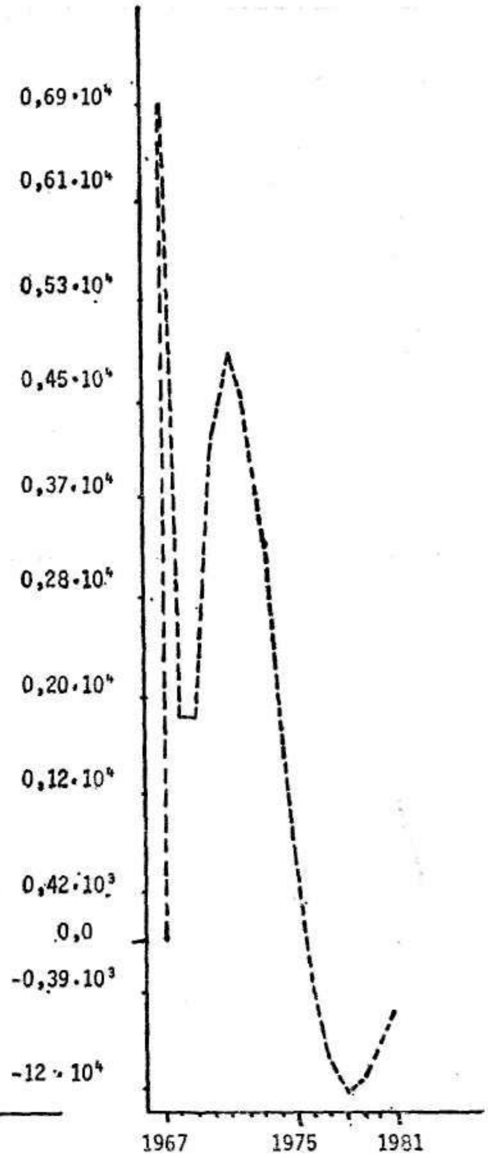
TABLE 5.4

Dynamic multipliers. Instantaneous increase of PZ, 5%

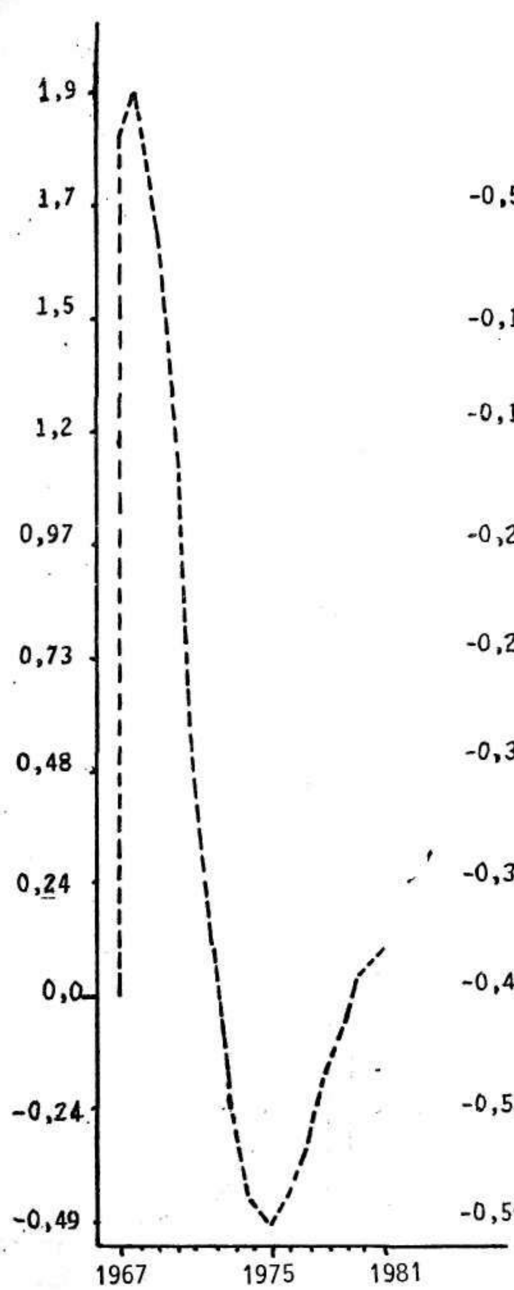
Year	s_1	z_1	p_1	s_2	z_2	p_2
1967	0	6900	1,8504	0	-7000	4,2875
1968	-3309	1860	1,9374	-5560	-4500	2,0441
1969	- 891	1910	1,636	-3540	-2900	1,0133
1970	917	4110	1,128	-230	-1900	0,5242
1971	1974	4850	0,574	-1400	-1200	0,283
1972	2326	4440	0,090	- 900	- 400	0,159
1973	2132	3350	-0,255	- 600	- 500	0,093
1974	1606	1980	-0,442	-400	- 300	0,055
1975	949	683	-0,486	-200	- 100	0,034
1976	327	- 325	-0,427	- 100	- 100	0,020
1977	156	- 949	-0,307	- 100	-100	0,013
1978	-455	-1200	-0,169	0	-100	0,008
1979	-574	-1150	-0,043	- 100	0	0,006
1980	- 548	- 894	0,050	- 100	0	0,004
1981	- 428	-558	0,104	0	0	0,002



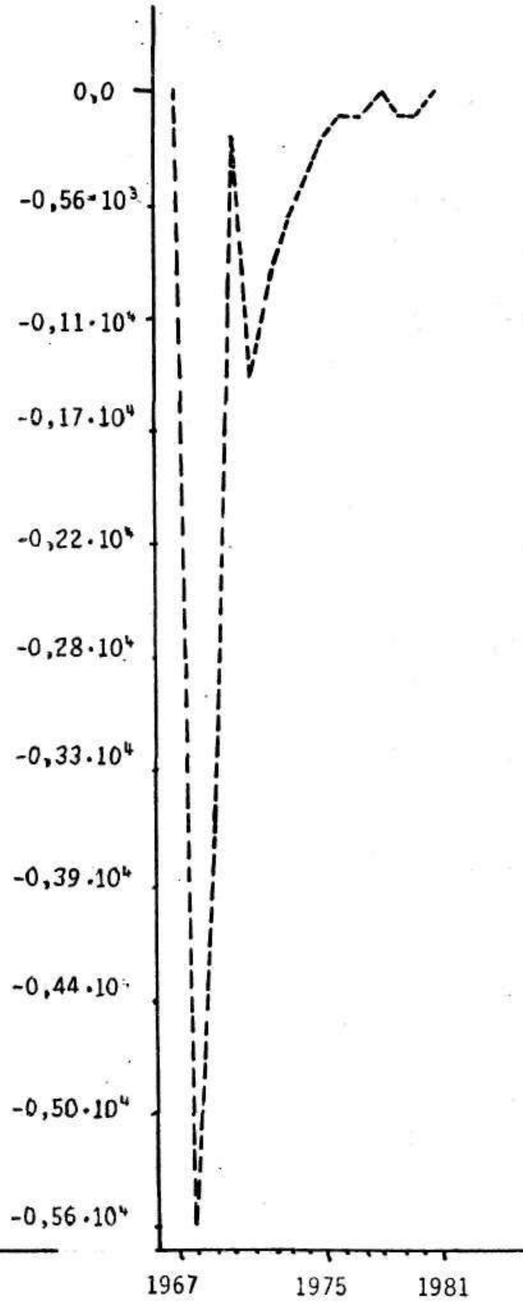
(DIAGR. 5.4
Slaughtered animals (Bovines)



(DIAGR. 5.5)
Livestock capital (Bovines)

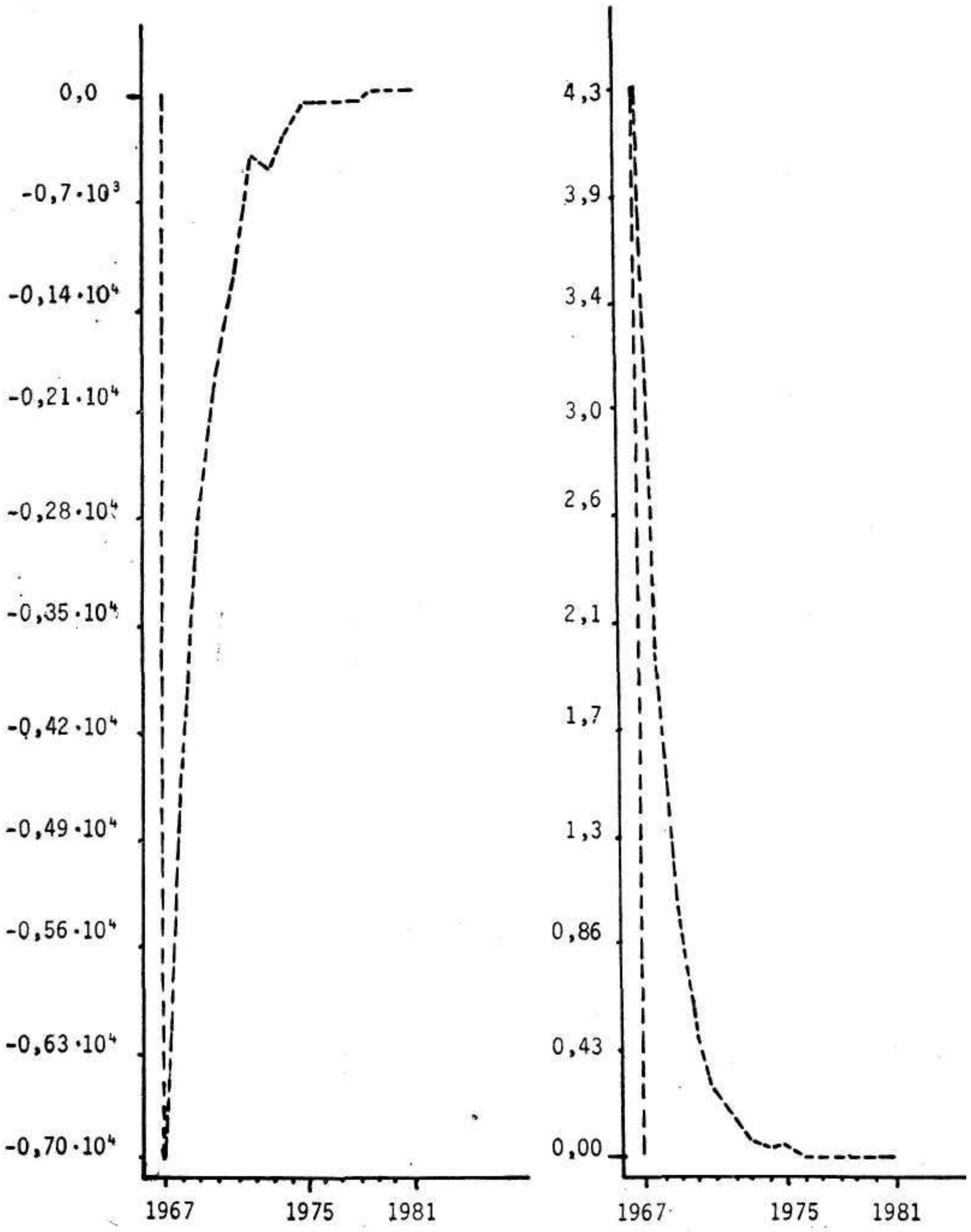


(DIAGR. 5.6)



(DIAGR. 5.7)

Annual indices of prices received by farmers (P_1) Slaughtered animals Lamps Sheep-Goats)



(DIAGR. 5.8) (DIAGR. 5.9)

Livestock capital (Lamps-Sheep-Goats) Annual incices of prices received by farmers (P_2)

Β Ι Β Λ Ι Ο Γ Ρ Α Φ Ι Α

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