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INFLUENCE OF FOOD ON THE BIRTH RATE OF THE POPULATION IN THE REPUBLIC OF MACEDONIA

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Abstract

In the hierarchy of needs, food is the most important, while the people with their existence, knowledge, skills and creativity are irreplaceable realizators of the success of any activity, any enterprise and any country.

Statistical data indicate that during the last two or three decades the birth rate in the Republic of Macedonia has declined. The most significant biological factors show that in 1981 the number of live births in Republic of Macedonia was 39,488, in 2001 it was 27,010 and in 2011 the number of live births was 22,270. On the other hand, the area of cultivated land is declining; in 1981 it was 644 thousand hectares, in 2001 - 612 thousand hectares and in 2011 - 511 thousand hectares. According to the data of the State Statistical Office, the total number of livestock decreased; in 1981 it was 431 thousand heads, in 2001-274 thousand heads and in 2011 - 296 thousand heads of livestock. Hence, the data show that in the last decades the number of newborn children has been continuously declining and at the same time the area of cultivated land and the number of livestock have been decreasing. The coefficients of the correlation between cultivated land and birth rate on the one hand, and between livestock and birth rate on the other are quite high. The correlation coefficients are r = 0.87 and r = 0.86 respectively, while the determinations of these variables are 76% and 74%.

This paper will discuss the development trends of some vegetable crops, as they are: wheat, corn and grapes, as well as some animal products, such as: cow's milk, meat and eggs and their impact on population growth.In the empirical part we use VECM model, to investigate cointegration relationship between variables.

***Key words**: Food, Crop and Animal Production, Birth rate, Correlation, Population.*

1. Introduction

Worrying situation of population growth, is causing us to do deeper analyzis of the impact of individual factors, to realize their trend development and their correlativity with birth rate.

From that aspect is analyzed development trends and dependencies with birth rate with vegetable crops: wheat, corn and grapes, as well as animal products: cow's milk, meat and eggs.

Development trends show a general reduction of arable land and the cattle herds conditional or separately it is detected reduction of production of grapes, meat and eggs, and increased production of wheat, corn and cow's milk in the Republic. Macedonia.

On the other hand, the birth of population and further decrease. Correlation dependence is expressed quite high and the cultivated area with the livestock and their correlation coefficient is 0, 87 and 0.86

In this paper, through tabular, graphical and analysis and estimations we are showing the trends and their correlation dependence.

2. Materials and Methods

We use data that are taken from the Statistical Yearbook of the Bureau of Statistics for 1990 – 2013 [12], the Republic of Macedonia, and covered are the time series from 1981 to 2011. First we graphically depict time series, and trends, later we employ Vector error correction model analysis (VECM).

We seek evidence that the variables are cointegrated. Once we find evidence of cointegration between the variables, we specify any vector correspondent model for correction of equilibrium deviation (error) VECM (Vector error correction model), which is applied in testing the models containing more than one endogenous variables. Engle and Granger [2] in their paper

provided a solid theoretical foundation for modeling and estimation of non-stationary cointegrated time series. Some authors suggest that the odds of Engle and Granger, long term estimated parameters by the method of least squares are consistent and highly efficient (they have a small standard deviation) [2]. This is formally proven in the estimations of VECM models that are given below. Johansen [3 and 4] and Johansen and Juselius [5], introduced a systematic approach, and the main advantage of the Johansen method of maximum likelihood (ML), is that allows determining the number of cointegrating (long-term) relationships between variables. The information criteria for the number of lags to use Hannan-Quinn criterion, which provides most consistent results. Unlike him information Akaike criterion (AIC), has a feature to overestimate optimal order of lags. Saikonen [10], proposed a new asymptotic efficient estimator, which is known as Saikonen Lutkepol method for cointegration, and the idea behind it is to remove the inefficiencies asymptotically estimated coefficients by the least squares method.

3. Results and Discussion

3.1 Birth rate and the food

People with their existence, knowledge, skills and creativity are indispensable implementers of the success of each activity, each organizational entity and each country [1].

So today has been given special attention, and even development of specific scientific disciplines for their analysis, research and forecasting.

But these conditions indicate that the birth rate from year on year declines with some fluctuations and it is predicted that this trend will continue to decline in the future.

In fact these conditions of the declining of birth rate are more than worrying. Such Balance is dictated by a number of factors that act directly and indirectly, i.e. long-term and short-term and can be divided into three groups: biological, economic, social and psychological.

In those many factors, however, food is the first, in hierarchical order to meet the needs of people. While many make the food products of plant and animal origin in the area of labour is only analyzed the impact of the production of wheat, corn, grapes, meat, cow's milk and eggs for a period of 30 years.

In this regard, it can be concluded that the cultivated area where crops are planted decrease, so in 1981 the same was around 644 thousand hectares in 2001 about 612 thousand hectares, and in 2011 about 511 thousand hectares, with forecasts show further decline.

Seen from the aspect of animal production, it can be said that the number of live stock drops, that in 1981 there were about 431 thousand heads suspended in 2001 about 274 thousand, and in 2011 about 296 thousand throats conditional livestock, and forecasts show further decline.

Most significant biological factors show that in 1981 the number of live births was 39,488, and in 2001 were 27,010, while in 2011 the number of live births was 22,770.

So, the data show that the number of children born decades continuously decreases, and thus decrease the cultivated area and the livestock. Most significant biological factors show that in 1981 the population of the Republic. Macedonia was 1,909,136 people, while the number of live births was 39,784, and in 1990 the population of the Republic. Macedonia was 2,028,000 people, while the number of live births was 35,401.

In the next decade, ie in 2000, the population of the Republic. Macedonia was 2,026,000 people, while the number of live births was 29,308, and in 2010 the population of the Republic. Macedonia was 2,055,000 people, while the number of live births was 24,296.

So, the data show that the number of children born decades continuously declining and it is likely that in the coming years will continue to decline (Table 1).

Table 1. Birth rate, Arable land agricultural cultures, livestock in R. Macedonia 1981-2011 [11]

Year	Birth rate		Arable land agricultural cultures		Livestock	
	In numbers	Base indices base:1981 in %	In thousand hectares	Base indices base:1981 in %	In thousands livestock	Base indices base:1981 in %
1981	39.488	100%	644	100%	431	100%
1982	39.789	101%	638	99%	377	87%
1983	39.210	99%	660	102%	378	88%
1984	38.861	98%	662	103%	402	93%
1985	38.722	98%	665	103%	369	86%
1986	38.234	97%	666	103%	338	78%
1987	38.572	98%	665	103%	332	77%
1988	37.879	96%	665	103%	336	78%
1989	35.927	91%	668	104%	336	78%
1990	35.401	90%	666	103%	340	79%
1991	34.830	88%	664	103%	325	75%
1992	33.238	84%	662	103%	329	76%
1993	32.374	82%	663	103%	330	77%
1994	33.487	85%	661	103%	334	77%
1995	32.154	81%	656	102%	300	70%
1996	31.403	80%	658	102%	337	78%
1997	29.478	75%	647	100%	319	74%
1998	29.244	74%	635	99%	311	72%
1999	27.309	69%	633	98%	287	67%
2000	29.308	74%	598	93%	319	74%
2001	27.010	68%	612	95%	274	64%
2002	27.761	70%	577	90%	273	63%
2003	27.011	68%	569	88%	282	65%
2004	23.361	59%	560	87%	283	66%
2005	22.482	57%	546	85%	276	64%
2006	22.585	57%	537	83%	286	66%
2007	22.688	57%	526	82%	289	67%
2008	22.945	58%	521	81%	289	67%
2009	23.684	60%	513	80%	284	66%
2010	24.296	62%	509	79%	292	68%
2011	22.770	58%	511	79%	296	69%

Forecast

2013	19.749	50%	519	81%	257	60%
2014	19.086	48%	513	80%	253	59%
2015	18.423	47%	507	79%	249	58%
2016	17.760	45%	502	78%	246	57%
2017	17.097	43%	496	77%	242	56%

Representations of these variables are shown in Figures from 1 to 3 as follows.

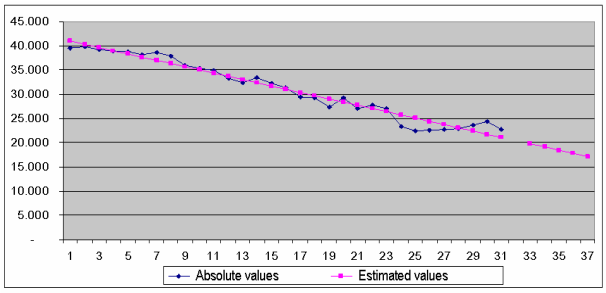

Figure 1. The development trend of the birth rate of the population of the Republic of Macedonia

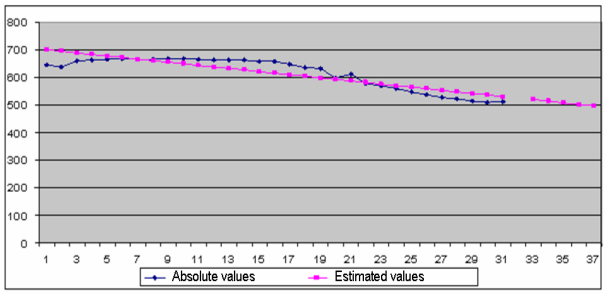

Figure 2. The development trend of processed arable land in thousands of acres in Macedonia

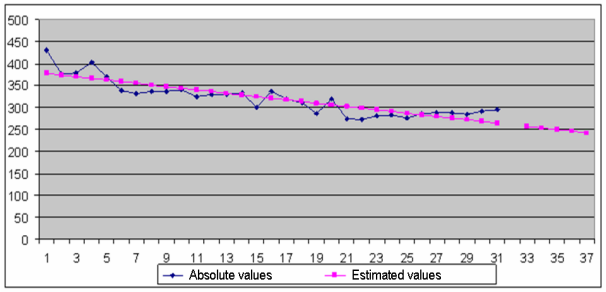

Figure 3. The development trend of cattle per thousand throats in R. Macedonia

These general indications for birth and its reliance on food-products derived from the production of vegetable crops showing through arable land show that the development trends and the birth rate and arable land are declining.

By analyzing these two varijablise gets high correlation coefficient of 0,87 (R = 0,87) and high indices of determination 76% (D, ie R^2 = 76%).

Similar dependencies are obtained between birth variables and conditional heads of cattle. That there is a correlation coefficient of 0,86 (R = 0,86) and the ratio of impact or the determination was 74% (D, ie R^2 = 74%).

The general conclusion from the calculations of simple and multiple correlation is that there is high interdependence between the variables of birth, arable land and livestock of cattle.

3.2 Developmental trends in production of wheat corn and grapes and their correlative dependence with population growth

Development trends in the production of wheat, corn and grapes, show that in the past thirty years, their production oscillates through reduction and increased (Table 2).

Table 2. Production trends: wheat, corn and grape in R. Macedonia 1981-2011 [11]

Year	Wheat production		Corn production		Grape production	
	In tons	Base indices base:1981 in %	In tons	Base indices base:1981 in %	In tons	Base indices base:1981 in %
1981	235.730	100%	91.520	100%	316.422	100%
1982	272.408	116%	92.878	101%	353.397	112%
1983	245.566	104%	98.992	108%	307.054	97%
1984	267.719	114%	88.795	97%	305.316	96%
1985	288.455	122%	79.194	87%	200.758	63%
1986	314.655	133%	123.627	135%	303.581	96%
1987	292.228	124%	95.419	104%	277.418	88%
1988	295.397	125%	73.956	81%	236.451	75%
1989	313.752	133%	136.700	149%	199.298	63%
1990	231.392	98%	79.543	87%	192.807	61%
1991	340.747	145%	134.958	147%	264.281	84%
1992	299.522	127%	130.259	142%	264.614	84%
1993	249.789	106%	101.063	110%	127.992	40%
1994	336.133	143%	133.211	146%	205.486	65%
1995	381.226	162%	165.652	181%	190.677	60%
1996	269.303	114%	142.421	156%	214.513	68%
1997	293.762	125%	157.234	172%	258.360	82%
1998	336.562	143%	140.949	154%	243.567	77%
1999	319.419	136%	160.550	175%	230.104	73%
2000	299.356	127%	125.383	137%	264.256	84%
2001	246.208	104%	117.070	128%	229.805	73%
2002	266.961	113%	140.694	154%	118.935	38%
2003	225.300	96%	136.492	149%	243.821	77%
2004	356.825	151%	141.875	155%	254.613	80%
2005	333.880	142%	148.234	162%	265.717	84%
2006	293.326	124%	147.494	161%	254.308	80%
2007	218.076	93%	118.378	129%	209.701	66%
2008	291.719	124%	127.125	139%	236.834	75%
2009	271.117	115%	154.237	169%	253.456	80%
2010	243.137	103%	129.045	141%	253.372	80%
2011	256.103	109%	126.096	138%	235.104	74%

Forecast

2013	284.156	121%	153.646	168%	212.517	67%
2014	284.010	120%	155.293	170%	210.763	67%
2015	283.864	120%	157.041	172%	209.010	66%
2016	283.718	120%	158.788	174%	207.257	66%
2017	283.572	120%	160.535	175%	205.503	65%

Development trends for investigated crops are given in separate Figures from 4 to 6:

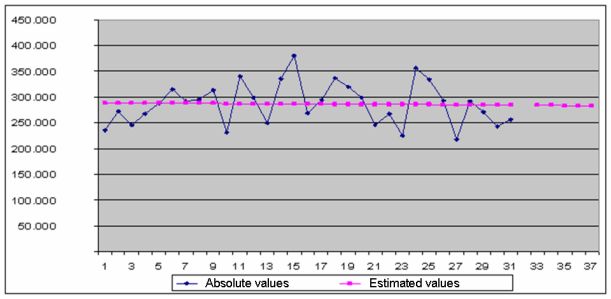

Figure 4. The development trend of wheat production in the Republic of Macedonia

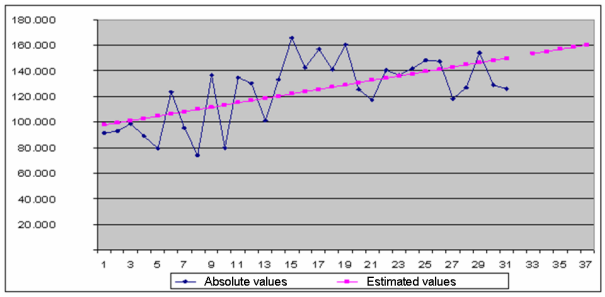

Figure 5. The development trend of production of maize in the Republic of Macedonia

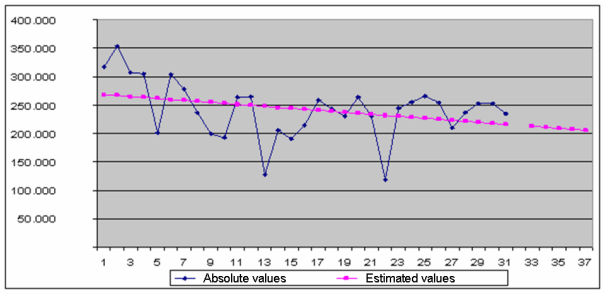

Figure 6. The development trend of grape production in the Republic of Macedonia

Tabular and graphic displays show that production in individual crops is different while production of wheat shows a more stable level of production of maize has increased, while, in the production of grapes to decrease. The coefficients of correlation between population growth and the production of certain crops is very weak and insignificant. On the other hand, the situation with the development trends of the production of animal products show their reduction in the production of meat and eggs, while the production of cow's milk increases (Table 3)

Table 3. Production trends: meat, cow's milk and eggs in the Republic. Macedonia [11]

Year	Meat production		Cow milk production		Eggs production	
	In tons	Base indices base:1981 in %	In thousand litters	Base indices base:1981 in %	In thousand numbers	Base indices base:1981 in %
1981	41952	100%	95807	100%	642000	100%
1982	43716	104%	92967	97%	637208	99%
1983	42175	101%	94364	98%	527783	82%
1984	44596	106%	99716	104%	620815	97%
1985	44892	107%	99452	104%	541611	84%
1986	41944	100%	102675	107%	602965	94%
1987	44098	105%	114675	120%	576651	90%
1988	45990	110%	114243	119%	548420	85%
1989	43037	103%	116951	122%	551523	86%
1990	37546	89%	123154	129%	587263	91%
1991	35258	84%	119194	124%	573545	89%
1992	34114	81%	117443	123%	516177	80%
1993	34009	81%	118398	124%	513390	80%
1994	33787	81%	115791	121%	510148	79%
1995	29375	70%	128825	134%	485493	76%
1996	29368	70%	133642	139%	434602	68%
1997	27800	66%	133308	139%	425910	66%
1998	25971	62%	173567	181%	470844	73%
1999	26512	63%	202387	211%	445443	69%
2000	27470	65%	220244	230%	425469	66%
2001	26041	62%	200904	210%	394676	61%
2002	27471	65%	198431	207%	345032	54%
2003	29835	71%	191533	200%	283300	44%
2004	29839	71%	212898	222%	340007	53%
2005	28264	67%	197464	206%	339669	53%
2006	28041	67%	234708	245%	330546	51%
2007	27228	65%	373706	390%	321146	50%
2008	25065	60%	368217	384%	276398	43%
2009	25362	60%	342622	358%	274043	43%
2010	26623	63%	347103	362%	336000	52%
2011	25831	62%	376290	393%	296000	46%

Forecast

2013	20.961	50%	331.907	346%	246.660	38%
2014	20.233	48%	340.879	356%	234.274	36%
2015	19.506	46%	349.852	365%	221.888	35%
2016	18.778	45%	358.824	375%	209.501	33%
2017	18.051	43%	367.796	384%	197.115	31%

For greater clarity will be separately displayed graphical representations of certain animal products i n Figures from 7 to 9 and in Figure 10 will be displayed index indicators of development trends in the production of food products for period 1981 - 2017.

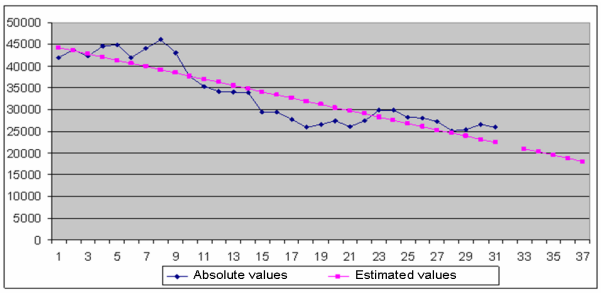

Figure 7. The development trend of meat production in the Republic of Macedonia

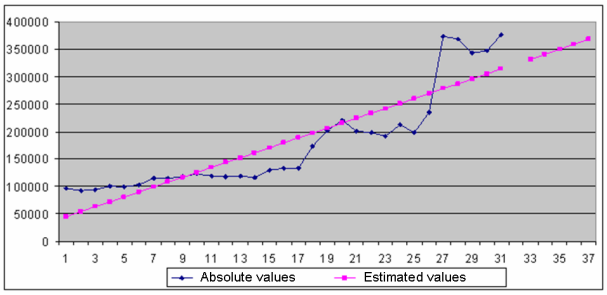

Figure 8. The development trend of production of cow milk in the Republic of Macedonia

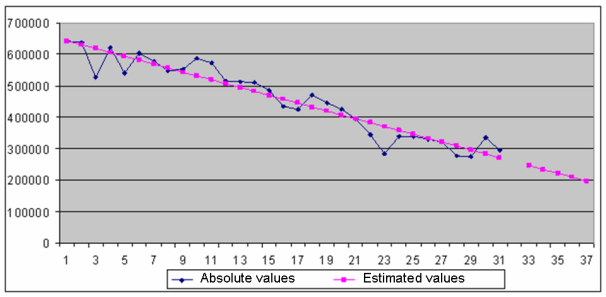

Figure 9. The development trend of eggs production in the Republic of Macedonia

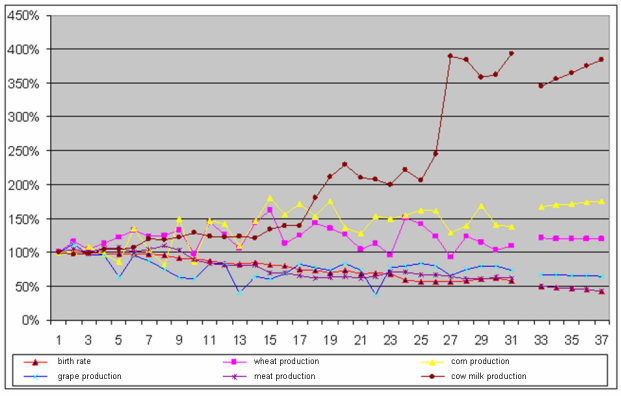

Figure 10. Base index indicators of development trends in the production of foodstuffs, products 1981-2017

The data are taken from the Statistical Yearbook of the Bureau of Statistics for 1990 - 2013, the Republic of Macedonia, and covered the 1981 series in 2011. Or this period covers 31 observations. Series are in logarithms in order to examine their elasticity (%). Time series that are covered include logarithms: of birthrate (birthrate_log), logarithms of arable land (arable_land_log), logarithms of livestock (livestock_log), logarithms of wheat production (wheat_log), logarithm of producing corn (corn_log), logarithms of production of grape (grape_log), logarithms of meat production (meat_log), logarithms of the production of cow milk (cow_milk_log), logarithms of egg production (eggs_log). In addition to test stationarity of the time series, we use the standard Augmented Dickey-Fuller test [1] (Table 4).

Table 4. Augmented Dickey Fuller test for stationarity

Testing/ variables	First difference of the logarithm of birth rate (birthrate _log_log_ d1)	First difference of the logarithm of arable land (arable _land_log_ log_d1)	First difference of the logarithm of livestock (livestock _log_log_ d1)	First difference of the logarithm of wheat production (wheat_log _log_d1)	First difference of the logarithm of на corn production(corn _log_log_d1)
D-F H_0: there is a unit root at some level of significance (the series is not stationary)	-2.1563	-3.7623	-3.5987	-5.4393	-4.1600
Critical value at 5%	-4.9001	-2.0789	-2.3495	-3.2649	-4.9001
Critical value at 5% for Dickey Fuller test	-1.94	-1.94	-1.94	-1.94	-1.94
Critical value at 5%	-1.94	-1.94	-1.94	-1.94	-1.94

While in the tables are reported results when the series is first difference, and in fact for all series, the null hypothesis that the series contains a unit root can be rejected at all levels of statistical significance. The conclusion is that all series are I (1) or integrated of the first order. This conclusion may be confirmed graphically (Figure 11).

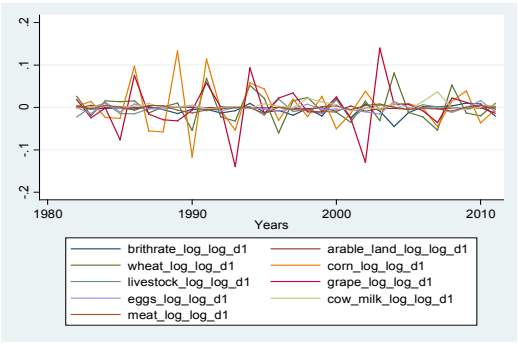

Figure 11. First difference logarithm of the time series

From the last graph we see that all series are stationary and moving around mean zero.

3.3 Vector models for correction of equilibrium deviation (error) (VECM)

The optimal number of lags for the endogenous variables in the VECM model is determined by Hannan-Quinn information criterion. Other criteria are less confidential, or as Akaike information criterion overestimates number of lags. Rank of cointegration: the results of the tests for cointegration birthrate and other variables. On the basis of Johansen test and Saikonen Lutkepohl for all variables we got a result that is cointegrated with birth and continue with the models that contain a one relationship of co-integration (Table 5). For the cointegration between birth rate logarithm (birthrate_log), logarithms of arable land (arable_land_log), logarithms of livestock (livestock_log), Saikonen and Lutkepol [10] test showed that in the case when the constant is included in the relationship of co-integration, the cointegration rank is 1, the same is true when compared to the cointegration included orthogonal trend. While in the case of the Johansen test rc(∏) = 1 is true when we have included constant and trend, and then orthogonal trend p-value is 0.0037, 0.0822, and 0.0272 respectively chance to make a Type 1 error if we reject the null hypothesis that is very low. For the cointegration between logarithm of birth rate, and logarithms of meat production (meat_log), logarithms of the production of cow milk (cow_milk_log), logarithms of egg production (eggs_log), when we have constant and trend terms in the cointegration relation, the test applies that the cointegration rank is 1, i.e. rc(∏) = 1, which means we have enough evidence to reject the null hypothesis rc(∏) = 0. This is according to Johansen test and Saikonen Lutkepohl (1999). The following tables are the specifications of the rank of co-integration between birth and other variables. For the cointegration logarithm of birth rate and between logarithm of grape production, logarithm of wheat production, logarithm of на corn production rc(∏) = 1, applies when we include constant and orthogonal trend p-value is 0.0286 and 0.0743 respectively. While in the Johansen test rc(∏) = 1, applies when we include constant.

Table 5. Specifications rank of co-integration between birth rate and other variables

Variables	Deterministic term	Johansen Trace test			Saikkonen and Lütkhepohl		
		Lag order	LR-stat.	Pvalue	Lag order	LR-stat.	Pvalue
(birthrate_log), (arable_land_log), (livestock_log),	Constant	6	21.55	0.0312	6	31.93	0.0037
	Constant and trend	6	19.34	0.2664	6	14.42	0.0822
	Orthogonal trend	6	14.45	0.0702	6	11.24	0.0272
birthrate_log (meat_log), (cow_milk_log), (eggs_log)	Constant	5	57.51	0.0224	5	25.89	0.0293
	Constant and trend	4	32.52	0.3666	4	17.03	0.6171
	Orthogonal trend	4	22.66	0.2719	4	18.88	0.0940
birthrate_log (wheat_log), (corn_log), (grape_log),	Constant	5	37.16	0.0286	5	24.54	0.0446
	Constant and trend	4	34.81	0.2565	4	20.60	0.3520
	Orthogonal trend	4	28.33	0.0743	4	15.69	0.2233

Estimation of the Vector error correction model

VECM model was estimated with two stage procedure (Two stage procedure (S2S)) and Johansen procedure used in the first stage and feasible generalized squares (Feasible generalized least squares (FGLS)), the second stage. Standard t- tests and F-tests retain their asymptotic features if applied to short-term parameters of VECM model. From the model coefficients are eliminated that have $t < 2$, t stats lower than 2. This is done according to the recommendations of Lutkepohl and Kratzig [7] and Lutkepohl and Kratzig [8]. Coefficients of normalized vectors (*Loading coefficients*), their t statistics can be interpreted in the usual way according estimated coefficients of co-integration. Their significance is explained in the following table for the VECM model (Table 6). *Vectors of co-integration*, thus because we chose to birth rate for a dependent variable, means that the coefficient of this variable in terms cointegration relation will be normalized to 1, in the procedure of maximum likelihood estimation.

Table 6. VECM estimation and interpretation

Cointegration vector	Interpretation of the cointegration vector	Coefficient of the normalized cointegrating vectors (t-stats) and interpretation	Deterministic variables influence	Optimal number of lags in endogenous variables
$\log birthrate_t = 0.407 \log arableland_t + e_t^{fgls}$ (−3.235)	1% increase in the arable land will increase the birth rate by 0.407%	t-statistics of the three equations [-7311] [3109] [-4265]] indicates that they fall significantly in cointegration	Trend and constant are not significant in any of the three equations	2
$\log birthrate_t = -0.853 \lg dlivestock_t + e_t^{fgls}$ (4.165)	1% increase in the live stock will decrease the birth rate by 0853%	t-statistics of the three equations [-7311] [3109] [-4265]] indicates that they fall significantly in cointegration	Trend and constant are not significant in any of the three equations	2
$\log birtrate_t = 0.893 \log wheat_t + e_t^{fgls}$ (-33.679)	1% increase in wheat production in tons will increase the birth rate by 0893%	t-statistics of the four equations [-2.808] [3.871] [-2.060] [0.378]] indicates that they fall significantly in cointegration	Trend and constant are not significant in any of the four equations	4
$\log birthrate_t = -0.234 \quad logpcorn_t + e_t^{fgls}$ (3 .302)	1% increase in production of corn will reduce the birth rate of 0.234%	t-statistics of the four equations [-2.808] [3.871] [-2.060] [0.378]] indicates that they fall significantly in cointegration	Trend and constant are not significant in any of the four equations	4
$\log birhrate_t = -0.078 \quad loggrape_t + e_t^{fgls}$ (3.332)	1% increase in grape production in tons will reduce the birth rate by 0.078%	t-statistics of the four equations [-2.808] [3.871] [-2.060] [0.378]] indicates that they fall significantly in cointegration	Trend and constant are not significant in any of the four equations	4
$\log birthrate_t = 0.054 \log meat_t + e_t^{fgls}$ (-6.027)	1% increase in meat production in tons will increase the birth rate by 0.054%	t-statistics of the first equation [-10,930]] indicates that it enters significantly in cointegration, the other three equations are not sginifikantni.	Trend and constant are not significant in any of the four equations	4
$\log birthrate_t = 0.044 \quad logmilk_t + e_t^{fgls}$ (−4.469)	1% increase in production of cow milk will increase in the birth rate by 0.044%	t-statistics of the first equation [-10,930]] indicates that it enters significantly in cointegration, the other three equations are not sginifikantni.	Trend and constant are not significant in any of the four equations	4
$\log birthrate_t = 0.562 \quad logeggs_t + e_t^{fgls}$ (−4.469)	1% increase in egg production will increase the birth rate by 0562%	t-statistics of the first equation [-10,930]] indicates that it enters significantly in cointegration, the other three equations are not sginifikantni.	Trend and constant are not significant in any of the four equations	4

From the above table we see that there is a twofold relation of cointegration between birth rate, arable land and number of livestock. So there is two-way causality between variables mentioned with birth rate. The same conclusion applies when we examine cointegration between birth rate, wheat, corn and grapes. So, there is a bilateral causal relationship.

While in the case of produced milk, meat and eggs direction of causality is from birth to other variables. This is to be expected, since population growth (birth rate) influence the increase of consumption (and hence production) of meat, milk and eggs. Next, we represent diagnostic models (Table 7).

Table 7. VECM models diagnostics

Type of tests	p-value of the model(birthrate_ log), (arable_ land_log), (livestock_log),	p-value of the model birthrate_ log (meat_log), (cow_milk_log), (eggs_log)	p-value of the model birthrate_ log (wheat_log), (corn_log), (grape_log)
VECM model statistics	0.6923 (√)	0.6933 (√)	0.2567 (√)
LM autocorrelation test	0.7821 (√)	0.3909 (√)	0.3909 (√)
Dornik and Hansen (1994)	0.1254 (√)	0.7347 (√)	0.0170 (√)
Lütkepohl (1993)	0.1135 (√)	0.8916 (√)	0.0878 (√)

Note: √ indicates that there are no problems with diagnosis; x shows that there are some problems with diagnosis.

The previous tables for the diagnosis models we cannot reject the null hypothesis that the restricted model has a better presentation of the unrestricted VECM model. Statistics patterns respectively are: 0.6923, 0.6933, and 0.2567. Autocorrelation, which is important in the analysis of time series, is not a problem in any of the models.

4. Conclusions

- Demographic changes indicate that the birth rate of the population in Macedonia and surrounding countries in the last thirty years shows a downward trend. Thus, the number of live births in Macedonia in 2011 decreased by 43% compared to 1981.
- In order to provide better competitive position, companies need to continuously adapt its marketing strategy in line with demographic changes.
- Demographic changes in R. of Macedonia and its environment is particularly manifested in reducing population growth and increasing life expectancy. According to forecast expected that in the later period the average life expectancy will increase.
- According to the above results, we conclude those cointegration terms of a bilateral birth of arable land and number of cattle.
- The same conclusion applies when we examine cointegration between births, wheat, corn and grapes. While in the case of produced milk, meat and eggs direction of causality is from birth to other variables.
- Based on the results we can decide to favor long-term causal relations. While the short-run series are not statistically significantly associated in the short term. According to Lemos [6], the researcher's conclusions about causality depend on the length of the sample, the number of explanatory variables etc. So, we have to be cautious about the results from our paper, and in the future we can amend our paper by introducing more data into analysis.

5. References

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