

ELASTICITY OF APPLE PRICE DEPENDING ON OFFER IN ROMANIA

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Abstract

The paper aimed to analyze the elasticity of apple price in close relationship to apple output in Romania based on the empirical data provided by the National Institute of Statistics for the period 2007-2015. Apple price increased by 19.7 % from Lei 2,230 per ton in 2007 to Lei 2,670 per ton in 2016, while apple production declined by 1.8 % from 475.4 thousand tons in 2007 to 467.3 thousand tons in 2016. The elasticity was determined in two variants: (V1) the year 2007 being term of reference, and V2, all the years were considered term of reference one by one. The coefficients of elasticity showed that apple production has a deep impact of apple price. In case of V1, in six years (2008, 2010, 2012, 2013, 2014, and 2015), the apple price was very elastic, while in two years (2009 and 2011), it was relatively elastic in relation to the change in apple production. In case of V2, in three years (2008, 2011 and 2014), the apple price was very elastic, in other three years (2010, 2013 and 2015), it was relatively elastic, in one year (2009), it looked to be unitary and in one year (2012), it looked to move to perfect inelastic. All these results, confirmed the H_0 hypothesis that the variation of apple production leads to apple price volatility. As a consequence, apple tree growers must create associations which are the only chance to reduce the expenses for farm inputs, to increase apple production and quality, to keep under control production cost, to store the production for a longer period of time to protect it against hail and degradation, to preserve it in the best conditions and to deliver it in the market at a higher price in the periods when the offer will be lower. In this way, they apple production will have a better impact on price and farmers could get a higher profit.

Key words: apple price, apple production, coefficient of elasticity, Romania

INTRODUCTION

Apples are the most important fruit in Romania's market due to consumer's preferences for its special taste and flavor, nutritive and therapeutic properties given by its chemical composition, and the possibilities of preservation for a long period of time from summer to next spring under peculiar storage conditions (temperature, hygiene, humidity, cleanliness, light etc) [1, 3, 6].

Apple consumption has continuously increased, for example, only in the period 2010-2014, it has grown by 12 %, being at present of 25.2 kg/inhabitant.year. Apples are on the top position among other fruits. Of the annual consumption/inhabitant of about 76.3 kg fruits, apple consumption represents 33 % [9].

Apple production like in case of other fruit output, has annual variations due to a large range of factors, among the major ones being:

climate change, the used apple tree varieties, technological factors.

The seasonality of apples is lower compared to other fruits produced in Romania such as cherries, strawberries, apricots, peaches, melons and grapes.

Apples are among the perishable fruits, but their loss of weight and qualitative degenerations are reduced than in case of pears, plums and grapes and could be successfully avoided by a corresponding conservation in climatized storages.

Apple production has a deep influence on apple price both at farm gate and at the consumer level. Each variation in apples output from a year to another determines changes in a way or another in apple price.

Apple production has recorded a decline during the last decade, due to the reduction of the surface covered with apple trees orchards and of the number of grown trees [2].

For this reason, apple production is not enough to cover consumer's needs, which justify the import of apples [8].

The relationship between production and price is very strong. In order to analyze the measure in which apple price responds to production change, the economists have set up the coefficient of elasticity [5, 10].

The elasticity of apple price depends on apple output and it reflects the change in price according to the change in production (offer) in the market [4].

In this context, the paper aimed to analyze the elasticity of apple price based on the variation of apple production in Romania in the last ten year, 2007-2016 in order to establish in what measure apple price was influenced by production. Therefore, the H_0 hypothesis taken which has to be checked in this study is that the variation of apple production leads to apple price volatility.

MATERIALS AND METHODS

The paper is based on the empirical data regarding apple production and apple price provided by the National institute of Statistics, Tempo-online Data Base for the period 2007-2016.

The data were analyzed using statistical methods in order to establish the main parameters such as: mean, standard error, standard deviation, coefficient of variation, and regression.

The coefficient of elasticity (E_Y) was determined using the formula:

$$E_Y = \frac{\Delta Y\%}{\Delta X\%} = \frac{\frac{\Delta Y_i}{Y_0}}{\frac{\Delta X_i}{X_0}} = \frac{\Delta Y}{\Delta X} \cdot \frac{X_0}{Y_0}$$

where:

$\Delta Y\%$ is the percentage deviation of apple price, $\Delta X\%$ is the percentage deviation of apple production, $\frac{\Delta Y}{\Delta X} = 1/\text{tangent slope to price curve}$, and X_0, Y_0 represents the point of the price curve where elasticity was computed.

The coefficient of elasticity (E_Y) was determined for two variants as follows: (V_1) where the year 2007 was considered as term of reference and (V_2) where each value of the

chronological series was considered, one by one, term of reference or fixed basis.

The results were presented in tables and graphics to illustrate the them much better.

RESULTS AND DISCUSSIONS

The evolution of apple price.

Apple price has varied from a year to another, but the general trend was an ascending one from Lei 2,230 per ton in 2007 to Lei 2,670 per ton in 2016. In the year 2010 it was recorded the lowest apple price (Lei 2,160 per ton), and the highest price was Lei 2,790 per ton in the year 2013(Fig.1.).

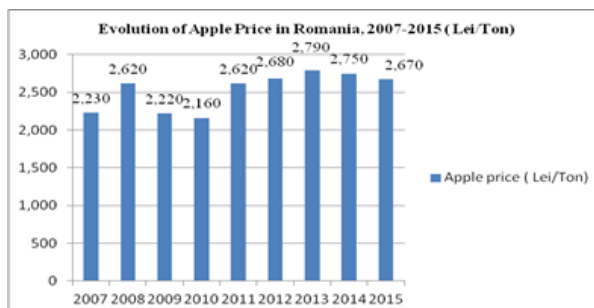


Fig.1.The evolution of average apple price in Romania, 2007-2015 (Lei/Ton)

Source: Own design based the data provided by the National Institute of Statistics, Tempo online, 2017[7].

The evolution of apple production.

Apple production varied between 475.4 thousand tons in the year 2007 and 467.3 thousand tons in the year 2016.

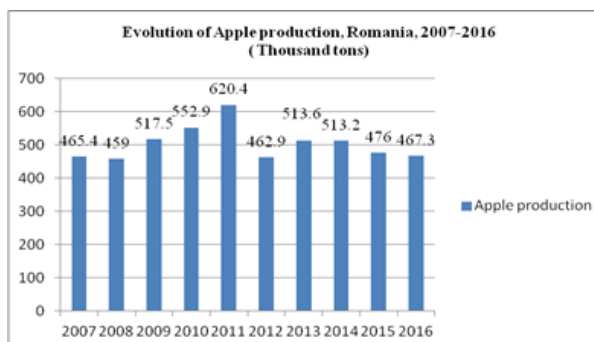


Fig.2.The evolution of apple production in Romania, 2007-2016 (Thousand tons)

Source: Own design based the data provided by the National Institute of Statistics, Tempo online, 2017[7].

Therefore, the general trend was a declining one determined by the reduction of the surface covered by apple tree orchards and the number

of apple trees. The top production was noticed in the year 2011 (620.4 thousand tons) and the lowest performance in the year 2012 (462.9 thousand tons) (Fig.2).

The descriptive statistics for apple price and apple production is presented in Table 1.

The mean value for apple price was Lei 2,526.66 per ton and for apple production 504.82 Thousand tons for the whole analyzed period. The variation coefficients had low values reflecting that the data were closely arranged around the average value of the both indicators (Table 1).

Table 1. Descriptive statistics for apple price and apple production, Romania, 2007-2015

Parameter	Apple price	Apple production
Mean	2,526.66	504.82
Standard error	83.09	16.22
Standard deviation	249.29	51.23
Minimum	2,160	459
Maximum	2,790	620.4
Coefficient of variation (%)	9.86	10.14

Source: Own computation based the data provided by the National Institute of Statistics, Tempo online, 2017[7].

Table 1.Coefficients of elasticity for apple price depending on apple production in case of V1

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Apple price (Lei/Ton)	2,230	2,620	2,220	2,160	2,620	2,680	2,790	2,750	2,670
$\frac{\Delta Y_i - \Delta Y_0}{Y_0}$	0	0.174	-0.004	-0.031	0.174	0.201	0.251	0.233	0.197
Apple production (Thousand tons)	475.4	459	517.5	552.9	620.4	462.9	513.6	513.2	476
$\frac{\Delta X_i - \Delta X_0}{X_0}$	0	-0.034	0.088	0.163	0.305	0.026	0.080	0.079	0.001
E_Y	-	-5.11	-0.05	-0.19	0.57	7.67	3.12	2.93	156.1

Source: Own computation based the data provided by the National Institute of Statistics, Tempo online, 2017[7].

The coefficients of elasticity of apple price depending on apple production in case of V1, 2007 being considered as term of reference are presented in Table 1.

In the year 2008, the coefficient of elasticity, $E_Y = -5.11$ reflected that a small change in apple production caused a relatively high change in apple price. Therefore, the price was *very elastic*. In other words, if production declines by 1 %, the apple price will increase by 5.18 %.

In 2009, $E_Y = -0.051$ showing that apple price was *relatively elastic*, as a change of 1 % in production determined a very small change of the apple price.

In 2010, $E_Y = -0.193$ reflected the trend of the apple price to become *more elastic* for a change of 1 % in apple production.

In 2011, $E_Y = 0.573$ suggested that both the price and production went in the same direction, a change of 1 % in apple production determined a low variation in apple price,

therefore, the price looked to become *relatively elastic*.

In 2012, $E_Y = 7.674$ meaning that the price was *very elastic*. For an increase of 1% in apple production, apple price will increase by 7.67 %.

In 2013, $E_Y = 3.125$ reflected the same situation like in 2012, i.e. for an increase of 1 % in case of production, apple price will raise by 3.12 %. The price was *very elastic*.

In 2014, $E_Y = 2.93$ showing a similar situation like in 2013, if production would grow by 1 %, apple price would also move in the same direction increasing by 2.93 %. The price was *very elastic*.

In 2015, $E_Y = 156.1$ reflected a *very elastic* price in relation to apple output.

The coefficients of elasticity of apple price depending on apple production in case of V2, each year being considered term of reference, one by one. The results are presented in Table 2.

Table 2. Coefficients of elasticity for apple price depending on apple production in case of V2

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Apple price (Lei/Ton)	2,230	2,620	2,220	2,160	2,620	2,680	2,790	2,750	2,670
$\frac{\Delta Y_i - \Delta Y_0}{Y_0}$	0	0.174	-0.152	-0.027	0.212	0.023	0.041	0.014	-0.029
Apple production (Thousand tons)	475.4	459	517.5	552.9	620.4	462.9	513.6	513.2	476
$\frac{\Delta X_i - \Delta X_0}{X_0}$	0	0.034	0.127	0.068	0.122	-0.253	0.109	-0.0007	-0.072
E_Y	-	5.11	-1.19	-0.39	1.73	-0.09	0.37	-20	0.40

Source: Own computation based the data provided by the National Institute of Statistics, Tempo online, 2017[7].

In 2008, $E_Y = 5.11$ reflecting that the price was *very elastic*, for 1 % growth of apple production, the price increased by 5.1 %.

In 2009, $E_Y = -1.19$ showing a *relatively unitary price*, as for a decline of 1 % in apple production, the price declined also by about 1 %, therefore in this year the price was not elastic.

In 2010, $E_Y = -0.39$ meaning that for 1 % growth of production, the price was diminished by 0.39 %, therefore it is about a *relatively elastic price*.

In 2011, $E_Y = 1.73$ reflecting that the price was *very elastic*, at 1 % production increase, the apple price went up by 1.73 %.

In 2012, $E_Y = -0.09$, therefore very close to zero. In this case, for a decline of 1 % in apple production, apple price was *perfect inelastic*, it practically did not varied.

In 2013, $E_Y = 0.37$ reflecting that for 1 % variation of apple production, the apple price increased by 0.37 %. Therefore, the price was *relatively elastic*.

In 2014, $E_Y = -20$ reflected that for a diminish of 1 % in apple production, the apple price declined increased by 20 %. Therefore, in this case, it is about the movement in the same direction of the two indicators, but the price was *perfect elastic*.

In 2015, $E_Y = 0.40$ meaning that a decline of 1 % in apple production determined a reduction of 0.4 % in apple price. The price of *relatively elastic*.

The graphical representation of the elasticity coefficients for V1 and V2 is comparatively shown in Fig.3.

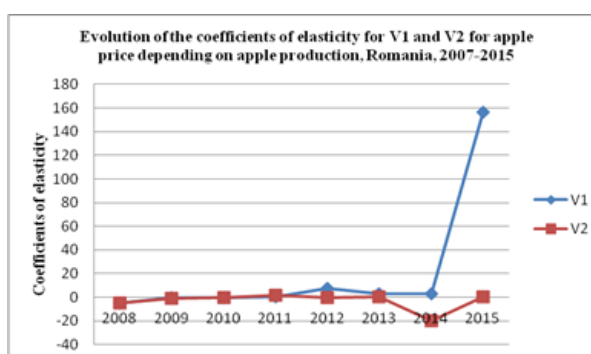


Fig.3. The coefficients of elasticity for apple price depending on apple production, V1 and V2, Romania, 2007-2015

Source: Own design

CONCLUSIONS

In the whole analyzed period of ten years, the apple price was either elastic or relatively elastic, with a few exception when it was stable, unitary.

The apple price volatility showed that it is closely related to apple production.

Apple price evolution depends on the quantity of apples apple produced and delivered in the market and also of apple quality and variety, demand/offer ratio and income/household.

This link between price and apple production is very important for apple tree growers who must be aware that price at delivery must cover production cost and lead top profit. Horticulturists must keep under control production cost, to increase apple production and quality for getting a higher price. The association of apple producers is an opportunity for them to reduce the cost of farm

inputs and to create the possibility to store the production for a longer period of time to protect it against hail and degradation, to preserve it in the best conditions and to deliver it in the market at a higher price in the periods when the offer will be lower. In this way, they could get a higher profit.

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