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Experimental Mathematical Models for Price Prognosis

Do not overlook or be afraid of mathematical language some people to know to use it without excess, others without fears, to know at the same time, its limits and dangers.

At present, in all European socialist countries, ever more numerous attempts are made, in order to apply modern mathematical models and to use computers, with a view to solving various problems in the fields of prices, among them, the price modelling planning and prognosis.

For this purpose, the scientific research develops concomitantly and in direct connection to the working out of various price models — an activity finding its finality, in the end, in mean-term price plans (usually 5 years) and in long-term prognoses (as a rule 10—15 years). It is estimated that, very soon, price plans will become (in some countries they have already become) component parts, sections of the national-economy plan, and their operative carrying out will be followed up as any section of the plan — by an adequate information-processing system.

The special attention paid to the construction of the most various econometric methods, as well as the use, for their solving, of electronic computers, is obvious from the speciality literature dealing with price planning.

From the ample field of the possibilities of applying mathematical methods in planning and following-up price, we limit ourselves, in this paper, to present a few price-prognosis methods, as applied to the peasant market. We particularly selected this field as research object, since, as is known, goods are sold, on the peasant market, at prices oscillating around a value depending on conjuncture, and they are built up according to the agreement between producer and consumer. In other words, they find themselves at the

cross-point between demand and supply. We must not neglect the fact that the organized market has a powerful influence in establishing these prices, a circumstance limiting, to a great extent, the action of other influencing factors. Consequently, the price level in the peasant market and the price variation depending on localities are particularly influenced by the continual improvement of population supply by the socialist trade units, at steady prices, and — for a great many products — at unique prices on the whole country's territory.

Due to the seasonal character of production and sale of vegetables and fruits, which have an important weight in the sale's volume on the peasant market, prices vary, and so do prices in the socialist trade, according to seasons and stages*). The variation on the country's territory, of the prices of vegetables and fruits, sold on the peasant market, is more marked than for other products sold by producers on the market. With a view to braking the speculating tendencies on the peasant market, the price level was affected, these last years by the maximum prices system.

The building up of prices on the peasant markets offers a wide appying field to the prognosis computations.

From all models which can be applied to determine price prognosis on the peasant market, we shall refer only to those concerning price trends in a given time period; the influence of the basic factors, which determine the price level at certain moments, and the price dispersion on the country's territory.

Building up models raised a series of problems, among which the most important were the determining of the length of time to be researched, and the obtaining of the necessary data.

On the basis of the achieved studies, we established that the period, for which it is possible to study statistic data, must not extend as far back as 1955, since the previous situation cannot be considered as edifying. Consequently, we used statistic data of the period 1955—1968, i.e. a time interval of 14 years. If one considers necessary to take into account a longer series of years, in order to more exactly emphasize the phenomena connected with the peasant market prices, it is also true that a 14 years period, as was considered, is sufficient for the many-sided characterizing of the studied phenomenon.

We must also add that, when selecting the research period, we took into account that, within this time interval, a series of economically and socially basic transformations took place, among them, in the first line, the concluding of the farming co-operativization, a fact which considerably affected the level, and particularly the structure, of sales on the peasant market. The research of the influences expressed by these transformations led us to the idea that they are such as to falsify the research results.

With a view to disposing of data as complete as possible, we resorted to official data concerning prices and price indexes, to statistic year-books, to the data funds existing at the State Committee for Prices, and other central bodies, to the periodical information of the Executive Committees of the

*) Concerning the factors more actively affecting prices on the peasant market, see the second part of this paper.

District People s Councils to tabulograms containing price recordings by districts, months and years, to the Bulletins of the former Department of Turning to account Vegetables and Fruits. We collected, from the quoted sources, 43 items, namely: an item concerning the total of goods sold on the peasant market, seven items representing the same number of sold product s groups, and 35 items, where sales of main products were included.

I. ESTABLISHING THE PRICE TREND PER PRODUCT

For each product subjected to research the price trend was determined, up to 1975, in the form of regression curves. Data were computed with the electronic computer IBM-360 of the Computation Centre of the Economic Cybernetics Department. We used, to this end, the CREPOL program (Polynomial Regression Curves), written in FORTRAN IV — language. With the help of the CREPOL program regression curves up to 20th degree inclusively can be computed in the actual studied case, of the price trend on the peasant market, curves of Ist, IInd, IIInd and IV-th degree were computed.

Computation consists in adjusting a connection between a resulting variable y (in our case, the product price level) and an influencing variable x (time) with the help of orthogonal polynomials (polynomials γ_k with $\gamma_i \gamma_j = 0$ for $1 \neq j$).

The p-th degree polynomial, which adjusts this connection, has the form

$$y' = \bar{y} + A_1\gamma_1(x) + A_2\gamma_2(x) + \ldots + A_p\gamma_p(x)$$

where $\bar{y}$ represents the arithmetic mean of variable y — values, during the observed period. The polynomials ζ_k values for the observed points x are computed by means of some recursive formulas:

$$\gamma'_{k+1} = \gamma'_1\gamma'_k - \frac{k^2(n^2 - k^2)}{4(4k^2 - 1)}\gamma'_{k-1}$$

with

$$\gamma'_k(x) = \lambda_k\gamma'_k; \quad \gamma_0 = 1; \quad \gamma_1 = x - \bar{x}$$

where: n — represents the number of statistical observations on variables y and x; $\bar{x}$ — the mathematic mean of variable x — values.

Following main results were obtained with the computer, by using the CREPOL program:

— the number of years, considered in the computation (N);

— the trend-curve polynomial coefficients, which represent the common ratio to be added or substracted (depending on the increasing or decreasing data series), to design the price dynamic for every year of the forecast period;

— the correlating index, expressing the strength of the connection between the dependent and the independent variable, in our case between the considered product and the time;

— the mean square deviation of the observed points, as against the computed curve, which expresses, in the unit of measure of the dependent variable,

the mean value of the deviation of the observed points, with respect to those estimated by the regression curve.

As is known, the mean square deviation is computed by means of formula:

$$S^2_{y/x} = \frac{n-1}{n-2}(S^2_y - a^2 S^2_x),$$

where

n represents the number of observed points;
s^2_y — dispersion of the dependent variable y;
s^2_x — dispersion of the independent variable x;
a — is the regression coefficient;
— the number of years located above the curve;
— the number of years located under the curve;
— the tabled values of function $Y' = f(x)$;

In our case the price indexes computed for years 1956—1968 are involved,

As an example, we present the data resulting from the computation. for one of the studied products *:

a) *First-degree regression curve*

N	IV	IX	MEAN Y	MEAN X
13	1	2	110.0922	7.0000

DEGREE	UNDER THE CURVE	ABOVE THE CURVE	MEAN SQUARE DEVIATION	CORRELATION INDEX
1	8	5	13.9820	0.030

COEFFICIENTS OF THE POLYNOMINAL

CO = 110.3614
C1 = — 0.1099

	X	Y	Y COMPUTED	Y—Y COMP.
1	1.	126.60	110.75	15.8485
2	2.	102.70	110.64	— 7.9416
3	3.	101.90	110.53	— 8.6318
4	4.	107.20	110.42	— 3.2219
5	5.	89.40	110.31	—20.9120
6	6.	100.80	110.20	— 9.4021
7	7.	122.40	110.09	12.3078
8	8.	125.10	109.98	15.1177
9	9.	132.70	109.87	22.8276
10	10.	122.80	109.76	13.0374
11	11.	103.40	109.65	— 6.2527
12	12.	87.80	109.54	—21.7428
13	13.	108.40	109.43	— 1.0329

*) The Ist, IInd IIIrd and IVth degree regression curves, for each of the 43 products and product groups, were computed in the same way.

b) *Second-degree regression curve*

DEGREE	UNDER THE CURVE	ABOVE THE CURVE	MEAN SQUARE DEVIATION	CORELATION INDEX
2	7	6	13.7262	0.157

COEFFICIENTS OF THE POLYNOMINAL

C0 = 104.8265
C1 = 2.3041
C2 = — 0.1724

	X	*Y*	*Y* COMPUTED	*Y*—*Y* COMP.
1	1.	126.60	106.96	19.6419
2	2.	102.70	108.74	— 6.0449
3	3.	101.00	110.19	— 8.2869
4	4.	107.20	111.28	— 4.0840
5	5.	89.40	112.04	—22.6362
6	6.	100.80	112.44	—11.6436
7	7.	122.40	112.51	9.8938
8	8.	125.10	112.22	12.8761
9	9.	132.70	111.60	21.1033
10	10.	122.80	110.62	12.1753
11	11.	103.40	109.31	—5.9078
12	12.	87.80	107.65	—19.8461
13	13.	108.40	105.64	2.7605

c) *THIRD-degree regression curve*

DEGREE	UNDER THE CURVE	ABOVE THE CURVE	MEAN SQUARE DEVIATION	CORRELATION INDEX
3	6	7	10.7656	0.632

COEFFICIENTS OF THE POLYNOMIAL

CO = $C_0 = 140.7712$
$C_1 = -23.7986$
$C_2 = 4.3207$
$C_3 = -0.2140$

	X	Y	Y COMPUTED	X − Y COMP.
1	1.	126.60	121.08	5.5207
2	2.	102.70	108.74	− 6.0450
3	3.	101.90	102.48	− 0.5845
4	4.	107.20	101.01	6.1859
5	5.	89.40	103.05	−13.6502
6	6.	100.80	107.31	− 6.5088
7	7.	122.40	112.51	9.8937
8	8.	125.10	117.36	7.7410
9	9.	132.70	120.58	12.1170
10	10.	122.80	120.89	1.9052
11	11.	103.40	117.01	−13.6103
12	12.	87.80	107.65	−19.8461
13	13.	108.40	91.52	16.8817

d) *Fourth-degree regression curve*

DEGREE	UNDER THE CURVE	ABOVE THE CURVE	MEAN SQUARE DEVIATION	CORRELATION INDEX
4	6	7	8.8653	0.770

COEFFICIENTS OF THE POLYNOMIAL

$C_0 = 180.9495$
$C_1 = -67.0297$
$C_2 = 17.0593$
$C_3 = -1.5926$
$C_4 = 0.0492$

	X	Y	Y COMPUTED	Y − Y COMP.
1	1.	126.60	129.44	− 2.8357
2	2.	102.70	103.17	− 0.4740
3	3.	101.90	94.38	7.5188
4	4.	107.20	96.46	10.7440
5	5.	89.40	103.98	−14.5784
6	6.	100.80	112.71	−11.9106
7	7.	122.40	119.60	2.8038
8	8.	125.10	122.76	2.3393
9	9.	132.70	121.51	11.1890
10	10.	122.80	116.34	6.4636
11	11.	103.40	108.91	− 5.5069
12	12.	87.80	102.08	−14.2752
13	13.	108.40	99.87	8.5257

The first column represents the current number; „*X*" column = years; „*Y*" column = price indexes per each year, reported to year 1955; „Y COMPUTED" column represents the trend.

The obtained results allow to draw following conclusions:

— the first-degree curve (regression straight line) is adequate for a longer time-period price prognosis;

— the IInd, IIIrd, and IVth —degree curves — expressing the connection between the independent variables and the dependent one, which is, more and more intensely, the object of the prognosis — are adequate, in their successive order, for shorter time periods (year, month, decade).

Since the purpose of our research was to establish the price prognosis up to 1975, we dwelt upon the first-degree curve. This curve has the shape exhibited in Fig. 1, for the time period 1955—1968 and the product taken as an example.

After knowing the adjusting polynomials coefficients of the connection between the two variables, we can obtain, by extrapolation, the price trend for the coming years. In the presented example, the polynomial coefficient is *0.1099*; we obtain, by extrapolation, for year 1975, index *108.66* as against *110.75* in year 1956, as results from the following table:

— year 1955 = 100 —

Nr. crt.	Year	Achieved price indexes	Price trend computed in indexes
1	1956	126,60	110,75
2	1957	102,70	110,64
3	1958	101,90	110,53
4	1959	107,20	110,42
5	1960	89,40	110,31
6	1961	100,80	110,20
7	1962	122,40	110,09
8	1963	125,10	109,98
9	1964	132,70	109,87
10	1965	122,70	109,76
11	1966	103,40	109,65
12	1967	87,80	109,54
13	1968	108,40	109,43
14	1969	—	109,32
15	1970	—	109,21
16	1971	—	109,10
17	1972	—	109,99
18	1973	—	108,88
19	1974	—	108,77
20	1975	—	108,66

In the period 1969—1975 the trend computed for the period 1956—1968 will be at the shown levels, but only if, in this second period, all factors which co-operated will be present, namely at the same rates they had when the

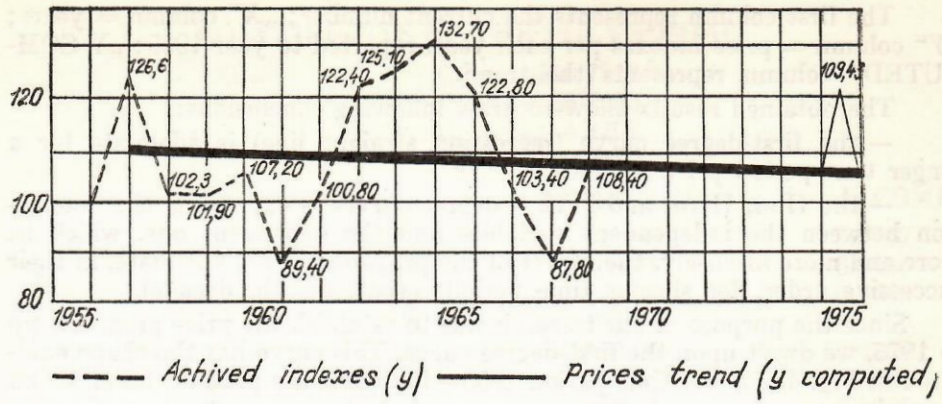


Fig 1

first-period trend was determined. If the rates are modified, or when other unforeseen factors occur, they will change, to some extent, the trend curve. We computed the liability interval, in order to ascertain the limits of these changes. The liability interval, for one of the examined products, presents itself according to the graph in Fig. 2.

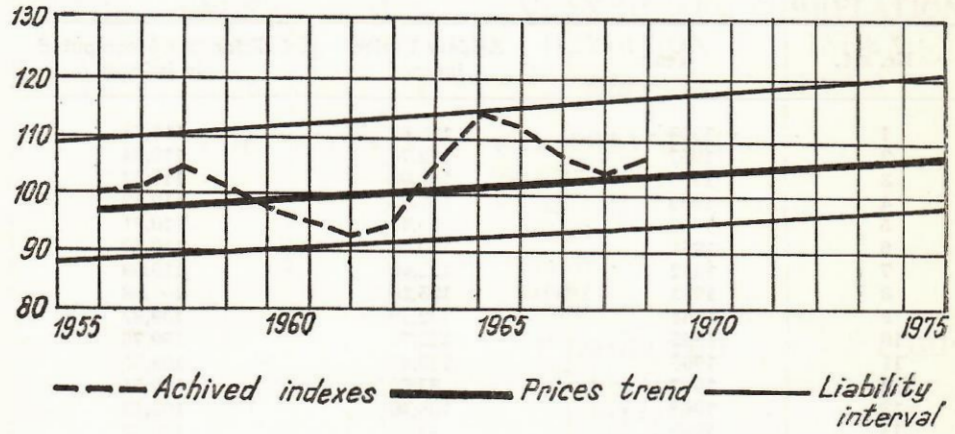


Fig 2

We computed the liability interval only for 16 products*) since we considered the results as sufficient to obtain valid conclusions.

As results from the aforesaid, the price index will be, in 1975, of 115%, as against 1955, placing itself, with a probability of 95%, in the liability interval comprised within the limits $\pm$ 10%. i.e., between 105% and 125%.

*) Computations have been affected at the Centre of Mathematical Statistics of the Academy of the Socialist Republic of Romania, with the aid of Eng. Dan V. Iliescu.

The liability interval was separately computed for each regression straight line, as follows:

$$y - t_\alpha,\ q^\sigma < y < y + t_\alpha,\ q^\sigma$$

where

σ is the mean square deviation of the values computed for y, hence y_c as against the real values of y_i, and is given by relation

$$\sigma = \frac{\sqrt{\sum_{i=1}^{n} (y_i - y_c)^2}}{i = n}$$

$t\alpha_q \approx 2$, for $1 - \alpha = 0{,}95$ (liability level);
$q = n - 1$ (number of degrees of freedom).

The actual data achieved for year 1969 have been compared with the prognosis computations, and there resulted the following errors:

Item	Prognosis error
TOTAL PEASANT MARKET	+ 5.4%,
— Edible-root vegetables	0
— Butter	0
— Maize flour	+ 0.1%
— Cereals and cereal flours	— 0.3%
— Hens	— 0.6%
— Lard	— 0.9%
— Fowls	+ 1.2%
— Hen eggs	+ 1,5%
— Butchery swine	+ 1.8%
— Eggplants	— 2.0%
— Maize	— 2.0%
— Mutton	+ 2.1%
— Animal fats	+ 2.9%
— Cow milk	+ 2.9%
— Geese	+ 2.9%
— Ewe's milk cheese	+ 3.6%
— Beef	— 5.0%
— Grapes	+ 5.9%
— Pure wheaten flour	+ 6.0%
— Whole meal	— 6.0%
— Long pod beans	— 6.0%
— Pork	+ 8.6%
— Apples	— 9.0%
— Cucumbers	+ 11.0%
— Peas	+ 11.0%
— Melons	+ 16.0%
— Tomatoes	+ 20,0%

We, generally, notice the fact that, in the case of products having a correspondent in the socialist trade, and for which there are steady and stable prices all over the year, the prognosis errors are recording low values. In

exchange, with products having seasonal prices in the socialist trade (e.g., fruits and vegetables), errors are higher. The difference at tomatoes is mainly explained by the big amounts of hothouse products, sold through the socialist trade, with correspondingly higher prices which influenced the product prices of the field culture, sold on the peasant market.

On the whole peasant market, the effective indexes, achieved in 1969 as against 1965, corresponding to the prognosis for the same period, are as follows:

	Prognosis $\frac{1969}{1965}$	Effective results $\frac{1969}{1965}$	Prognosis error
— index —	107.8	108.2	0.4

The price prognosis, by extrapolation of trend, has an applying field, limited to our economy. The overwhelming majority of prices acting in economy are planned by the State, through its authorities, their evolution being pre-established by plan, or more exactly, by the substantion computations, cf the State plan. In these conditions, the trend extrapolation is often unsignificant.

Nevertheless there are a series of domains, where the method can be applied with good results, and among them, the following ones are to be borne in mind:

— for the price prognosis in the peasant market as a whole, on product groups and on products. The exposing of our model was, as a matter of fact, focussed on this example;

— for the price prognosis in the socialist trade, for vegetables and fruits and other products with marked seasonal character and with prices established by seasons, and within their framework, by periods. In this case, the trend curve will get the profile of an index of price seasonality;

— for estimating the wholesale and retail mean-price dynamic, in the socialist sector, for homogeneous groups of products.

DETERMINING TO WHAT EXTENT THE VARIOUS FACTORS AFFECT THE PRICE LEVEL

The computation of the trend curves, according to known methods, only represents a version of the dynamic model of prices on the peasant market. Though this determination is more adequate for prices on the peasant market, than for any other price sector, the computed trend has, even for the peasant market, a simply orientating character, since — as was shown — the level and evolution of the prices used by producers on the market are influenced by a series of factors, part of which are fixed by plan.

Among the main factors influencing the price level on the peasant market, we fixed ourselves upon the following ones:

— planned level of retail prices in the socialist trade;

— amounts of goods settled by plan to be sold through the socialist trade;

— products supplied to the State fund, as stipulated by plan;

— sales on the peasant market, — estimates.

The data concerning the above indexes in the period 1955—1968 are those effectively achieved.

For the sake of our computation — carried out only for experimenting the method — conventional data have been taken into account for the period 1970—1975.

The determination of the way in which each of these factors are influencing prices in the peasant market has been effected by using the multiple-correlation methods, for a series of products being simultaneously on sale, both in the State trade, and on the peasant market.

Computations have been carried out by means of the electronic computer IBM/360, on using the REMUS (Selective Multiple Regression) computation program. This program allows the determination of the best regression hypersurface (in the sense of the least mean squares method), between a resulting variable y (in our case, prices on the peasant market) and several influencing variables x_i (in our case, prices in the socialist trade, sales on the peasant market and supplies to the State fund).

The connection between the resulting variable y and the influencing variables x_1 is delivered under the form of some coefficients of the sought-for regression hypersurface (or regression hyperplan). At the same time, are provided: the multiple correlation index, which illustrates the strength of the connection between variable y and variables x_i, the multiple determination coefficient, which represents in procents the weight of the collective influence of variables x_i upon variable y, and the mean square deviation of the observed points — by means of which the determination was carried out — around the regression hypersurface.

A very important characteristic of the REMUS program consists in selecting the best regression equation for certain fixed liability levels (0,1; 0,05; 0.01 and 0.001); in other words, if unsignificant influencing variables are also present in the computed equation, they are eliminated and the equation is re-computed.

The selection is effected through a complex algorithm, which combines the testing by dispersional analysis („F" criterion) on the whole equation, with the testing by „t" (Student) criterion, on each equation's coefficient; the elimination of a variable from the equation is achieved only when it is— significant — as against „t" criterion, and, at the mean time, when it makes that the whole equation be unsignificant.

This characteristic of the REMUS program provides the possibility that, when several factors, which only apparently influenced the price level, were introduced in the price analysis of a certain product, these factors be automatically eliminated, thus setting an equation which correctly reflects the interconnections of price and its influencing variables.

In general, the most important factor influencing the price level on the peasant market is the price of similar products, sold through the socialist trade. This results from data referring to potatoes, onions, cabbage, where the influence of prices in the socialist trade was decisive. This fact is natural,

since the price level in the socialist trade also includes the action exerted by other factors, as sales through the socialist trade and supplies to the State fund.

Since we know the results, we can easily determine the trend in the future of prices for the analyzed products. As a matter of fact, if the potato price in the socialist trade, in 1975, is 0.85 lei/kg, instead of 0,98 lei/kg as it is at present, we can make the prognosis that sales on the peasant market and supplies to the State fund will increase in 1975, by 9% up to 20%, as against the mean of years 1955—1968.

The price regression equation on the peasant market, denoted by Y, can be analytically written:

$$Y = -0.9929 + 2.3407x_1 + 0.3676 \times 10^{-5}x_2 + 0.3523 \times 10^{-8}x_3 - \\ - 0.1143 \times 10^{-5}x_4$$

where:

x_1 = price on the socialist market;
x_2 = sales in the socialist trade;
x_3 = sales on the peasant market;
x_4 = supplies to the State fund.

We suppose that in 1975, following indexes will be achieved for potatoes:

x_1 = 0,85 lei/kg
x_2 = 355,000 tons
x_3 = 580,000 tons
x_4 = 675,000 tons

By replacing these values in the above equation, and by effecting the computations, we obtain $y = 1.58$, i.e. the potato price on the peasant market is estimated at 1,58 lei/kg in year 1975, in the exhibited conditions, as against 1.75 lei/kg — initial price.

In this way, by permanently following up all price-influencing factors, the price trend in the future can be easily determined.

The model is superior to the previously displayed prognosis method, in the sense that, as one knows the influencing ratio of each element, one can anticipatively influence the conjuncture price level, by correspondingly modifying, according to necessities, each separate above-stated index.

3. PRICE DISPERSION

Prices on the peasant market have a relatively high degree of dispersion all over the country's territory, this dispersion being different for each product, depending on several elements, among which two play a decisive part:

— the level of supplies through the socialist trade. In the case of a few products, as flour, edible oil, milk and dairy produces for which the goods fund

distribution throughout the territory corresponding, to a greater extent, with the population demand, than for other products — prices on the peasant market present a lower dispersion. For other products, with unique prices, but whose sale through the socialist trade does not always take place rhytmically, the dispersion degree of prices on the peasant market is higher;

— the seasonal character of production and sales of vegetables and fruits as well as the rulling prices of the commercial units, which determine important variations of prices on the peasant market, hence the price dispersion degree is high.

If we take into account that the vegetables and fruits sold on the peasant market have an important weight in the population supplies, and if we also consider the seasonal character of their production, it clearly appears that the decisive part in the forming of prices on the peasant market is played by the amount of production, obtained and presented for sale on this market, combined with the influence of the ruling prices of the socialist State and co-operative trade.

We also must bear in mind the fact that, excepting a few particularly important centres, where vegetables and fruits are brought on the peasant market from great distances, the majority of production is locally sold. Consequently, since there are zones with excess production, in parallel with zones of scarce production, the vegetables and fruit prices in various places are very much submitted to production oscillations, a fact reflected in the increase or diminution of price dispersion.

It is very important to know this dispersion, in order to take the necessary measures for supplying, by the socialist trade, increased amounts in the zones scarce production, acting in this way upon the price level on the peasant market of these zones, which implicitly leads to the continuous limitation of the gap between ruling prices in different places.

Consequently, through the measures taken with a view to ruling out gaps between prices of different products from a place to another, or at least to reducing as much as possible these price gaps, any differentiation possibility is suppressed, as concerns the purchasing power of people dwelling in excess-production zones, as against those from the scarce-production regions. This is why the determination of price dispersion is not only a problem of following up and of ascertaining, but also one of planning and prognosis of sales through the socialist trade, of price influencing policy on the peasant market.

In our experimental model, the price dispersion degree was determined according to classical formulas:
for the mean:

$$\bar{x} = \frac{1}{n} \sum_{i=1}^{n} x_1$$

for the dispersion:

$$\sigma^2 x = \frac{1}{n-1} \sum_{i-1}^{n} (x_i - \bar{x})^2$$

for the mean square deviation:

$$\sigma_x = \sqrt{\sigma_x^2}$$

for the variation coefficient:

$$y = \frac{\sigma \cdot 100}{\bar{x}}.$$

With a view to effecting these computations, one may use any of the two previously described programs (CREPOL and REMUS), which— in addition to their functions — also compute means and mean square deviations of the considered variables, — or certain special programs.

We obtained the following data, for one of the studied products, on the basis of observations concerning the ruling prices in 77 places and of the sum of 24,872 thousand lei, representing the mean prices sum for the analyzed product:

MEAN VALUE 3.23

DISPERSION 0.0989

STANDARD DEVIATION 0.31

where

MEAN VALUE = Arithmetic mean of ruling prices = 3.23 lei/kg;

DISPERSION = Price dispersion around mean value;

STANDARD DEVIATION = Mean square deviation of prices, as against mean price = 0.31 lei/kg

Thus, for the analyzed produce, a variation coefficient of 9.74% (0.31 × × 100 : 3.23), results, hence a deviation of ± 0.31 lei/kg of the ruling prices in various country's districts, as against mean price (3.23 lei/kg).

It is known that a decrease of the variation coefficient exhibits a decreasing of the price dispersion degree, and reversely. Thus is why a more complete price prognosis model for the peasant market must also comprise the variation coefficient evolution.

* * *

The presented experimental models represent only the beginning, at a reduced scale, of solving price problems through modern mathematical methods and by means of electronic computers.

The effected research led us to the conclusion that price prognosis models for the peasant market may be completed, improved and then also extended upon wholesale and retail prices in the socialist trade, or upon buying prices of farm products.

It is particularly important to apply the methods which are the most adequate for each separate price sector, to previously carry out through economic analysis, in order to identify, most accurately and in real proportions the independent variables, which influence to a certain extent the price evolution, and with respect to which the prognosis computations are carried out.

MODELES MATHEMATIQUES EXPÉRIMENTAUX POUR LA PREVISION DES PRIX

Les auteurs se proposent de déterminer la tendance évolutive des prix sur le marché paysan, par la construction de trois modèles.

Le premier modèle utilise le calcul de regression et a été construit par rapport au temps. Prenant comme point de départ, l'année de base, on a déterminé la tendance des prix jusque cette année, et, à l'aide de l'extrapolation, on a obtenue la tendance pour les années suivantes.

Pour ce modèle, construit par rapport au temps, on a considéré que les prix moyens et, respectivement, les indices pour chaque année, contiennent — comme de juste — divers événements qui ont conduit au niveau des prix considérés. En conséquence, la tendance pour les années suivantes devra tenir compte de tous ces événements, soit la concurrence de l'Etat par ses prix et ses marchandises, la production, la demande des consommateurs.

Le second modèle de détermination des prix tient compte du calcul de la corrélation multiple. On sait que les prix des produits agricoles sur le marché paysan subissent l'influence de toute une serie de facteurs dont les principaux sont: les ventes par l'intermède de ce secteur, les prix des marchandises similaires vendues par le commerce socialiste, les ventes des produits similaire faites par le commerce socialiste, les entrées des produits similaires au fonds d'Etat.

On a déterminé les proportions des différents facteurs qui influent le niveau des prix (à l'exemple des prix de certains produits vendus sur le marché paysan). On a utilisé la méthode de la corrélation multiple en appliquant le programme REMUS (La regression sélective).

Le troisième modèle se rapporte à la détermination qui utilise un programme de la dispersion des prix des légumes et des fruits vendus dans les unités du commerce socialiste et sur le marché paysan.

Pour se modèle on a employé un programme spécial (mais on peut travailler avec les programme CREPOL et REMUS).

Les modèles utilisés se sont avérés adéquats, conclusion obtenue par certaines comparaisons de la prévision avec les résultats réels.

ЭКСПЕРИМЕНТАЛЬНЫЕ МАТЕМАТИЧЕСКИЕ МОДЕЛИ ДЛЯ ПРОГНОЗА ЦЕН

В целях модернизации работы по установлению цен и наблюдению за ними были произведены в опытном порядке попытки разрешения при помощи электронных калькуляторов задач в связи с тенденцией и прогнозом цен, улучшением системы информации в этой области, упрощением и повышением оперативности работы по установлению цен.

Авторы поставили перед собой цель определения тенденции перспективной эволюции цен на крестьянском рынке, разработав три модели для определения тенденции цен на этом рынке.

Первая модель, основанная на регрессивном расчете, была построена в зависимости от времени. На основе базисного года была определена тенденция цен вплоть до текущего года и путем экстраполирования была получена тенденция на последующие годы.

В этой модели, разработанной в зависимости *от времени*, считается, что средние цены и соответственно индексы каждого года содержат — как это естественно — различные события, обусловившие соответствующий уровень цен. Поэтому тенденция на будущие годы будет учитывать все эти события, соответственно конкуренцию государственного сектора путем его цен и товаров, производство, потребительский спрос.

Вторая модель определения тенденции цен основывается на расчете многократной корреляции. Известно, что на цены сельскохозяйственных продуктов на крестьянском рынке оказывает влияние ряд факторов, из которых наиболее важными являются: продажа в этом секторе, цены подобных товаров, продаваемых в социалистической торговле, продажа подобных товаров в социалистической торговле, поступления подобных товаров в государственный фонд.

Определение размеров влияния различных факторов на уровень цен (например, цен на некоторые продукты, продаваемые на крестьянском рынке). Был применен метод корреляции и многократной регрессии путем применения программы РЕМУС (селективная многократная регрессия).

Третья модель касается определения на основе программы дисперсии цен на овощи и фрукты, продаваемые организациями социалистического сектора и на крестьянском рынке. Для этого была использована специальная программа (но могут быть использованы и программы КРЕПОЛ и РЕМУС).

Примененные модели оказались соответствующими, что вытекает из некоторых сопоставлений прогноза с фактическими результатами.