

## FLUCTUATIONS AND TRENDS IN GROWTH RATES IN SOCIALIST COUNTRIES

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In 1964 G. J. Staller published an article on fluctuations in socialist economies in which he presented figures on intensity of fluctuations in socialist countries for four macro-aggregates (total social product, agriculture, industry, and construction) and compared them with those in capitalist countries. His main finding was that during 1950—1960 »mean fluctuations were higher in the communist bloc than in the OECD economies for all four aggregates. Only in industry is the mean for the planned economies close to the average for free-market economies«.<sup>1)</sup>

Since then five years have elapsed; there is therefore, a series of fifteen years, instead of ten years, at hand. Many previous data have been revised in the meantime. This makes further research possible and necessary.

In measuring the intensity of fluctuations, I followed Staller's path: yearly growth coefficients (chain indices) have been calculated, linear trends fitted to them, and square roots taken from the average residual variances. These roots (standard errors) are taken as a measure of intensity of fluctuations. We shall call them fluctuation coefficients<sup>2)</sup>. All this was done, as Staller did, for four aggregates: total social product, agriculture, industry, and construction. For socialist economies, we have added a fifth one, industrial investment.

In the case of socialist countries, the total social product is interpreted in the sense of social *net* product (net of depreciation), i. e., in the sense of national income. Also, the volume of agricultural and industrial production and of construction is measured by the corresponding social net products (=national income), all in stable prices. The only exception is Yugoslavia, where, for all four aggregates, the social *gross* product is taken instead. Further exceptions are: agricultural production of the Soviet Union and Bulgaria measured by the total physical farm production; the industrial production of the

Soviet Union, Bulgaria and Germany (DDR) is measured by the corresponding indices of physical industrial production; Bulgarian construction and German agriculture are measured in current prices; this increases more likely than decreases fluctuation coefficients. As for investment, we could not get industrial investment figures for Germany. They are substituted by total investment figures.

In the case of capitalist countries, total social product is interpreted in the sense of *gross* domestic product at factor cost (stable prices). The main exceptions are: all U.S. aggregates and the individual aggregates of some other countries are at stable *market* prices; Canadian data, 1950—1955, are for gross *national* product at market prices (stable); for 1950—1955, all French aggregates and all German aggregates with the exception of total social product are in *market* prices (stable); and Turkish data, 1950—1955, are for *net* domestic product.

The comparability of data (and of results) is further reduced between socialist countries, on the one hand, and capitalist, on the other. The first reason is the difference between the net (socialist countries) and gross (capitalist countries plus Yugoslavia) figures. However, as depreciation allowances present rather constant percentages of the social gross products in socialist countries time series derived from gross domestic product figures for capitalist countries are, nonetheless, fairly comparable with those derived from net social product figures for socialist countries. The second reason is the difference in the concept of sources of social product. While in socialist countries all data relate only to material production (excluding personal transportation and pure wholesale and retail trade except in the case of Yugoslavia), in capitalist countries non-material production (personal transportation and pure wholesale and retail trade, banking, insurance and real estate, ownership of dwellings, public administration and defense, health and educational services, miscellaneous services) is included in gross product aggregates. To improve comparability, all computations have also been made for gross domestic products net of non-material production. However, as there is no possibility of distinguishing between personal and material transportation and between pure wholesale and retail trade and their material part, total transportation and total wholesale and retail trade are included in Western material gross product figures. A. Nove's suspicion<sup>3)</sup> that services find their way into social product figures in socialist countries also, since they are calculated as the difference between the total value of output and material costs, does not seem to apply here. For all social product figures are in stable prices; in this way they can express only changes in the volume of material production. The fact that services are financed out of national income originating in material production does not in any way influence the movements of the social net product. The only real problem is relative prices. It is market prices and not factor cost in which production is evaluated in socialist countries. Via these prices, and particularly via their

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1) G. J. Staller, *Fluctuations in Economic Activity, Planned and Free Market Economies, 1950—1960*, *American Economic Review* 54, 1964, p. 389.

2) Staller's second measure, the antilog of the square root of logarithmic variance of the yearly growth coefficients minus unity, was not used. As shown by him, it yields fairly similar results as the standard error. An important factor was also expenses.

3) A. Nove, *The Soviet Economy*, New York 1961, p. 253.

distorted structure, non-material services may have some influence on the comparability of socialist and capitalist social product figures.

Classification of industries and coverage of activities (industry, agriculture, construction) is not the same in all countries. For instance, Netherlands data on gross domestic material product do not include trade; Netherlands construction and Portuguese construction in 1950 — 1955 are included in industry; in Yugoslavia, handicraft enterprises are not included in industry or in construction; Polish, Bulgarian and Yugoslav agriculture does not include forestry; German (DDR) construction includes only construction enterprises and not all construction activity. There are some inconsistencies even within individual time series. I do not, think, however, that elimination of all these shortcomings would substantially change the results.

All the data on the five aggregates, as well as gross domestic material product, are official data. The only exception is Yugoslav industrial investment. The sources are given in the tables.

The results of our investigation of intensity of fluctuations in socialist countries are given in Tables I and II. Two additional tables, Ia and IIa, are added for a comparison between socialist and capitalist countries. In both cases those countries for which relevant data could be gathered were included. For Albania there are no data available at all. From the OECD countries, Luxembourg, Belgium, Ireland and Iceland were excluded because series of data were not long enough. In all tables, standard errors are multiplied by 1000. The non-material social product is designated by SNA (System of National Accounts) and the material as MP (material product).

Table I.

## Fluctuations in Growth Rates in Socialist Economies (1950—1965)

	Total social product (MP)	Agriculture	Industry	Construction	Investment
Soviet Union	18.63	47.26	11.51	43.00	30.81
Poland	20.28	63.25	22.39	59.47	102.70
Germany (DDR)	34.78	n.a.	31.31	91.14	65.57
Czechoslovakia	25.55	45.39	34.55	65.24	103.70
First group means	24.81	51.97	24.97	64.71	75.69
Rumania	86.99	226.90	45.56	137.74	166.90
Hungary	79.41	171.20	85.03	111.85	216.20
Yugoslavia	84.08	238.60	48.99	126.74	130.80
Bulgaria	101.24	136.40	31.14	134.19	157.80
Second group means	87.93	193.28	52.68 (1) (41.90)	127.63	167.92
Socialist averages	56.37	132.71	38.81 (1) (32.21)	96.17	121.80

Sources: Soviet Union: Narodnoe hozjajstvo SSSR v 1965 g., Moscow 1966, p. 85, 259, 122; Poland: Rocznik Statystyczny, Warsaw 1966, p. 81; Germany: Statistisches Jahrbuch der DDR, 1967, p. 21, 24, 22; Czechoslovakia: Statisticka ročenka ČSSR, 1966, p. 24—25, 32—33, 28—29; 1967, p. 131, 275, 200, 256—257; Rumania: Anuarul Statistic al Republicii Socialiste Romania, 1966, Bucharest 1966, p. 104; Hungary: Statistical Year—book—Statističeskij Ežegodnik, 1966, Budapest 1967, p. 39; Yugoslavia: «Jugoslavia», Belgrade 1965, p. 80; Statistički godišnjak Jugoslavije 1967, p. 106; Institut za ekonomiku investicija, Investicije 1947—1965, Beograd 1967, p. 115; Bulgaria: Statističeskij godišnjak na narodna republika Bulgaria, 1966, p. 88, 93, 225; 1964, p. 100, 127; 1963, p. 233—234; 1962, p. 104; 1960, p. 88, 156.

Individual figures, missing in the above publications, have been gathered through direct contacts with institutions and individuals in the corresponding countries. For their very useful help the author would like to express his deep indebtedness.

Note: (1) Averages without Hungary.



Table Ia.

## Fluctuations in Growth Rates in Capitalist Economies (1950—1965)

	Total social product SNA MP	Agriculture	Industry	Construction	
United States	28.23	38.70	29.99	56.03	36.76
Canada	32.71	n.a.	n.a.	n.a.	n.a.
Austria	29.48	35.07	73.79	30.48	83.02
Denmark	21.78	24.01	51.06	31.58	49.03
France	14.32	16.66	58.70	23.54	34.12
Greece	33.87	47.15	101.34	34.88	64.09
Germany (BDR)	29.33	32.70	45.83	37.91	49.76
Italy	18.47	21.43	49.86	33.42	41.19
Netherlands	28.23	31.80	98.52	33.75	together with industry
Norway	15.94	19.38	65.35	29.00	41.96
Portugal	15.59	20.63	55.29	24.31	n.a.
Sweden	17.27	n.a.	n.a.	n.a.	n.a.
Turkey	50.55	60.39	82.62	29.65	132.51
United Kingdom	17.27	23.45	20.69	30.77	43.11
Capitalist averages	25.22	30.95	61.09	32.94	57.56

Sources: United States: Survey of Current Business, U. S. Department of Commerce, Office of Business Economics, Vol. 47, April 1967, p. 23; Greece: National Accounts of Greece, 1948—1965, Ministry of

Coordination, Department of National Accounts, Athens, 1967, p. 105—106; all other capitalist countries: OECD, Statistics of National Accounts, 1950—1961, Paris 1964 (for the period 1950—1954), OECD, National Accounts Statistics, Expenditure, Product and Income, 1955—1964, Paris 1966, and OECD, National Accounts Statistics, Expenditure, Product and Income, 1956—1965, Paris 1967. All series were constructed on the basis of the latest available data.

In compiling the data necessary for the above coefficients the author exploited generous help of various institutions and individuals. He would like to express his sincere thanks to all of them.

The results, presented in Table I, suggest the following conclusions:

1. Fluctuations in socialist countries during 1950—1965 were in general, the highest in agriculture, investment, and construction; much lower in total social product; and the lowest in industry. The corresponding (simple arithmetic<sup>4</sup>) means are 124.82 for agriculture, 121.8 for investment, 96.17 for construction, 56.37 for total social product, and 38.81 for industry (if Hungary is eliminated because of 1956, the last figure drops to 32.21).

2. Socialist countries form, from the point of view of fluctuations, two groups: the Soviet Union, Poland, Germany, and Czechoslovakia belong to the first; group; Rumania, Hungary, Yugoslavia, and Bulgaria to the second one. Fluctuations in growth rates in the first group are much lower than in the second. Particularly smooth was the development of industrial production in the Soviet Union (and in Poland) and there were rather violent fluctuations in Yugoslav and Rumanian agriculture. Mean fluctuations in the first group are 75.69 for investment, 64.71 for construction, 56.36 for agriculture, 24.97 for industry, and 24.81 for total social product. In the second group mean fluctuation coefficients are 193.23 for agriculture, 167.92 for investment, 127.63 for construction, 87.93 for total social product, and 52.68 for industry. No fluctuation coefficient of the first group is higher than the corresponding means of the second group, and only one fluctuation coefficient (Bulgarian industry) of the second group is lower than the highest fluctuation coefficient in the first group (Czechoslovak industry).

Further light can be thrown on the same problem by looking at the relative frequency of negative growth rates. In the total social product, negative growth rates appeared in 8.3 per cent of all cases and, if Hungary is disregarded, in 6.7 per cent of all cases. In agriculture, these percentages are 31.7 and 27.5. In industry and construction, negative growth rates appeared in 4.2 and 10.0 per cent of cases.

Very different is the relative frequency of negative growth rates between the two groups of socialist countries. While it is as low as 1.6, 25.0, 1.6, and 5.0 per cent in total production, agriculture, industry, and construction, respectively, in the first group of economies, it amounts to 15.0, 38.3, 6.7, and 15 per cent for the same sectors in the second group of countries.

<sup>4</sup>) This is a very rough measure. Readers who do not like it should simply disregard it and compute a weighted mean. We avoided weighting as it is a rather time consuming procedure and because some theoretical problems should have been clarified before.

Table II. Fluctuations in Growth Rates in Socialist Economies (1951—1960 and 1956—1965)

	Total social product 1951-60 (MIP)		Agriculture 1951-60		Industry 1951-60		Construction 1951-60		Investment 1951-60	
	1956-65	1956-65	1956-65	1956-65	1956-75	1956-65	1956-65	1956-65	1956-65	1956-65
Soviet Union	17.74	20.70	48.93	58.97	13.09	6.68	40.51	31.95	29.71	18.50
Poland	19.43	20.36	27.44	76.25	18.72	17.41	67.27	41.70	115.63	49.07
Germany (DDR)	38.57	21.20	n.a.	n.a.	35.97	20.55	107.80	47.87	66.13	51.70
Czechoslovakia	20.77	24.80	38.82	40.79	31.33	28.74	56.06	67.77	105.88	69.43
First group means	24.13	21.76	38.40	58.67	24.78	18.34	67.91	47.32	79.34	47.18
Rumania	103.30	58.87	273.60	229.83	62.82	30.33	167.76	50.35	188.29	97.04
Hungary	95.99	79.47	204.74	96.62	103.50	87.64	135.31	44.72	263.00	112.12
Yugoslavia	96.91	68.19	289.65	187.67	42.85	35.04	123.25	130.73	139.78	133.45
Bulgaria	121.45	55.36	162.85	98.54	33.64	24.08	157.60	149.84	166.82	155.31
Second group means	104.41	65.47	232.71	153.17	60.70	44.27	145.98	93.91	189.47	124.48
Socialist averages	64.27	43.62	149.43	112.67	42.74	31.31	106.95	70.62	134.41	85.83
Index		67.9	75.4		73.3		66.0		63.9	

Sources of data: The same as in Table I.

Table IIa.

	Fluctuations in Growth Rates in Capitalist Countries (1951—1960 and 1956—1965)									
	Total social product 1951-60 (SNA) 1956-60	Total material product 1951-60 (MP) 1956-60	Agriculture 1951-60 1956-65	Industry 1951-60 1956-60	Construction 1951-60 1956-60	Industry 1951-60 1956-60	Construction 1951-60 1956-60			
United States	30.36	18.95	42.49	30.93	27.02	27.19	62.18	44.11	40.40	29.50
Canada	35.78	25.55	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Austria	33.87	17.95	41.04	23.58	76.32	79.51	34.22	26.01	100.25	22.83
Denmark	19.56	21.45	20.26	24.19	55.31	47.02	29.59	31.95	40.96	49.01
France	15.21	14.46	16.50	16.12	55.08	65.55	26.59	18.65	35.51	27.29
Greece	33.93	25.89	48.22	37.31	96.19	92.24	40.73	23.66	63.84	39.11
Germany (BRD)	32.74	34.31	36.39	36.39	41.93	33.01	42.72	39.29	57.34	38.67
Italy	20.31	12.41	22.46	16.85	55.62	35.11	35.82	31.64	36.30	25.14
Netherlands	31.16	26.82	31.94	35.41	98.38	118.64	38.21	31.41	included in industry	
Norway	16.32	17.57	20.47	21.40	66.54	68.35	30.12	26.74	42.70	35.28
Portugal	18.80	11.37	24.47	14.58	62.98	33.23	21.79	24.99	n.a.	n.a.
Sweden	17.60	15.02	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Turkey	56.32	23.03	67.22	28.92	94.28	42.55	21.27	30.46	154.51	95.55
United Kingdom	17.78	15.99	24.47	21.59	22.98	23.64	32.88	26.18	41.62	37.91
Capitalist average	27.12	20.06	32.99	25.61	62.72	55.50	43.67	29.59	61.34	40.03
Index		74.0		77.6		88.5		67.7		65.3

Sources of data: The same as in Table Ia.

3. Fluctuations in agriculture and investment are to a great degree autonomous, the former being dependent on weather conditions and the latter on planners' development strategy. Since the intensity of fluctuations in agriculture and investment is very high, it is perhaps responsible for the high fluctuation coefficients of total production and industry. This is particularly relevant for the high coefficient group. If fluctuations in agriculture and investment were lower, fluctuations in the total production and industry would also perhaps be lower. This problem will be discussed later.

One may want to compare fluctuations in socialist countries with those in capitalist countries. Statistics for capitalist countries are given in Table IIa. At first glance, we see the following:

4. Fluctuations are lower in capitalist countries than in socialist ones. Mean coefficients of fluctuation are 25, 22 for total gross product, 30, 95 for total material gross product, 61, 09 for agriculture, 32, 94 for industry, and 57, 56 for construction. Socialist fluctuations are, therefore, 82 per cent (material gross product), 117 per cent (agriculture), 17, 8 per cent (industry including Hungary), and — 2, 3 per cent (industry excluding Hungary), and 67, 1 per cent (construction) higher than capitalist ones. However, if our hypothesis in 3. is justified, one would prefer to compare capitalist fluctuations only with the first group of socialist countries with low agriculture oscillations. In this case, capitalist fluctuations are *higher* than socialist ones by 24, 7 per cent (material gross product), 17, 5 per cent (agriculture), 31, 9 per cent (industry), and — 11, 1 per cent (construction). Of course, this comparison is not quite correct as there are countries with high oscillations in agriculture in the capitalist group too (Turkey and Greece).

The relative frequency of negative growth rates in capitalist economies is the following: total gross product, 5, 7 per cent; total material gross product, 6, 1 per cent; agriculture, 31, 7 per cent; industry, 5 per cent; and construction, 15, 3 per cent. Negative growth rates in capitalist countries were more frequent than in socialist ones in industry and construction, and less frequent in total production and agriculture. If capitalist countries (with the same reservation as above) are compared with the first group of socialist countries only, all figures are in favor of socialist countries.

Let us see now what the trends in fluctuation coefficients in socialist countries are. For this purpose the whole 1951—1965 period was split into two overlapping ten-year periods, 1951—1960 and 1956—1965, and the corresponding fluctuation coefficients were calculated. The results are given in Table II. These results permit the following conclusions to be drawn:

5. From the first to the second subperiod in 1950—1965, fluctuations *decreased* in nearly all cases. Mean fluctuations decreased from 64, 27 to 43, 62 for total social product, from 42, 74 to 31, 31 for industrial production, from 106, 95 to 70, 62 for construction, from 139, 77 to 107, 86 for agriculture production, and from 134, 41 to 85, 83 for investment. There are no exceptions to this trend in industry and investment; and only one in construction (Yugoslavia). The main exception is agricultural production in the first group of countries, where flu-

tuations increased. In three (out of four) cases, fluctuations in total production of this group also increased. Nonetheless, all conclusions in 2. are confirmed by Table II. In only four cases that cover 6 per cent of all cases (Bulgarian industry for 1951—1960 and 1956—1965, Rumanian and Hungarian construction for 1956—1965) are the lowest fluctuation coefficients of the second group lower than the highest ones in the first one.

The procedure described under 5. was also applied to capitalist countries in order to see trends in their fluctuation coefficients and to compare them with the socialist ones. The results of this investigation are presented in Table IIa. They allow us to conclude the following:

6. Trends in the coefficients of fluctuation are, in general, also decreasing in capitalist countries. Out of fourteen countries, the fluctuation coefficients decreased for total gross product in eleven countries; for total material gross product in eight cases, for agriculture in six cases, and for industry in nine cases (all out of twelve cases); and for construction in nine cases out of ten cases. Mean fluctuation coefficients decreased from 27.12 to 20.06 for total gross product, from 32.99 to 25.61 for total material gross product, from 62.72 to 55.50 for agriculture, from 43.67 to 29.59 for industrial production, and from 61.34 to 40.03 for construction. They decreased by 26.0, 22.4, 11.5, 32.3, and 34.7 per cent, respectively. Since the corresponding percentages for socialist countries are 32.1 (total social product), 24.6 (agriculture), 26.6 (industry), and 34 (construction) per cent, one may conclude that differences in coefficients of fluctuation between capitalist and socialist countries became less in 1956—1965 than they were in 1951—1960 in total social production and agriculture and that they became greater in industry and only slightly greater in construction.

## B

The second section of the first part of this paper is intended to present to the reader some by-products of my research on the intensity of fluctuations in socialist countries. These by-products are the average growth rates of the four (five in the case of socialist economies) aggregates studied in the first section ( $\bar{r}$ ) and the regression coefficients of the linear regression of the yearly growth rates on time (b). These coefficients (multiplied by 1), added to the corresponding average rates of growth, give (approximately, since only two decimals are given (the estimated values of yearly growth rates for any of the years under review ( $r = \bar{r} \pm bt$ )).

The average growth rates and their trend coefficients are presented, separately for socialist and capitalist countries, in the Tables IV and IVa. Mean (simple arithmetic) growth rates for socialist (separately for the first and second groups) and capitalist countries are added at the bottom of the tables.

The following conclusions can be drawn:

1. While there are important differences in coefficients of fluctuation between the two groups of socialist countries, differences in

Table IV  
Average Growth Rates ( $\bar{r}$ ) and Their Trend (b) Coefficients Socialist Countries, 1951—1965.

	Total Social Product		Agriculture		Industry		Construction		Investment	
	$\bar{r}$	b	$\bar{r}$	b	$\bar{r}$	b	$\bar{r}$	b	$\bar{r}$	b
Soviet Union	9.04	-0.44	4.32	-0.11	10.70	-0.44	10.28	-0.56	10.66	-0.37
Poland	7.14	-0.22	2.17	0.15	9.76	-0.34	8.21	-0.77	10.06	-0.96
Germany (DDR)	8.10	-0.97	n.a.	n.a.	9.60	-0.80	9.25	-0.94	13.57	-1.45
Czechoslovakia	5.71	-0.58	1.14	-0.03	9.07	-0.59	8.89	-1.19	8.37	-0.27
First group means	7.47		3.86		9.78		9.16		10.67	
Rumania	10.26	-0.43	6.16	-0.88	14.10	-0.30	13.49	-1.32	16.19	-1.49
Hungary	5.70	-0.15	1.43	-0.63	8.63	-0.23	7.16	-0.63	9.81	-1.07
Yugoslavia	7.60	0.27	6.96	-1.24	10.26	0.55	5.28	0.32	6.66	-0.31
Bulgaria	9.95	-0.72	5.98	-0.53	13.78	-0.26	11.99*	-0.28*	16.34	-0.26
Second group means	8.38		5.13		11.69		9.48		12.25	
Socialist averages	7.93		4.49		10.73		9.32		11.46	

Sources: Same as for Table I.  
\*In current prices

growth rates, except for agriculture (where the second group has almost 80 per cent higher growth rates than the first one) do not reach 20 per cent.

2. Growth rates of socialist countries (the only exceptions being the Yugoslav total social product, Yugoslav industry, Yugoslav construction, Polish agriculture, and Bulgarian industrial investment) are *decreasing*, and are decreasing rather *fast*. Two remarks may be made about Yugoslavia: first, if two or three additional years are included into our time series, Yugoslavia ceases to be an exception; second, and this is remarkable, Yugoslavia has, among socialist countries, the highest rate of growth in agriculture and the lowest rate of growth in construction and industrial investment.

Table IVa

Average Growth Rates ( $\bar{r}$ ) and Their Trend (b) Coefficients  
Capitalist Countries, 1951—1965

	Material Gross Product		Agriculture		Industry		Construction	
	$\bar{r}$	b	$\bar{r}$	b	$\bar{r}$	b	$\bar{r}$	b
United States	3.70	0.13	1.44	0.13	4.14	0.12	2.49	0.36
Canada	4.50(a)	0.05(a)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Austria	5.41	-0.15	2.49	-0.25	5.79	-0.17	5.70	-0.32
France	5.17	0.08	2.49	0.15	5.56	-0.04	6.17	0.46
Denmark	3.90	0.33	1.79	0.08	4.57	0.49	5.18	0.59
Greece	6.74	0.07	5.01	-0.35	8.46	0.06	9.14	0.66
Germany (BRD)	7.54	-0.35	2.48	-0.26	9.64	-0.27	7.68	-0.45
Italy	6.12	-0.24	2.66	-0.12	8.11	-0.28	9.57	-1.78
Netherlands	5.24	0.07	2.96	0.11	5.81	0.12	included in industry	
Norway	4.28	0.19	0.16	-0.02	5.12	0.23	2.16	0.24
Portugal	5.01	0.25	1.56	0.02	7.32	0.50	—	—
Sweden	3.82(a)	0.22(a)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Turkey	4.73	-0.41	3.43	-0.59	6.23	-0.09	6.68	-0.64
United Kingdom	2.93	0.13	2.71	0.15	3.13	0.10	2.53	0.41
Capitalist average	4.94		2.43		6.16		5.73	

Sources: Same as for Table I.  
(a) non-material (SNA) concept.

3. Rates of growth in capitalist countries are lower and in many cases, particularly agriculture, much lower than those in socialist countries. Since the differences in rates of growth of agricultural production are mainly a result of the level of economic development (the two underdeveloped capitalist countries have higher rates of growth

of agricultural production than the average socialist rate), they do not tell very much. As for other rates of growth, their comparison for the same time periods is also rather dubious. Instead of insisting on differences, we would rather attract the attention of readers to the fact that capitalist rates of growth, unlike socialist ones, are in general increasing. Out of forty-six (excluding agriculture), there are thirteen (28 per cent) cases of decreasing average rates of growth (in socialist countries 87 per cent, excluding agriculture and investment). If these trends continue, socialist growth rates may in the near future come very close to capitalist ones.

4. The relation of the rate of growth of industrial production to the rate of growth of industrial investment may serve as a rough indicator of the efficiency of investment in industry (the structure of investment, the level and the structure of investment before the period under consideration, relative prices, and the like are not taken into account). Computed in the said way, the coefficients of efficiency of investment are the following: Bulgaria, 0.84; Rumania, 0.87; Hungary, 0.88; the Soviet Union, 1.004; Czechoslovakia, 1.08; and Yugoslavia, 1.54. Germany is left out since no industrial investment figures are available.

(Rad primljen septembra 1969.)

#### FLUKTUACIJE I TRENDI STOPA RASTA SOCIJALISTIČKIH ZEMALJA

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##### Rezime

Prikazuju se rezultati merenja intenziteta fluktuacija u savremenim socijalističkim zemljama kao i prosečnih stopa rasta i njihovih trendova. U empirijske stope rasta osnovnih makroagregata regresirani su linearni vremenski trendovi. Kao merilo fluktuacija uzeta je standardna greška (suma kvadriranih reziduuma linearne regresije podeljena sa brojem članova u seriji, korenovana i pomnožena sa 1000) godišnjih stopa rasta; konstanta linearne regresije daje prosečnu stopu rasta, a regresioni koeficijent brzinu njenog opadanja odnosno povećavanja. Rezultati su prikazani u odnosnim tabelama.

Osnovni zaključci na bazi prikazanih podataka su sledeći: U razdoblju 1950—1965. fluktuacije stopa rasta jače su u socijalističkim zemljama nego u kapitalističkim. U pogledu fluktuacija socijalističke zemlje čine dve odvojene grupe. U prvoj, u koju ulaze SSSR Poljska, Nemačka Demokratska Republika i Cehoslovačka, fluktuacije su bitno manje nego u drugoj grupi u koju ulaze Rumunija, Mađarska, Jugoslavija i Bugarska. Naročito su velike razlike u intenzitetu fluktuacija između te dve grupe zemalja u poljoprivredi, investicijama i građevinarstvu. U svim socijalističkim zemljama fluktuacije su najjače u navedenim trima makroagregatima, a bitno su manje u industriji i celokupnom društvenom proizvodu. Priličan je izuzetak Sovjetski Savez u kome su fluktuacije svih makroagregata vrlo male, mnogo manje nego u kapitalističkim zemljama. Sa jedinim izuzetkom poljoprivrede u prvoj grupi

zemalja, u svim se socijalističkim zemljama i makroagregatima fluktuacije smanjuju s vremenom. To je bilo utvrđeno na osnovu upoređivanja koeficijenta fluktuacije za razdoblje 1955—65. sa razdobljem 1950—60. god.

Vrlo su interesantni rezultati izračunavanja prosečnih stopa rasta i njihovih trendova. Stope rasta u socijalističkim zemljama su prilično visoke, više nego u kapitalističkim zemljama. Međutim, sa jednim izuzetkom Jugoslavije, one pokazuju u razdoblju 1950—65. god. negativan trend, znači — smanjuju se.

Svi podaci iz kojih proizlaze gornji rezultati su službeni podaci odnosnih zemalja, objavljeni velikom većinom u odnosnim statističkim godišnjacima. Autor nije tretirao pitanje u kolikoj meri ti podaci odgovaraju realnosti ni da li su upoređivane stope suštinski uporedive.

## AZUSTIRANJE, INTERPOLACIJA I EKSTRAPOLACIJA SEZONSKIH VREMENSKIH SERIJA

Branislav IVANOVIĆ

1. Ako se u toku vremenskog razmaka od  $N$  godina, svake godine meri  $n$  puta obeležje  $X$  i ako je  $x_{ij}$  njegova  $j$ -ta vrednost u  $i$ -toj godini, matrica

$$X = \begin{pmatrix} x_{11} & \dots & x_{1n} \\ \dots & \dots & \dots \\ x_{N1} & \dots & x_{Nn} \end{pmatrix}$$

predstavljace tada niz sezonskih vremenskih serija. Varijacije između podataka jedne iste godine i između odgovarajućih vrednosti podataka različitih godina mogu biti posledica aleatornog karaktera, sezonskog karaktera i opšte tendencije u razvoju posmatrane pojave. Ako je dovoljno dug posmatrani vremenski razmak, ciklički karakter pojave može se takođe afirmisati u opštoj tendenciji razvoja.

Ako je u pojavi jako naglašen sezonski karakter i ako su među-sezonske varijacije više manje stabilne, relativne izravnate vrednosti u  $(t+1)$ -oj godini biće

$$(1.1) \quad \theta_{i+1,t}^* = \sum_{j=t-1}^{t+1} k_{jt} \theta_{ij}$$

gde je

$$i \in \{1, \dots, n\}, \quad t \in \{1, \dots, N-1\},$$

$$i = 1 \longrightarrow i-1 = n \text{ i } \theta_{i,t-1} = \theta_{n,t-1},$$

$$i = n \longrightarrow i+1 = 1 \text{ i } \theta_{i,t+1} = \theta_{1,t+1}$$