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RECENT IMPROVEMENTS TO CONSTANT PRICE ESTIMATES IN BULGARIAN NATIONAL ACCOUNTS

Supporting paper submitted by National Statistical Institute of Bulgaria*

Introduction

A major concern in economic analyses is the measurement of the economic growth in volume terms between different periods of time - the inter-temporal comparisons. In principle, the economic accounts provide a suitable framework for constructing a system of price and volume indices and ensure the consistency of the price and volume data, the main objective being to have measures which will allow to carry out good analyses of inflation and economic growth. This is of particular interest for the transition countries in a period which is characterized by radical changes both in the economic and social life and in the accounting and statistical systems.

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This paper sets out the main issues related to recent work on improvements to the constant price estimates of national accounts in Bulgaria. The work has been undertaken with actual data and is closely related to the topics and problems considered by the joint Eurostat and ACs project A2 'Estimation methods at constant prices', following the principles for measuring prices and volumes outlined in the Commission Decision (30 November 1998):

Principle 1:

In the measurement of prices and volumes a detailed level of aggregation of products shall be used. This level of aggregation, which is referred to as the elementary level of aggregation, shall be at least as detailed as the P60 level of ESA 95 for output, as well as all categories of intermediate and final use.

Principle 2:

Volume measures available at the elementary level of aggregation shall be aggregated using the Laspeyres formula to obtain the volume measures of all national accounts aggregates. Price measures available at the elementary level of aggregation shall be aggregated using the Paasche formula to obtain the price measures of all national accounts aggregates.

Principle 3:

Volume measures derived at the elementary level of aggregation shall be aggregated using weights derived from the previous year.

In Bulgaria constant price estimates and volume changes are expressed in the prices of the previous year rather than using the fixed base year. Because of both: the rate of inflation and the extensive changes in the structure of prices and the economy itself, until now it has not been thought appropriate to calculate price data on a single base year. That is why, the chained approach was adopted since the very beginning of the SNA'93 implementation. Since 1998 for PPIs and year 2000 for CPIs (as an experiment only) 1995 fixed base year approach was implemented as well. Re-basing procedure concerns the chain linked previous year referenced indices using also previous year weights. So, **Principle 3** is performed.

Concerning **Principles 1** and **2** the recommendations are met to a great extent in the Bulgarian national accounts. However, there are still some problems to be solved. Those weak points were the major target of the project work during the recent two years. Although the project considered methodology and practice of

annual national accounts constant price estimates, some attention was paid to corresponding short-term indicators such as quarterly national accounts data, monthly price series, etc. As far as the quarterly national accounts compilation follows the major principles of the annual accounts framework a part of the work on improving constant price estimates was focused on them also. Furthermore, particular efforts were put to increase the quality of the basic statistics that have strong impact on the plausibility of the national accounts figures.

Some of the improvements achieved were completed and implemented in practice, and the others are still in progress.

Improvements completed

Increased detail in the structure used for deflation of industrial output

Special work was undertaken to improve the former practice in this area, i.e. industrial enterprises output deflation at branch level was done by a price index (PPI) covering only principal products of a given industry. The idea was to start deflating the detailed product groupings making up the output at branch aggregation.

The main efforts were put on getting more detailed structure of sales of industrial enterprises and incorporating it in the corresponding output deflators.

Relevant practical issues

Monthly, quarterly and annual PPIs are calculated for about 600 product groups. Each of them is associated with one 3-digit industrial group. The products are weighted by their base year (1995) relative importance in order to derive the 3-digit level indices. Thus, the 3-digit level PPIs appear to be a kind of price indices for the corresponding principal products. In other words, the 3-digit level PPIs do not take into account price movements of any secondary products of enterprises. Nevertheless it might be appropriate for common purposes of PPIs, it does not meet the required format of the deflators for national accounts set out by **Principles 1** and **2**. This might have a negative impact on the accuracy of the constant price data not only at the level of aggregation in mind but also at the upper ones.

Recent improvements

The work began with checking the possibilities of getting additional information in order to estimate the product breakdown of the industrial branches at 3-digit level. A good basis for doing so was the sample survey on industrial production conducted monthly by the NSI Industrial Statistics Division, considering sales on the domestic market (in value and quantity terms).

The following additional procedures were applied to that set of data:

1. Two data series were constructed - for the private and for the public sector. Both of them contain information about the sales' values by product.
2. Two matrices 'industry by product' were designed for the respective types of ownership (public and private). Thus, the tables consist of about 130 rows (products) and 130 columns (branches).
3. Detailed product structure by branch was obtained as regards the two types of ownership.
4. Composite deflators were derived for each 3-digit branch level by weighting a vector-column of common PPIs re-based to the preceding year prices with the product decomposition from those structural tables.

The effect of the new procedure is monitored in Annex 1 where the 1997 results for the public sector are shown. The table compares the principal product and 'commodity weighted' deflators at the 3-digit level. (Please note that the overall annual average CPI for 1997 to 1996 was 1147,3 per cent.)

The improved indices were used to deflate the current price domestic sales as part of the industrial output. It was done at a 3-digit branch level separately for the public and for the private sector. Corresponding UVIs were used for the direct exports.

The common PPI methodology has been changed at the beginning of 1998. The current period weights and preceding year price base have been fixed to 1995 ones. The indices take into account the direct exports as well and those movements are explained only by the BGL/USD exchange rate changes due to the lack of monthly foreign trade price data. Although these changes were appropriate to face the aim of PPIs themselves, they did not meet the national accounts purposes. That is why, the national accountants have undertaken some

additional procedures in order to achieve the wanted deflator format according to **Principle 3**:

1. Deriving re-based deflators for sales on the domestic market, as follows:
 - the fixed base Laspeyres type PPIs at 3-digit level for the current period (a quarter or a year), have been re-based to average previous year prices. These indices are used as a vector-column in the procedure described above.
 - the so derived new composite indices are then aggregated up from the 3-digit to 2-digit level by using the current period domestic sales as weights.
2. Calculating deflators for direct exports:
 - corresponding UVIs referenced to the previous year prices are used for deflating the direct sales abroad.

Improved deflation of exported output and imported intermediate inputs, imported machinery for GFCF and net exports of goods

Some work has been done since the beginning of 1999 in order to improve exports/imports UVIs. So, more accurate deflation has been pursued for the respective components of national accounts aggregates, such as: output and intermediate consumption (from the production side) and exports/imports of goods and GFCF (from the expenditure side).

The **practice until the end of 1998** considered specific deflators especially constructed for national accounts purposes:

- composite price index for the homogenous goods (oil, chemical products, coal, electricity, etc.) were derived from corresponding exports/imports UVIs using Paasche formula. These products comprise about 45-50 per cent of the external trade of goods.
- for exports of non-homogeneous goods the total domestic CPI adjusted for exchange rate movements was used, while for imports, the harmonized EU15 CPI adjusted by the BGL/USD exchange rate was applied.

The use of those deflators was imposed by some limitations in the Bulgarian UVI calculation practice, most of which still exist. One of the problems referred to major operational difficulties in trying to validate Customs data. As the NSI edits the data currently, it often finds inconsistencies. When transactions are questioned because of the inconsistencies, the declaration must be sent back to the original custom's official who issued the declaration as he is the only person authorized to make changes. This type of environment makes the computation of meaningful unit value indices more difficult. Another problem was related to the changes in the Customs tariff. The third problem that still exists is the potential inaccuracies of the UVIs by themselves. These might be: changes in the mix of goods and of companies engaged in foreign trade, and of markets; erroneous recording, especially of the quantity component; changes in product quality, and exchange rate movements.

Recent improvements

Additional development of the UVIs was undertaken by the NSI External Trade Division staff in order to provide national accounts with more appropriate deflators for the exported/imported components of GDP. The following steps were done:

1. The implementation of the new Customs tariff based on the Harmonized System (HS) allowed calculation of unit values to be made at the level of 9-digit HS code (instead of the previously used 6-digit level). The goods are thought to be more 'homogeneous' at that lowest level of aggregation, so the unit values are seen to be very close to the 'true' exports/imports prices.
2. Screening approach was applied in order to reduce insignificant and volatile transactions. The screening out covered about 5 per cent of all transactions based on value, i.e. the smallest and one-of-a-kind transactions in both the base period and current (quarterly, annual) periods were eliminated.
3. Additional smoothing was applied to the raw data. The goods with extreme movements in unit value terms were considered as outliers and were eliminated by that procedure.
4. A cross-classification was established between the Customs Tariff and the National Classification of Economic Activities (NCEA) based on NACE, Rev.1. Thus, each 9-digit HS level UVI is associated with and allocated to a given 3-digit branch code, so that exports/imports price indices were derived at that classification level by using current period weights (Paasche formula).

The improved overall UVI represents about 90 per cent of external trade of goods, and the detailed UVIs can be used for deriving implicit deflators at upper levels of aggregation.

The improved exports/imports UVIs have positive impact on the constant price estimates of GDP both from production and final expenditure sides. They are implemented in the national accounts practice, as follows:

- in the production accounts - as deflators correspondingly for the direct exports of industrial output and the imported supplies for intermediate consumption. For the latter, a structural table of imported intermediate inputs (weights) has been constructed by using the data and the format (30 branches and 50 commodity groups) of the last Use matrix available.
- in GDP by final expenditure:
 - ⇒ the total exports of goods at current prices are deflated by the overall exports UVI derived by aggregating the improved HS 9-digit level UVIs using current periods weights (Paasche type indices);
 - ⇒ the total imports of goods at current prices are deflated by the overall imports UVI derived by aggregating the improved HS 9-digit level UVIs using current periods weights (Paasche type indices).
 - ⇒ the imported machinery and equipment for GFCF are deflated by an index aggregated from the UVIs for 9 machinery headings at 3- and 2-digit level of NCEA. This is done because there is no breakdown of GFCF at current prices.

The effect of the UVI improvements on respective final expenditure aggregates for preliminary 1998 data are shown in Annex 2.

Recent research work

This section briefly describes the progress of work on improvements not yet fully completed. Such work has been undertaken in the following areas:

- excises;
- development of the PPI;
- developments of the CPI.

Excises

The efforts were put on the **excise duties** estimation at constant prices as a part of taxes and subsidies on products methodology and practice. The main goal was to increase the breakdown of estimates and to use the proper volume projection method. The work was done on experimental basis only by using the annual data for 1998 (Annex 3). After analyzing the results some inconsistencies were found as regards the raw excise tax base data (Table 3 in Annex 3). Because of that, and of foreseen changes in the tax legislation and recording, it made no point in implementing these 'improvements'. Since the new excise tariff has taken place from the beginning of 1999 the excise duties are now a kind of **quantity tax** - they are obtained as certain amount per quantity unit. So, certain clarifications of that approach are still necessary. In addition to that, the tax data compiled according to the new legislation are expected to be more reliable due to additional validating procedures applied during the data processing.

Development of the PPI

The common PPIs calculated by the NSI are based on **average prices**, i.e. they are rather like UVIs. The price measures used in the index is the unit values for each product, calculated by dividing the corresponding domestic sales by the quantity sold.

Some work was undertaken in 1998 to collect price data on the proper **transaction basis**. According to the adopted programme new activities should be involved in the specification price survey each quarter in order to meet EU statistical standards by the end of 2001. Since January 1999 this survey was expanded to 9 industries at 3-digit level of the National Classification of Economic Activity (NCEA), for which the prices of precisely specified products have been observed.

At present, that survey covers 25 industrial groups at 3-digit level.

Development of CPI

The CPI covers that part of SNA aggregates which concerns the monetary expenditures of the population and the criteria, determining the expenditures on individual consumption, are in methodological compliance with the principles of SNA practice.

The CPI is a chain Laspeyres index re-based every year to annual average previous year prices. The commodity basket is consistent with the COICOP

structure and with the national accounts definitions and concepts. It is re-weighted every year by the annual household final consumption monetary expenditures provided by HBS¹- totally they cover about 83.7% of the overall monetary expenditures of households for final consumption. The link is made for December in the previous year, when two monthly indices are calculated based both: on current and on previous year average prices and weights. This practice ensures consistency of the base prices and weights and of the chain indices within one year. A problem still exists because of the fact that no traditional adjustments are made yet for changes in quality of priced goods.

The NSI verifies the data and calculates monthly indices based on the annual average prices and final consumption expenditures of households from the previous year. At present, the Bulgarian consumer basket of goods and services is allocated into 12 major consumption groups according to the new COICOP/HICP. For national accounts purposes CPI based deflators are provided at 3-digit level.

Following the **Principle 2** additional development of CPI based deflators was undertaken from the beginning of year 2000 especially for national accounts purposes. That refers to the application of **Paasche formula** using the current year HBS weights in order to derive the wanted deflator format. A comparison between the results of calculating CPIs according to the two types of index formula is shown in Annex 4.

Final remarks

Much work has been done by NSI in the last year pursuing improvements to constant price national accounts. Irrespectively of the results achieved concerning the improvement of GDP constant price estimates, additional work is still needed. In this aspect, it should be stressed that the further development in this field closely depends on the relevant background - financial and staff resources, organizational decisions, intradepartmental and inter-institutional relationships and cooperation.

¹ HBS = Households budget survey.

ANNEX 1**Effect of the procedure used for calculating the new deflators for domestic sales of industrial output, public sector, 1997**

%, 1996=100

Code, NCEA	Former deflators	New deflators	Code, NCEA	Former deflators	New deflators	Code, NCEA	Former deflators	New deflators
061	1240,3	1180,8	231	1017,8	930,6	343	1494,4	1686,5
062	1015,8	1162,9	232	1128,5	1127,4	344	945,9	957,0
092	1123,4	1123,4	240	1037,0	744,3	345	846,7	936,4
093	1127,2	1126,6	251	1040,7	1038,7	346	1045,9	1023,3
101	984,5	976,9	252	1037,0	1037,0	347	994,2	997,2
102	1152,3	1142,8	261	1028,5	912,6	350	1454,0	1453,0
104	1096,8	1105,1	262	1200,1	1149,9	361	996,8	996,7
105	1200,2	1271,0	271	925,9	916,4	362	1010,2	1006,4
141	1547,0	1631,2	272	1102,3	1102,3	363	1057,6	1058,2
142	1032,9	1032,9	273	1187,8	1141,9	364	964,8	964,4
143	1053,0	1057,8	274	1146,1	1153,7	365	1038,6	1038,1
144	924,3	926,4	275	1199,0	1165,7	366	925,3	913,3
145	1205,7	1206,2	276	1148,3	1282,5	371	1292,2	1284,0
146	1028,5	1023,2	277	879,4	895,1	372	1062,7	1062,7
147	913,2	856,2	281	1038,5	1013,6	373	893,3	893,3
148	957,0	948,2	282	1093,7	1095,2	381	1277,5	1268,5
149	1039,2	1040,5	291	1138,0	1138,3	382	1343,1	1311,7
151	1005,5	984,9	292	968,2	971,2	383	937,9	1098,0
152	1279,6	1279,6	293	1450,1	1438,4	384	1411,2	1059,8
153	947,8	946,3	294	992,8	994,4	385	1277,5	1277,5
160	1206,5	1252,2	295	975,1	976,5	391	847,4	864,2
171	974,3	975,6	296	1429,9	1420,4	392	862,4	934,5
172	983,7	985,9	297	1051,6	1049,6	393	1040,6	741,3
174	976,8	1012,0	298	793,0	866,6	401	1017,4	1014,7
175	942,0	940,4	299	1224,7	1211,3	402	1149,6	1112,6
176	630,3	788,9	301	1023,4	1028,4	403	964,4	964,4
177	1077,6	1042,6	302	1034,3	1019,3	404	1020,5	1020,5
181	1071,1	1079,6	303	1147,6	1121,3	405	1116,2	998,8
182	943,8	954,3	310	1002,7	996,0	411	993,8	989,5
191	1274,6	1471,9	320	1108,3	1075,8	412	911,5	911,5
192	1020,5	1005,6	331	870,4	890,7	413	911,5	911,5
201	993,9	988,8	332	1244,5	988,3	414	859,1	859,1
202	1060,1	1043,9	333	1047,8	1076,8	415	911,5	911,5
203	1019,1	1018,0	334	1046,8	1045,7	416	1124,7	984,0
221	1003,4	1007,2	335	1121,7	1067,7	422	981,5	981,5
222	905,1	923,3	336	1031,4	1035,4	451	944,7	948,6
223	900,2	901,5	337	1123,4	1112,0	452	962,1	1039,7
224	958,9	963,5	341	990,3	991,7	453	1039,7	1015,4

225	959,2	959,2	342	1024,6	1030,6			
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ANNEX 2

Effect of the UVI improvements on preliminary 1998 NA data

NA variable	Volume indices, 1997=100, %		Relative importance as share of GDP, %, current prices
	Former	New	
Exports of goods	86.4	88.8	45.2
Imports of goods	106.2	110.0	46.3
Imported machinery within GFCF	150.4	163.6	3.0

ANNEX 3

Table 1 Accrued and actually paid excise by type of goods and services, 1998

(Thous. Levs)

N	NAME (N in the EXCISES Tariff)	DOMESTIC PRODUCTION					IMPORTS				
		Unit	Quantity	Value at basic price	Excise accrued	Excise paid	Unit	Quantity	Custom taxable value	Excise accrued	Excise paid
a	b	1	2	3	4	5	6	7	8	9	10
I	TOTAL	X X	2152033701	6617230325	72322961	46175267	X X	28103532	6426742	4157275	4064987
1	Beer	litre	2069922154	5141859043	21293179	16078547	litre	523113	532750	182331	166793
2	Wine	litre	33382762	129578805	10045880	5594213	litre	26489	55314	20641	73452
3	Spirits	litre	48728785	1345792477	40983902	24502507	litre	27553930	5838678	3954303	3824742

Table 2 Excise constant price estimates, 1998 at 1997 prices

(Thous. Levs)

N	NAME (N in the EXCISES Tariff)	PPI domestic market	Index of imports	Constant price taxable value			Excise rate	Excise constant prices
				domestic production	imports	Total		
a	b	11	12	13 = 3 / 11	14 = 8 / 12	15=13+14	16	17=15*16
I	TOTAL			3974251441	5046794	3979298235		917661037
1	Beer	1,719	1,286	2991718706	414269	2992132975	0,15	448819946
2	Wine	1,467	1,252	88318465	44173	88362638	0,20	19439780
3	Spirits	1,505	1,273	894214270	4588352	898802622	0,50	449401311

Table 3 Excise rates – actual data and excise tariff, 1998

%

N	NAME (N in the EXCISES Tariff)	Excise rates (actual data)		Excise rates (excises tariff)
		Domestic production	Imports	
a	b			
1	Beer	0,4	34,2	15,0
2	Wine	7,8	37,3	22,0

3	Spirits	3,0	67,7	50,0
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ANNEX 4

Comparison of the two CPI sets calculated by Paasche and Laspeyres formulae

COICOP CODE	NAME	1996			1997			1998		
		W96-Levs	Paasche	Laspeyres	W97-Levs	Paasche	Laspeyres	W98-Levs	Paasche	Laspeyres
	Total	1054388957	218,82	221,58	4347903256	1118,27	1147,59	7129260687	116,18	117,27
01	Food and nonalcoholic beverages	513941401	220,62	222,68	2299420658	1158,84	1187,68	3311796811	109,16	109,53
02	Alcoholic beverages and tobacco	46985664	209,73	211,39	156250718	1016,92	1028,49	278670223	111,02	112,40
03	Clothing and footwear	87810046	199,31	199,97	353759620	1160,03	1173,74	583681262	115,27	115,57
04	Housing, water, electricity, gas, and other fuels	126954146	264,13	266,73	555048673	1160,48	1173,63	1011366588	133,15	135,33
05	Furniture, household equipment and routine home maintenance	49259868	214,99	217,26	167678860	1019,81	1072,23	316108279	108,09	109,14
06	Health	26310852	186,28	188,34	125972055	1347,18	1384,97	234700137	128,77	130,54
07	Transport	82674760	254,07	258,94	279746231	1046,72	1102,03	511268321	117,97	121,23
08	Communication	12214976	183,34	186,51	65540727	934,98	935,02	133756840	120,84	121,00
09	Recreation and culture	26798587	196,64	205,84	93139316	733,24	821,74	211882736	127,38	137,90
10	Education	5889511	158,51	158,24	17738028	967,50	970,11	46157805	233,04	231,85
11	Restaurants and hotels	39029690	185,73	186,27	108272021	1068,82	1086,12	252636063	146,65	148,52

12	Miscellaneous goods and services	36519456	184,60	189,42	125336349	1002,86	1021,44	237235622	113,73	118,43
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