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NOWCASTING OF PPP

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1. GENERAL APPROACH AND BASIC DATA

A frequent user complaint is that the detailed PPP results come too late for their purposes and that there are no early estimates available. At the June 2002 PPP Working Party meeting, Eurostat, therefore, introduced the outline of a nowcasting model for PPPs, which would produce early estimates of PPP, so called "nowcasts" five months after the end of the reference period.

Between June and November 2002, this model has been tested using so-called "real time" data, i.e. data actually available at the time when a nowcast is to be carried out. In general, such "real time" data would be data available in spring (t+4 is the deadline for the ESA95 delivery) of the year t for the year t-1. The test covered the 15 EU Member States and the year 2000 only.

Two main basic data sets are required for the calculation of PPPs: *prices* from the PPP price surveys and *weights* (GDP expenditure) from National Accounts (NA). At the point in time when the nowcasting will be undertaken (t+5), generally no price data from price surveys is available for the reference year t in question. Therefore, the PPPs of the previous year t-1 have to be extrapolated with annual average price indices.

Eurostat undertook the test using HICP data. This has the advantage that no extra data collection from the countries is necessary, as the HICP is already available at Eurostat. There are still problems with the availability of a complete and dis-aggregated set of HICP from some Candidate Countries. The same data availability problems apply for Switzerland.

The question, which we wanted to answer with the tests was if the extrapolated PPP get "better" by using extrapolation at a more disaggregated level or not. The indicator for being "better" is how close the extrapolated PPP are to the PPP which have been calculated for the reference year using a full set of price data and weights (hereinafter referred as "actual PPPs"). We compared the extrapolated PPP for the reference year 2000 and 2001, simulating how we would have estimated them with the information available in Spring 2001 and Spring 2002, with the preliminary PPP 2000 as published in July 2002 and the preliminary results 2001 as published in December 2002.

However, because of data availability, the only GDP expenditure for which the PPP of the previous year can be extrapolated at disaggregated level is Private Household Consumption Expenditure (PHCE). The other expenditure items have to be extrapolated using the NA aggregate level implicit deflators and reference PPPs. As in the "normal" calculation process, the PPPs for net tourist purchases abroad and net exports are simply the exchange rates.

To be able to aggregate the extrapolated PPPs up to GDP level, following the same aggregation method as in the "normal" PPP calculations based on a full set of input data, weights are necessary. At the point in time when the extrapolation of PPP will be undertaken, t+5, from the national accounts first delivery according to the ESA95 data delivery timetable (t+4), the following aggregates are available:

- Sum of private household and NPISH final consumption expenditure (PHCE + NPISH FCE)
- General government final consumption expenditure
- Gross fixed capital formation
- Changes in inventories
- Exports and imports of goods and services.

In fact, these first estimate of expenditure data from the national accounts are the only "hard facts" in the proposed extrapolation model. Their availability after t+4 is the reason why the nowcast can be undertaken at the earliest at t+5. However, as the available level of disaggregation is not sufficient for the nowcast, the detailed breakdown of PHCE has to be estimated by applying the detailed expenditure structure of the previous year t-1 (or what ever most current year is available in individual countries) to the more aggregated information on expenditure available at t+4.

2. DIFFERENT VERSIONS OF THE PPP EXTRAPOLATION

To analyse and compare the possible differences in the results provided by using different levels of aggregation, the following four alternative calculation methods for extrapolating PPPs were proposed:

1. **Extrapolation of PPPs at total GDP** level using the total GDP implicit deflator.

2. **Extrapolation at the level of main GDP aggregates** using the implicit deflators of these aggregates and reference PPPs. The PPPs for 5 main aggregates were extrapolated by implicit deflators; the actual exchange rate was used for "net exports" and a reference PPP was used for "changes in inventories". Finally the extrapolated PPPs, the exchange rate and the reference PPP were combined with expenditure data and the EKS aggregation procedure was carried out for the seven main aggregates.

3. **Extrapolation of PPPs when PHCE is broken down into 15 categories** (for breakdown, see Annex). These 15 items represent the PPP analytical categories plus a further breakdown of housing[1]. The PPP for 15 categories of PHCE were extrapolated by the HICP, the PPPs for the four other main aggregates were extrapolated by implicit deflators, the actual exchange rate was used for "net exports" and for the "net purchases of tourists abroad" and a reference PPP was used for "changes in inventories"; then these extrapolated PPPs were combined with expenditure data and the EKS aggregation procedure was carried out for these 21 categories (15 + 6 other main aggregates).

[1] The PPP analytical category "Gross rents, fuel and power" was split into three sub-items because of the large imputed rents weight in national accounts. The HICP does not have the imputed rents included in the weighting scheme. The weights' structure of price indices used for the extrapolation should be as close as possible to the weights' structure of the PPPs, which comes from the NA and therefore includes imputed rents. To be able to apply the right price index to the rentals the split was necessary.

4. **Extrapolation of the PPPs when PHCE is broken down at basic heading level**. The PPP for 198 categories of PHCE were extrapolated by the HICP and the PPPs for the four other main aggregates were extrapolated by implicit deflators. The actual exchange rate was used for "net exports" and for the "net purchases of tourists abroad" and a reference PPP was used for "changes in inventories". The extrapolated PPPs were combined with expenditure data and the EKS aggregation procedure was carried out for these 205 categories (199 + 6 other main aggregates).

Consequently, methods 2, 3 and 4 differ mainly in terms of the level of aggregation of PHCE used. As for the calculation procedures, a summary is given in table 1.

Table 1. Summary information on calculation procedures

Aggregate	**Breakdown**	**Extrapolation factors / reference PPP**
Private household consumption expenditure	Method 2: total	Method 2: implicit deflator of sum of PHCE and NPISH FCE
	Method 3: by 15 items	Method 3: HICP broken down by 15 items
	Method 4: at the basic heading level	Method 4: HICP at the basic heading level
Balance of tourist purchases abroad	total	Exchange rate
NPISH final consumption expenditure	total	Method 2: implicit deflator of sum of PHCE and NPISH (FCE) (Nov'02: reference PPP is the PPP of PHCE of method 2)
		Method 3: implicit deflator of sum of PHCE and NPISH (FCE) (Nov'02: reference PPP is the PPP of PHCE of method 3)
		Method 4: implicit deflator of sum of PHCE and NPISH (FCE) (Nov'02: reference PPP is the PPP of PHCE of method 4)
Gross fixed capital formation	total	Implicit deflator from national accounts
Changes in stocks	total	Reference PPP is the PPP of GFCF
Government final consumption expenditure	total	Implicit deflator from national accounts
Balance of exports and imports	total	Exchange rate

It is obvious that from a theoretical point of view Method 1 is the weakest approach, however its beauty is its simplicity. Method 1 implies indirectly that the country's price structures are relatively unchanged over time and this hypotheses is especially questionable for the countries, which are heavily effected by changes in the terms of trade.

The differences between Method 3 and Method 4 should be generally not very significant because the HICP data exist not for all 199 BHs and, in reality, approximately 80 different initial / primary HICP have been used. In addition, it needs to be underlined that the product baskets of the HICP (or the national CPI baskets) and the product baskets of PPP can be very different. Therefore, even very detailed HICP data do not guarantee the adequate reflection of the price movements in the products building up the PPP baskets. With other words: very aggregated data is not good but very detailed (but not fully relevant) data is also not necessarily an advantage.

Consequently it was up to the tests presented here to find out which intermediate level could bring acceptable results, if possible combined with acceptable regular workload at both ends, ECP participant countries and Eurostat.

3. THE RESULTS AND CONCLUSIONS OF THE NOVEMBER 2002 TESTS

The tests by all four versions for th EU15 countries were done for the year 2000 in November 2002. tThe following could be concluded by analysing the deviations of the ratio between actual PPPs and nowcast PPPs:

1. It seems that the nowcasting exercise on the basis of a detailed breakdown of GDP and extrapolation of PPP at **more disaggregated level** of PHCE provides the best result.

2. The results for methods 3 (PHCE by 15 categories) and 4 (PHCE by basic headings) are very close to each other. This means that **moving from the PHCE breakdown of 15 items to 200 items** (the basic heading level) does **not** give rise to a significant difference in the results. These results suggest that method 3 may be the good compromise between accuracy and economy we were looking for.

3. Concerning the impact of the **revision of national accounts data** on the nowcast it could be concluded that about half of the difference in the actual and nowcast GDP in PPS per head is due to the revision of NA data and the other half is due to the difference in the methodology and basic data of the actual and the nowcast calculation of PPPs.

In addition, the Working Party put Eurostat under obligation to execute further tests on **nowcasting** based on the year 2001 data and tests including the Candidate Countries (CC) and EFTA countries data, as far as available involving HICP or alternatively national CPI . Moreover, Eurostat got green light to prepare nowcasting 2002 by May 2003 according to method 3.

4. THE RESULTS OF THE FEBRUARY 2003 TESTS

In line with the conclusions of the November 2002 Working Party, Eurostat undertook further tests concerning its proposed nowcasting model.

The differences to the earlier tests were:

1. The test was undertaken for the years 2000 and 2001.

2. The test involved now all 31 participating countries of the Eurostat exercise.

3. Compared with the earlier tests' calculation procedures as summarised in table 1, for NPISH no reference PPP was used, but the implicit deflator of PHCE from the National Accounts, as using the PPP of PHCE as reference PPP produced too volatile results.[2]

4. For Switzerland and Turkey, HICP data are not available. The national CPI was used instead to extrapolate PHCE.

5. Malta was not included in the test yet, as they are currently undertaking a major revision of their National Accounts to introduce ESA95. Sensible nowcasts are only possible after this revision.

6. The test at basic heading level (method 4) was not repeated, as for Member States the earlier test showed clearly that this level does not add accuracy to the nowcast and, even more importantly, the data situation for Candidate Countries and EFTA countries is even more difficult at this detailed level of breakdown. Another check of method 4 versus method 3 will be, however undertaken for the October 2003 PPP Working Party.

The question to be answered by this test was, therefore, if the nowcast for the year 2001 confirms the findings for Member States of 2000 and if the findings concerning the possible application of method 3 for the Candidate and EFTA countries are in line with those for the Member States.

The results of the tests of February 2003 are given in the tables 2 and 3 below. Table 2 provides the mean absolute deviation of the ratio between actual and nowcast PPP for the EU Member States, the Candidate Countries, EFTA and all 31 participating countries for the years 2000 and 2001.

[2] This can be explained by the fact that the NPISH comprises only several specific parts of PHCE - namely, Housing, Health, Cultural services, Education, Social protection and some other. The actual PPPs for NPI are calculated on the basis of reference PPPs from PHCE for these areas only and, in principle, this should be done during the nowcasting. However usually NPISH have not very significant share in GDP and the simplest method was selected for all versions.

Table 2: Mean absolute deviation (in %) of actual and nowcast PPP, 2000 and 2001

	method	EU-15	EFTA-3	AC,CC-13[a)]	ALL 31[a)]
year 2000					
Final cons. by private h/holds (H)CPI 15	method 3	1,4	1,1	3,8	2,3
Final cons. by private h/holds impl defl.	method 2	2,1	0,9	3,7	2,6
Final cons. by NPISH, PHC impl defl		2,4	3,0	10,2	5,6
Final cons. by government	all methods	2,8	3,2	9,7	5,6
Gross fixed capital formation		2,9	5,6	4,7	3,9
Gross Domestic Product, PHC (H)CPI 15	method 3	1,1	2,1	3,4	2,1
Gross Domestic Product main aggs impl defl.	method 2	1,9	2,2	3,9	2,7
Gross Domestic Product total impl defl.	method 1	2,0	7,0	4,3	3,4
year 2001					
Final cons. by private h/holds (H)CPI 15	method 3	2,2	2,8	4,3	3,1
Final cons. by private h/holds impl defl.	method 2	3,1	3,6	4,9	3,8
Final cons. by NPISH, PHC impl defl		4,3	4,2	7,7	5,6
Final cons. by government	all methods	3,8	3,4	7,7	5,6
Gross fixed capital formation		4,2	5,1	3,4	3,6
Gross Domestic Product, PHC (H)CPI 15	method 3	2,2	1,5	3,8	2,8
Gross Domestic Product main aggs impl defl.	method 2	2,8	1,6	3,9	3,1
Gross Domestic Product total impl defl.	method 1	2,7	1,2	3,5	2,9

Table 2 allows the following conclusions:

1. The conclusions reached for 2000 for the Member States, are now fully confirmed by the tests for the year 2001: method 3 (PHCE broken down by 15 categories) delivers the best results; using extrapolation at main aggregates level (method 2) does not add accuracy, compared with extrapolation at total GDP level (method 1). The best estimate, measured by the smallest mean absolute deviation is always marked in grey.

2. Method 3 also delivers the best results for the overall comparison, involving all 31 participating countries.

3. For the other countries' groups the results for PHCE in 2000 are very close to each other. In 2001, however, they show that method 3 has advantages over extrapolating the aggregate as a whole (method 2).

4. The mean absolute deviation for aggregates other than PHCE is significantly bigger than the one for PHCE. This is noticeable uniformly over all country groups and in both years, however particularly for EFTA and Candidate Countries. The reason for it is that outlier values in individual countries' data and breaks in the timeseries are more common outside PHCE. A smaller difference for PHCE is also due to the rolling 3-years benchmark-extrapolation approach used for the actual calculations of PHCE PPP. Using this approach, two thirds of the PPP at basic heading level and many of the HICP extrapolation factors are the same for both, the nowcast and the actual calculations.

5. Higher deviations in areas outside PHCE can lead to situations where the results delivered by method 1 are slightly better than the ones by method 3, as it is the case for EFTA and Candidate Countries in 2001.

6. Conclusion 4 and 5 also means that the overall quality of the nowcast can only be as good as the input data are provided by the countries. This is particularly important, as nowcasting uses extrapolation techniques, which can only work if there are no breaks in the timeseries of the input data.

Table 3 provides the comparison of the actual GDP per head (EU =100) for each of the participating countries with the GDP per head as a result of the nowcast tests, using methods 1 to 3.

Table 3: GDP in PPS per head 2000 and 2001, EU-15=100

	2000				2001			
	GDP ph in PPS "actual"	GDPph in PPS (PHC: (H)CPI 15)	GDP in PPS ph (main aggs impl defl.)	GDP ph in PPS (total GDP impl def)	GDP ph in PPS "actual"	GDPph in PPS (PHC: (H)CPI 15)	GDP in PPS ph (main aggs impl defl.)	GDP ph in PPS (total GDP impl def)
	actual	method 3	mehod 2	method 1	actual	method 3	mehod 2	method 1
B	107	107	108	108	108	106	106	106
DK	119	124	124	123	116	120	121	119
D	105	106	107	108	103	105	105	105
EL	67	69	71	72	64	66	66	66
E	82	82	83	83	84	82	81	81
F	101	100	101	101	103	100	99	100
IRL	116	118	119	119	117	117	115	114
I	105	104	105	105	102	104	104	104
L	194	194	196	193	188	187	184	191
NL	113	117	117	116	115	112	112	112
A	113	112	113	113	111	112	113	112
P	73	73	73	74	71	73	73	73
FIN	104	106	106	106	104	102	102	104
S	101	100	99	98	102	104	110	110
UK	99	97	94	93	103	102	102	103
IS	115	119	120	122	113	116	118	115
NO	143	142	143	123	143	140	141	140
CH	121	126	125	123	117	120	118	116
BG	27	27	28	29	24	27	27	28
CY[1)]	78	(87)	(89)	(88)	74	76	77	78
CZ	56	58	59	60	59	57	58	58
EE	40	40	41	41	40	40	41	43
HU	51	51	51	52	53	51	51	52
LV	31	29	30	30	33	32	32	34
LT	36	35	35	35	38	36	36	38
PL	40	39	39	40	40	41	41	42
RO	24	23	24	24	24	25	25	25
SK	46	48	48	50	47	47	48	49
SI	68	68	68	70	70	69	69	69
TU	25	26	27	27	23	21	21	23

Table 3 presents the results of the test from a different perspective, the GDP per head in PPS as percent of the EU average. This calculation was done because finally users will look at this indicator rather than the PPP as such.

The data presented above confirm the conclusions already made for table 2. For countries where the nowcasts according to the 3 methods provides significantly different results from each other, in the majority of the cases the value coming from method 3 is closest to the actual value. The best nowcast is always marked in grey.

The values according to method 2 are mostly in-between method 1 and 3 and, therefore, do not contribute to accuracy, nor represent a significant cost saving compared with method 3, once the system is set up.

Table 3, however, also shows that in some countries the nowcast can be significantly different from the actual value, whatever method is used. This applies mainly to Denmark, Switzerland and Iceland. Also Norway, UK and Cyprus are interesting cases, which are discussed below.

The reason for such significant differences between the actual GDP per head and the nowcasts falls principally into 2 categories:

1. Significant changes to the level of GDP, the population figure or the exchange rate (in the case of non-Eurozone countries) between the nowcast and the preliminary results. These are less problematic differences, as they can be quantified and explained to the users when the preliminary data are compared to the nowcast.

2. Quality problems in the input data such as break in the time series to be extrapolated and problems with the reliability of the extrapolation factors as such.

The nowcasts presented in table 2 and 3 were influenced by both types of differences. Significant changes in the total level of GDP in national currency between the nowcast and the actual figure were noticeable for Poland, Slovakia, Estonia, Norway and Denmark in 2000 and in 2001 for Norway and Turkey.

Problems with input data and extrapolation factor reliability were particularly visible for general government and capital formation. This does not come as a surprise, is however influencing nowcasts negatively even twice. Firstly are both areas weak areas in the PPP exercise what provides a weak basis for the extrapolation. Secondly, are both areas not the strongest ones in the National Accounts volume measures, so that the extrapolation factor, the implicit deflator from the National Accounts, is not very strong either. If in addition the differences between nowcast and actual value for both areas go in the same direction, as it was the case for Denmark, Iceland and Switzerland in 2000 and for Denmark in 2001, the results at GDP level can differ significantly.

A good example to which doubtful nowcasting results questionable input data can lead is Cyprus in 2000. The nowcast for 2000 would have overestimated the actual value by nearly 10 % points. Main reason for this is a very significant break in the timeseries of the salary data, underlying the general government calculations, between

1999 and 2000. The data in table 3 is, therefore, put in brackets and provided simply for demonstration purposes.

Both, capital goods and salaries in general government are in the spotlight of the currently ongoing revision of the PPP 1995 to 2000. It is hoped that every step taken in the revision to look at PPP input data also in a timeseries context would help to improve the basis for future nowcasting.

A very interesting case is also Norway in 2000. If the nowcasting at total GDP level would have been executed (as it is currently done by many economists), the actual value of GDP per head in PPS would have been underestimated by 20 % points, while using method 3, the nowcast is in reach of 1 % point. The reason for this is that Norway as an oil-producing country is very much effected by oil price crises as in 2000. Using extrapolation at the level of 15 breakdowns of PHC, as done in method 3, already picks up price changes do to the oil crises and produces results much closer to the reality. This is obviously not the case by extrapolating at total GDP level, which relies on a GDP at a very early stage of the GDP calculation process (T+4), which subsequently undergoes big changes due to later information becoming available. Similar effects can be seen in table 3 for UK in 2000, however too lesser extends than for Norway.

5. OVERALL SUMMARY

After having tested the proposed nowcasting model for all 31 participating countries and two years, it can be concluded:

1. Method 3, which uses:
   - extrapolation at the level of 15 categories of PHCE by the respective HICP or national CPI,
   - extrapolation of the NPISH by the National Accounts implicit deflator of PHCE
   - National Accounts implicit deflators for gross fixed capital formation and general government,
   - a reference PPP for changes in stocks and
   - the exchange rate for net exports

seems to produce the most reliable nowcast in a cost efficient way.

2. Method 3 puts now extra data requirements and reporting burden on the countries
3. The nowcast is sensitive to problems in the input data and the extrapolation factors, as these can even multiply each other
4. Every step taken to review PPP input data in a timeseries context would also be beneficial for future nowcasts.
5. The nowcast in May 2003 for the reference year 2002 will be undertaken using method 3.
6. By October 2003 another test will be executed confronting method 3 and 4 to check again if nowcasting at basic heading level may add to accuracy.

ANNEX

The private household consumption expenditure breakdown in the method 3

Code	Description
0101	Food and non-alcoholic beverages
0102	Alcoholic beverages, tobacco, narcotics
0103	Clothing and footwear
010401	Rentals for housing
010402	Maintenance, household services
010403	Electricity, gas and other fuels
0105	Furnishings, equipment, maintenance
0106	Health
0107	Transport
0108	Communication
0109	Recreation and culture
0110	Education
0111	Restaurants and hotels
0112	Miscellaneous goods and services
0113	Net purchases abroad
