AN ANALYSIS OF REVISIONS OF NATIONAL ACCOUNTS DATA FOR 40 COUNTRIES

(A progress report)

BY H. GLEJSER AND P. SCHAVEY

Vrije Universiteit Brussel and Facultés Aniversitaires de Namur

The paper analyzes annual revisions of figures for G.N.P. and 8 of its components in 40 countries. It arrives at the conclusion that first estimates are very often significantly biased downwards, especially Private Consumption, Fixed Investment, G.D.P. and G.N.P. Also successive revisions are sometimes correlated (negatively in most cases). The distribution of revisions differ as between developed and developing countries.

INTRODUCTION

One of the problems encountered in the use of statistical figures for economic studies is the provisional character of the last years' data: the series published by the various statistical institutes are revised annually and substantial differences may arise between the first and the last estimations. This point cannot be overlooked as it has been shown in the case of a country like Canada that revision of data entail much more important differences in parameter estimates and forecasts of an econometric model than the use of two different estimating procedures.[1]

We have tried therefore to analyse the statistical properties of these revisions.

In this paper, the following results will be presented: a brief description of the data (section 1); tests on the mean revisions, answering the question: do they differ significantly from zero? (section 2); tests on the correlation coefficient between revisions, answering the question: are revisions linearly independent? (section 3). Differences, in those respects, between developed and developing countries will also be investigated. In addition, we are examining now (and hope to present results in the near future) the following questions:

—what is the distribution of the revisions?

—can it be surmised that the last estimates are more accurate than the first?

—what is the optimal linear predicter of the last revision?

SECTION 1. DESCRIPTION OF THE DATA AND NOTATIONS

We have used the national accounts data published in the United Nations *Yearbook of National Accounts Statistics*[2] for 40 countries. These have been subdivided into 19 developed and 21 developing countries,[3] according to their level of income per head, the dividing line being 1,000 dollars *per capita* in 1966.

[1] F. T. Denton and J. Kuiper: "The Effect of Measurement Errors on Parameter Estimates and Forecasts: a Case Study Based on the Canadian Preliminary Accounts". *Review of Economics and Statistics*, May 1965, nr. 2, vol. XLVII, p. 206.

[2] United Nations, *Yearbook of National Accounts Statistics*, New York, Editions 1957–1969.

[3] For a list of these countries, see appendix I.

The variables we have taken into consideration are:

1. Private consumption expenditure
3. General government consumption expenditure
3. Gross domestic fixed capital formation
4. Exports of goods and services
5. Imports of goods and services
6. Expenditure on gross domestic product
7. Expenditure on gross national product

We have chosen figures at current prices to avoid the difficulties arising from change of base year for the prices. All figures are expressed in annual rate of change (in percent).

The sample of revisions covers the period 1956–1967.[4] We limited ourselves to a maximum of six successive estimations of the rate of change for one given year. The ith estimation of the rate of change in year t for country p will be noted a_i^{pt}.

The revision between estimations i and j is defined as (the symbol C stands for "correction"):

$$C_{ij}^{pt} = a_i^{pt} - a_j^{pt} \qquad \left.\begin{matrix} i = 2, 3, \ldots, 6 \\ j = 1, 2, \ldots, 5 \end{matrix}\right\} i > j$$

$$p = 1, \ldots, 40$$

$$t = 1, \ldots, 12.$$

We have done this for all seven variables considered:

Section 2. Does the Mean Revision Differ Significantly from Zero?

The mean revision of a given variable for country p is:

$$\bar{C}_{ij}^{p} = \frac{1}{T} \sum_{t=1}^{T} C_{ij}^{pt}.$$

We suppose that, for given i and j, the $\bar{C}_{ij}^{p}$ are drawn from the same population.

1. *Non-parametric Test*

In the null hypothesis the probability p of obtaining a positive mean revision equals the probability $1 - p$ of obtaining a negative one. A binomial sign test is thus in order.

With 40 $\bar{C}_{ij}^{p}$'s (one for each p, i and j remaining constant), the null hypothesis is rejected at a 5 percent significance level in favor of $p > \frac{1}{2}$ if the number of positive revisions is or exceeds 27.[6]

[4]The last year for which we had at least two estimations of the rate of change at the beginning of this study.

[5]The figure 40 is the maximum of p. For some components we have less countries because of unpublished or very incomplete data.

[6]It is, of course, rejected in favor of $p < \frac{1}{2}$, if the number ≤ 13.

With 38 observations, the threshold is 26. In the tables 1a through 1g, the number of positive means is given for each of the seven variables and for all i's and j's: all the results which allow us to reject the null hypothesis in favor of $p > \frac{1}{2}$ are underlined.

TABLE 1a

NUMBER OF POSITIVE MEANS $\bar{C}_{ij}$ (40 COUNTRIES) FOR PRIVATE CONSUMPTION EXPENDITURE

$\downarrow i$ \ $\rightarrow j$	1	2	3	4	5
2	34	—	—	—	—
3	31	23	—	—	—
4	32	27	24	—	—
5	34	28	30	30	—
6	34	25	30	29	22

TABLE 1b

NUMBER OF POSITIVE MEANS $\bar{C}_{ij}$ (40 COUNTRIES) FOR GENERAL GOVERNMENT CONSUMPTION EXPENDITURE

$\downarrow i$ \ $\rightarrow j$	1	2	3	4	5
2	27	—	—	—	—
3	26	22	—	—	—
4	25	23	23	—	—
5	28	22	19	20	—
6	24	21	21	18	19

TABLE 1c.

NUMBER OF POSITIVE MEANS $\bar{C}_{ij}$ (38 COUNTRIES) FOR GROSS DOMESTIC FIXED CAPITAL FORMATION

$\downarrow i$ \ $\rightarrow j$	1	2	3	4	5
2	31	—	—	—	—
3	28	25	—	—	—
4	28	21	24	—	—
5	26	20	23	17	—
6	28	24	21	18	21

TABLE 1d.

NUMBER OF POSITIVE MEANS $\bar{C}_{ij}$ (38 COUNTRIES) FOR EXPORTS OF GOODS AND SERVICES

$\downarrow i$ \ $\rightarrow j$	1	2	3	4	5
2	19	—	—	—	—
3	20	23	—	—	—
4	22	23	21	—	—
5	21	21	18	22	—
6	19	21	21	21	21

TABLE 1e.

NUMBER OF POSITIVE MEANS $\bar{C}_{ij}$ (38 COUNTRIES) FOR IMPORTS OF GOODS AND SERVICES

$\downarrow i$ \ $\rightarrow j$	1	2	3	4	5
2	23	—	—	—	—
3	24	22	—	—	—
4	23	18	19	—	—
5	23	21	19	15	—
6	23	25	20	23	25

TABLE 1f.

NUMBER OF POSITIVE MEANS $\bar{C}_{ij}$ (38 COUNTRIES) FOR EXPENDITURE ON GROSS DOMESTIC PRODUCT

$\downarrow i$ \ $\rightarrow j$	1	2	3	4	5
2	$\underline{\overline{28}}$	—	—	—	—
3	$\overline{27}$	$\underline{\overline{26}}$	—	—	—
4	$\underline{\overline{28}}$	$\underline{\overline{31}}$	$\underline{\overline{26}}$	—	—
5	$\underline{\overline{29}}$	$\underline{\overline{30}}$	$\overline{25}$	$\underline{\overline{27}}$	—
6	$\overline{27}$	$\underline{\overline{28}}$	24	$\overline{25}$	19

TABLE 1g.

NUMBER OF POSITIVE MEANS $\bar{C}_{ij}$ (38 COUNTRIES) FOR EXPENDITURE ON GROSS NATIONAL PRODUCT

$\downarrow i$ \ $\rightarrow j$	1	2	3	4	5
2	$\underline{\overline{31}}$	—	—	—	—
3	$\overline{31}$	$\underline{\overline{33}}$	—	—	—
4	$\overline{31}$	$\overline{26}$	$\underline{\overline{26}}$	—	—
5	$\overline{31}$	$\overline{28}$	$\overline{27}$	25	—
6	$\underline{\overline{33}}$	$\underline{\overline{28}}$	$\underline{\overline{27}}$	24	17

It can be seen at first glance that the null hypothesis is never rejected in favor of $p < \frac{1}{2}$.

It is rejected in favor of $p > \frac{1}{2}$, for all $\bar{C}_{i1}$'s except for:

—Exports and Imports

—Government Consumption (in the case of $\bar{C}_{31}$, $\bar{C}_{41}$ and $\bar{C}_{61}$).

In fact, positive means represent more than eight-tenths of the total for Private Consumption, Gross Domestic Product and Gross National Product.

It is thus clear that, in general, the first estimate is biased downwards and that is particularly true for the totals (G.D.P. or G.N.P.).

The same conclusion holds, although in a weakened form, for the $\bar{C}_{i2}$'s and C_{i3}'s (especially for G.N.P.), but the figures for Trade Government Consumption, Investment and, in some cases, for Private Consumption do not allow us to reject the null hypothesis.

As to the $\bar{C}_{i4}$'s, the hypothesis that $p > \frac{1}{2}$ is only accepted for Private Consumption and also for G.D.P. in the case of $\bar{C}_{54}$.

The null hypothesis is always accepted for C_{65}.

In a nutshell, the first test indicates that upwards corrections dominate significantly up to the third revision as far as totals are concerned: corrections for Private Consumption, Investment and to a lesser extent Government Consumption seem responsible for the first revision of G.N.P. or G.D.P.; for the following revision, Private Consumption seems to weigh most heavily.

2. *Parametric Test*

The distribution of the $\bar{C}_{ij}$'s is surely not devoid of interest. Tables 2a and 2b reproduce the frequency distributions of those variables in the case of G.N.P. respectively for developed and developing countries.

Similar tables for the other variables can be obtained from the authors: they show approximately the same characteristics. A noticeable difference appears between the two groups of countries in the sense that the distribution of the developed countries seems to be shifted to the right as compared to the developing countries: thus, $\bar{C}_{61}$ is positive for *all* developed countries but "only" for 14 (out of 19) developing countries; also a parametric test, which will be described presently, indicates that 9 of the 19 $\bar{C}_{61}$'s differ significantly from zero for the developed countries but only 2 for the developing. It is remarkable that, for the two groups together, 10 out of 38 $\bar{C}_{61}$'s are greater than (or equal to) 1 percent.

The parametric test, of which the results appear in the last two columns of tables 2, looks as follows:

If, for each p, i and j, C_{ij}^p is drawn from a normal distribution (a hypothesis which will be tested in the near future), a parametric test on the mean of C_{ij}^p can be performed for *each* p (i.e. country) separately.

Define, for each p: $s_{ij}^2 = (T-1)^{-1} \sum_{t=1}^{T} (C_{ij} - \bar{C}_{ij})^2$

s_{ij}^2 is thus the unbiased estimator of the variance of the normal variate for that given p.

We know that, under those conditions, the ratio $T^{1/2}\bar{C}_{ij}/s_{ij}$ has a t_{T-1} distribution in the null hypothesis.

TABLE 2a.

FREQUENCY DISTRIBUTIONS FOR THE 19 DEVELOPED COUNTRIES. EXPENDITURE ON GROSS NATIONAL PRODUCT

Variables \ Intervals	$\bar{C}_{ij} < -1$	$-1 \leq \bar{C}_{ij} < -0.5$	$-0.5 \leq \bar{C}_{ij} < 0$	$0 \leq \bar{C}_{ij} < 0.5$	$0.5 \leq \bar{C}_{ij} < 1$	$1 \leq \bar{C}_{ij} < 2$	$\bar{C}_{ij} > 2$	Number of significant positive means	
								>0	<0
$\bar{C}_{21}$	—	—	1	13	4	1	—	8	—
$\bar{C}_{31}$	—	—	2	9	7	—	1	8	—
$\bar{C}_{41}$	—	—	1	7	8	2	1	5	—
$\bar{C}_{51}$	—	—	2	7	8	2	1	9	—
$\bar{C}_{61}$	—	—	—	10	6	2	1	9	—
$\bar{C}_{32}$	—	—	5	14	—	—	—	4	—
$\bar{C}_{42}$	—	—	3	12	4	—	—	2	—
$\bar{C}_{52}$	—	—	4	11	4	—	—	3	—
$\bar{C}_{62}$	—	—	4	12	2	1	—	2	—
$\bar{C}_{43}$	—	—	4	13	2	—	—	2	—
$\bar{C}_{53}$	—	—	3	14	2	—	—	2	—
$\bar{C}_{63}$	—	—	4	13	2	—	—	1	1
$\bar{C}_{54}$	—	—	6	13	—	—	—	1	—
$\bar{C}_{64}$	—	1	6	11	1	—	—	1	2
$\bar{C}_{65}$	—	1	10	7	1	—	—	—	1

TABLE 2b.

FREQUENCY DISTRIBUTIONS FOR THE 19 DEVELOPING COUNTRIES AND NUMBER OF MEANS STATISTICALLY DIFFERENT FROM ZERO (5 PERCENT LEVEL). EXPENDITURE ON GROSS NATIONAL PRODUCT

Intervals / Variables (%)	$\bar{C}_{ij} < -1$	$-1 \leq \bar{C}_{ij} < -0.5$	$-0.5 \leq \bar{C}_{ij} < 0$	$0 \leq \bar{C}_{ij} < 0.5$	$0.5 \leq \bar{C}_{ij} < 1$	$1 \leq \bar{C}_{ij} < 2$	$\bar{C}_{ij} \geq 2$	Number of significant positive means: >0	Number of significant positive means: <0
$\bar{C}_{21}$	1	—	5	8	5	—	—	2	—
$\bar{C}_{31}$	1	1	3	8	4	1	1	1	—
$\bar{C}_{41}$	—	3	3	6	4	2	1	1	—
$\bar{C}_{51}$	—	4	1	5	4	3	2	1	—
$\bar{C}_{61}$	2	2	1	4	3	5	2	2	—
$\bar{C}_{32}$	1	1	8	6	1	2	—	—	—
$\bar{C}_{42}$	—	1	8	6	2	2	—	—	—
$\bar{C}_{52}$	1	2	3	7	1	4	1	1	—
$\bar{C}_{62}$	—	3	3	6	2	5	—	—	—
$\bar{C}_{43}$	—	3	5	9	1	—	1	—	—
$\bar{C}_{53}$	—	2	6	6	1	2	2	—	—
$\bar{C}_{63}$	—	1	6	5	5	2	—	—	—
$\bar{C}_{54}$	—	1	6	9	—	1	2	—	—
$\bar{C}_{64}$	—	1	6	7	3	2	—	—	—
$\bar{C}_{65}$	1	3	6	6	3	—	—	—	—

TABLE 3a.

NUMBER OF SIGNIFICANT POSITIVE AND NEGATIVE MEANS FOR THE 19 DEVELOPED COUNTRIES

Variables \ Demand Components	Private Consumption		Government Consumption		Capital Formation		Exports		Imports	
	Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative
C_{21}	3	—	1	1	4	—	3	—	2	—
C_{31}	5	—	1	—	6	—	4	1	3	—
C_{41}	5	—	3	—	5	—	3	2	3	1
C_{51}	6	—	1	—	5	—	3	1	2	1
C_{61}	5	—	1	—	5	—	3	1	3	1
C_{32}	—	—	1	1	2	—	1	1	1	—
C_{42}	2	—	2	—	2	—	1	—	1	—
C_{52}	2	—	1	—	1	—	1	—	2	—
C_{62}	3	—	2	1	—	—	—	1	1	—
C_{43}	1	—	—	—	1	—	—	—	—	—
C_{53}	2	—	—	—	1	—	—	—	—	—
C_{63}	1	—	—	—	—	—	—	—	—	1
C_{54}	2	—	—	—	—	—	—	1	—	—
C_{64}	3	—	—	—	—	—	—	—	—	—
C_{65}	—	—	—	—	—	—	—	—	—	—

TABLE 3b.

NUMBER OF SIGNIFICANT NON-ZERO MEANS FOR THE 21 DEVELOPING COUNTRIES

Variables \ Demand Components	Private Consumption		Government Consumption		Capital Formation		Exports		Imports	
	Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative
C_{21}	—	—	1	—	3	—	—	—	—	—
C_{31}	—	—	1	—	1	—	—	1	—	—
C_{41}	—	—	1	—	2	—	—	—	—	—
C_{51}	—	—	1	—	2	1	—	—	—	—
C_{61}	—	—	1	—	—	—	1	—	—	—
C_{32}	1	—	—	—	1	1	—	—	1	—
C_{42}	—	2	—	1	1	—	—	—	—	—
C_{52}	1	—	—	—	—	—	—	—	—	—
C_{62}	1	—	—	—	—	—	—	—	—	—
C_{43}	—	1	—	—	1	—	—	—	—	—
C_{53}	1	—	—	—	—	—	—	—	—	—
C_{63}	—	—	—	—	—	—	—	—	—	—
C_{54}	—	—	—	—	—	—	—	—	—	—
C_{64}	1	—	—	—	—	—	—	—	—	—
C_{65}	—	—	—	—	—	—	—	—	—	—

Tables 3a and 3b show the number of cases for which that null hypothesis is rejected in favor of a positive or a negative mean, respectively for developed and developing countries. The tables present those results only for the 5 components of demand; the corresponding figures for G.N.P. can be found in the last 2 columns of tables 2.

We can see from the tables 3 that, for the developed countries, there is a strong tendency to a positive bias for the means; moreover we have hardly any negative mean which is statistically different from zero, especially if we look at the C_{i1}'s and at Private Consumption and Capital Formation. Thus, we can say that the biases are always downwards for the first estimates.

The situation is much less clear for the developing countries; as we can see from table 2b, we have a great dispersion of the means, and for almost all of them, we must accept the hypothesis $\bar{C}_{ij} = 0$.

This may be interpreted in two ways: either the statistical estimations of the developing countries are better than those of the developed countries (which in fact is hard to believe), or their statistical material is so deficient that revisions of the estimations are not worthwhile.

Section 3. Are the Successive Revisions Independent?

In this section, we have tested mutual linear dependence between the successive revisions C_{21}, C_{32}, C_{43}, C_{54} and C_{65} in order to detect a possible pattern of the revisions. Here again, we first used a sign-test.

1. *Non-parametric Test*

Let p be the probability of a positive correlation; the null hypothesis is $p = 0.5$. As before, a binomial test is used. Underlined figures designate, as before, acceptance of $p > 0.5$ whereas starred figures indicate acceptance of $p < 0.5$. Results appear in tables 4.

TABLE 4a.

Private Consumption Expenditure, 40 countries
(19 Developed + 21 Developing)

Correlation between	Number of positive correlation coefficients		
	All countries	Developed	Developing
C_{32}–C_{21}	14	4*	10
C_{43}–C_{32}	16	7	9
C_{54}–C_{43}	11*	3*	8
C_{65}–C_{54}	23	10	13

TABLE 4b.

General Government Consumption Expenditure, 40 countries
(19 Developed + 21 Developing)

Correlation between	Number of positive correlation coefficients		
	All countries	Developed	Developing
C_{32}–C_{21}	15	8	7
C_{43}–C_{32}	14	5*	9
C_{54}–C_{43}	21	8	13
C_{65}–C_{54}	26	10	<u>16</u>

TABLE 4c.

GROSS DOMESTIC CAPITAL FORMATION, 38 COUNTRIES
(18 DEVELOPED + 20 DEVELOPING)

Correlation between	Number of positive correlation coefficients		
	All countries	Developed	Developing
C_{32}–C_{21}	15	7	8
C_{43}–C_{32}	18	6	12
C_{54}–C_{43}	21	9	12
C_{65}–C_{54}	17	6	11

TABLE 4d.

EXPORTS OF GOODS AND SERVICES, 38 COUNTRIES
(19 DEVELOPED + 19 DEVELOPING)

Correlation between	Number of positive correlation coefficients		
	All countries	Developed	Developing
C_{32}–C_{21}	19	6*	13
C_{43}–C_{32}	19	9	10
C_{54}–C_{43}	22	8	14
C_{65}–C_{54}	25	13	12

TABLE 4e.

IMPORTS OF GOODS AND SERVICES, 38 COUNTRIES
(19 DEVELOPED + 19 DEVELOPING)

Correlation between	Number of positive correlation coefficients		
	All countries	Developed	Developing
C_{32}–C_{21}	16	7	9
C_{43}–C_{32}	17	6	11
C_{54}–C_{43}	17	8	9
C_{65}–C_{54}	20	9	11

TABLE 4f.

EXPENDITURE ON GROSS DOMESTIC PRODUCT, 38 COUNTRIES
(18 DEVELOPED + 20 DEVELOPING)

Correlation between	Number of positive correlation coefficients		
	All countries	Developed	Developing
C_{32}–C_{21}	11*	6*	5*
C_{43}–C_{32}	22	10	12
C_{54}–C_{43}	17	7	10
C_{65}–C_{54}	21	12	9

TABLE 4g.

EXPENDITURE ON GROSS NATIONAL PRODUCT, 39 COUNTRIES
(19 DEVELOPED + 20 DEVELOPING)

	Number of positive correlation coefficients		
Correlation between	All countries	Developed	Developing
C_{32}–C_{21}	10*	5*	5*
C_{43}–C_{32}	18	9	9
C_{54}–C_{43}	17	9	8
C_{65}–C_{54}	20	12	8

It can be seen that negative correlations tend to dominate, especially for developed countries and for lower values of i and j: if we consider e.g. C_{32} and C_{21} for developed countries, the binomial test leads to acceptance of $p < 0.5$ in all cases except Government Consumption, Capital Formation and Imports. On the other hand, the hypothesis $p > 0.5$ is accepted in two cases, both referring to C_{65} and C_{54}.

Instead of considering all correlation coefficients, we now limit ourselves to the significant ones, using the fact that in the null hypothesis $\rho = 0$, we have: $r(T-2)^{1/2}/(1-r^2)^{1/2}$ is distributed as t_{T-2}. Our results are summarized in Tables 5.

TABLE 5a.

NUMBER OF CORRELATION COEFFICIENTS STATISTICALLY DIFFERENT FROM ZERO AT THE 10 PERCENT LEVEL
PRIVATE CONSUMPTION EXPENDITURE

	All countries (40)		Developed (19)		Developing (21)	
Correlation between	>0	<0	>0	<0	>0	<0
C_{32}–C_{21}	2	1	—	1	2	—
C_{43}–C_{32}	—	2	—	1	—	1
C_{54}–C_{43}	—	2	—	1	—	1
C_{65}–C_{54}	—	3	—	2	—	1
Total	2	8	—	5	2	3

TABLE 5b.

NUMBER OF CORRELATION COEFFICIENTS STATISTICALLY DIFFERENT FROM ZERO AT THE 10 PERCENT LEVEL
GENERAL GOVERNMENT CONSUMPTION EXPENDITURE

	All countries (40)		Developed (19)		Developing (21)	
Correlation between	>0	<0	>0	<0	>0	<0
C_{32}–C_{21}	—	4	—	1	—	3
C_{43}–C_{32}	—	4	—	2	—	2
C_{54}–C_{43}	—	3	—	1	—	2
C_{65}–C_{54}	1	2	1	1	—	1
Total	1	13	1	5	—	8

TABLE 5c.

NUMBER OF CORRELATION COEFFICIENTS STATISTICALLY DIFFERENT FROM ZERO AT THE 10 PERCENT LEVEL
GROSS DOMESTIC CAPITAL FORMATION

	All countries (38)		Developed (18)		Developing (20)	
Correlation between	>0	<0	>0	<0	>0	<0
C_{32}–C_{21}	—	—	—	—	—	—
C_{43}–C_{32}	—	4	—	—	—	4
C_{54}–C_{43}	1	4	1	1	—	3
C_{65}–C_{54}	1	3	—	2	1	1
Total	2	11	1	3	1	8

TABLE 5d.

NUMBER OF CORRELATION COEFFICIENTS STATISTICALLY DIFFERENT FROM ZERO AT THE 10 PERCENT LEVEL
EXPORTS OF GOODS AND SERVICES

	All countries (38)		Developed (19)		Developing (19)	
Correlation between	>0	<0	>0	<0	>0	<0
C_{32}–C_{21}	1	2	1	1	—	1
C_{43}–C_{32}	—	3	—	—	—	3
C_{54}–C_{43}	2	1	1	1	1	—
C_{65}–C_{54}	—	4	—	2	—	2
Total	3	10	2	4	1	6

TABLE 5e.

NUMBER OF CORRELATION COEFFICIENTS STATISTICALLY DIFFERENT FROM ZERO AT THE 10 PERCENT LEVEL
IMPORTS OF GOODS AND SERVICES

	All countries (38)		Developed (19)		Developing (19)	
Correlation between	>0	<0	>0	<0	>0	<0
C_{32}–C_{21}	1	5	—	4	1	1
C_{43}–C_{32}	1	4	—	2	1	2
C_{54}–C_{43}	—	3	—	2	—	1
C_{65}–C_{54}	—	—	—	—	—	—
Total	2	12	—	8	2	4

TABLE 5f.

NUMBER OF CORRELATION COEFFICIENTS STATISTICALLY DIFFERENT FROM ZERO AT THE 10 PERCENT LEVEL
EXPENDITURE ON GROSS DOMESTIC PRODUCT

	All countries (38)		Developed (18)		Developing (20)	
Correlation between	>0	<0	>0	<0	>0	<0
C_{32}–C_{21}	2	2	1	1	1	1
C_{43}–C_{32}	2	3	—	1	2	2
C_{54}–C_{43}	1	3	—	1	1	2
C_{65}–C_{54}	1	2	1	1	—	1
Total	6	10	2	4	4	6

TABLE 5g.

NUMBER OF CORRELATION COEFFICIENTS STATISTICALLY DIFFERENT FROM ZERO AT THE 10 PERCENT LEVEL
EXPENDITURE ON GROSS NATIONAL PRODUCT

	All countries (39)		Developed (19)		Developing (20)	
Correlation between	>0	<0	>0	<0	>0	<0
C_{32}–C_{21}	3	2	1	1	2	1
C_{43}–C_{32}	2	3	1	—	1	3
C_{54}–C_{43}	2	1	1	—	1	1
C_{65}–C_{54}	1	2	—	1	1	1
Total	8	8	3	2	5	6

Our previous conclusions are qualified in the sense that negative ρ's still dominate but more so in developing countries and for the pair C_{43} and C_{32}. Also the superiority of negative ρ's in all components of demand contrasts curiously with the almost balanced situation for the two totals (G.N.P. and to a lesser extent G.D.P.).

A question of some interest would be whether successive significant ρ's often appear for the same country and, in that case, their signs. The answer can be found in table 6, which shows some dominance of the pair $(- -)$: 7 cases out of 15 (and in 2 out of those 7 cases we have even $(- - -)$): this seems to indicate that, in several cases, estimates tend to zigzag towards their final value. On the other hand, the pair $(+ +)$ is rare: 3 cases out of 15 (and out of those 3, we have once $(- + +)$).

TABLE 6.

CASES IN WHICH AT LEAST TWO SIGNIFICANT CORRELATION COEFFICIENTS APPEAR AND THEIR SIGNS (+ OR −)

Countries and Variables	Pair C_{32}–C_{21}	C_{43}–C_{32}	C_{54}–C_{43}	C_{65}–C_{54}
Private Consumption				
South Korea	+			−
Government Consumption				
New Zealand			−	+
Ceylon		−	−	
Panama	−			−
Capital Formation				
Philippines	−			−
Exports				
U.S.A.	−			−
Venezuela		−	+	
Imports				
Ireland	−	−	−	
Sweden	−	−		
Philippines (2nd time)		+	−	
G.D.P.				
South Korea (2nd time)	−		−	−
Panama (2nd time)		+	+	
G.N.P.				
Austria		+	+	
West Germany	+			−
Venezuela (2nd time)		−	+	+

SECTION 4. CONCLUSIONS

A provisional answer can be given to some of the questions we asked ourselves at the outset:

1. First estimates of national accounts variables are very *often* biased downwards, especially Private Consumption, Capital Formation, G.D.P. and G.N.P. This is more clearly the case in developed than in developing countries.

2. Successive revisions are *sometimes* correlated and, when they are, it is negatively in most cases so that successive estimates follow a zigzag path towards their final value.

Appendix. List of Countries

1. *Developed* (19 *countries*)

Australia
Austria[z]
Belgium
Canada
Denmark
Finland
France
West Germany
Iceland
Ireland
Israel
Italy
Japan
The Netherlands
New Zealand
Norway
Sweden
United Kingdom
United States

2. *Developing* (21 *countries*)

Burma
Ceylon
Chile
Columbia
Costa Rica
Dominican Republic
Ecuador
Ghana
Greece
Guatemala
Honduras
Jamaica
South Korea
Mauritius
Mexico
Panama
Philippines
Portugal
Puerto Rico
Turkey
Venezuela