SPECIAL ARTICLE[*]

An Analysis of Revisions to Growth Rates in the
Irish Quarterly National Accounts

By

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Abstract

*T*his article presents results of revisions analysis of GDP and GNP in the quarterly national accounts. It deals with quarterly GDP and GNP growth from 1998 to 2007 as well as seasonally adjusted quarter-on-quarter growth from 2003. Different stages of the revisions process are considered as well as how Ireland compares with other OECD countries. The components of GDP are analysed to ascertain the main drivers of revisions.

1. Introduction

U sers and analysts of the National Accounts face the problem of regular revisions to the early estimates of the main economic indicators. An analysis of the scale and direction of revisions over a time period can therefore be useful in assessing the validity of latest estimates. Revisions analysis is also an accepted way for statistics institutes to evaluate the accuracy of their estimates. See, for example, OECD (2006).

   The Central Statistics Office (CSO) has published *Quarterly National Accounts* (*QNA*) since 1999. The *QNA* provides a timely description of the

Irish economy and present CSO's first estimate of levels and growth rates of gross domestic product (GDP), gross national product (GNP) and their main components. The release is currently published three months after the reference period.

Each *QNA* contains revisions to previously published data relating to the current year. The annual figures are revised once a year in the *National Income and Expenditure* publication (*NIE*) and these annual figures provide control totals for the quarterly GDP for the quarters in earlier years. Thus, depending on the quarter in question, there are up to three revisions to the data in the current year plus any number of yearly revisions following the current year. There is no policy whereby data of a particular vintage will not be revised. However, there is very little change to data that is more than 5 years old except for methodological reasons.

Revisions are made to estimates of the components of GDP for a number of reasons including:

- the availability of firmer or more complete data;

- changes in methodology;

- correction of errors in source data;

- updating the base period used for constant price estimates.

Two significant changes to the methodology came about in the release of the first quarter in 2005. These were the incorporation of FISIM (financial intermediation services indirectly measured, a method of measuring the output of the financial sector) and the introduction of chain linking for the constant price series. The former of these changes, though significant in its impact on the level of GDP, had little or no effect on growth rates.

A particular feature of the Irish Economy is the impact of large multinational enterprises including financial service companies located in the IFSC. These enterprises frequently change their trading arrangements and structures with consequential effects on the reported data.

During the time under review, GDP growth in Ireland is consistently strong, with annual growth rate averaging 6.1 per cent. This may have a bearing on the results of this paper as the reliability of estimates may differ during periods of slow or negative growth.

The purpose of this paper is to analyse the revisions to *QNA* made by CSO in quarterly releases from 1999 to the present. Our investigation uses a model developed by OECD that provides summary statistics and tables of revisions to growth rates at certain periods after the initial publication. International examinations of this type, and the analysis carried out by OECD, concentrate on revisions to growth rate (as distinct from revisions

to the level) of GDP. A discussion of revisions to the levels of GDP is contained in Bermingham (2006).

Bermingham's article is the only other published examination of the revisions to *QNA* for Ireland, in recent times, that we know of, and deals with a shorter series than this paper. His results, where comparable, do not differ from ours except in one respect. Bermingham states that '…the magnitude of the final revision…is statistically significant.' In this paper we find that the mean of the total revision to GDP growth rate is positive but *not* significantly different from zero, see Section 2. Ruane (1975) also looks at revisions to Irish National Accounts relating to the period 1958 to 1968 and is limited to annual results.

The main part of this article (in Sections 2, 3 and 4) deals with the analysis of GDP growth based on one quarter relative to the same quarter in the previous year. Section 2 presents an overview of the revisions to GDP growth as well as some commentary and summary statistics. In Section 3 we make comparisons of CSO's revisions record with those of some other OECD countries. Section 4 attempts to discover the components of value added and of expenditure which contribute most to revisions. Section 5 presents a brief commentary on revisions of gross national product (GNP) growth rates. Section 6 looks at growth based on one quarter relative to the previous quarter. Section 7 concludes.

The publications from which data is used here are available on the CSO website at www.cso.ie /Releases and publications/National Accounts/ Archive.

Tables of the revisions are contained in the Appendices.

2. GDP Growth

The GDP growth rate is defined as the percentage change in GDP compared with the same period in the previous year, measured in constant prices. Thus if G_t is the GDP of a given quarter in constant prices, the quarterly growth rate is

$$100(G_t - G_{t-4})/ G_{t-4}.$$

The GDP growth rates referring to quarters 1998Q3 to 2007Q4 as first published and then after 3 months, 1 year, 2 years as well as the latest estimates are shown in Table 1 below. These are the values on which we base our analysis.

Table 1: First and Later Estimates of Quarterly GDP Growth 1998 -2007

Relating to Period	First Estimate Q0	3 Months Later Q1	1 Year Later Q4	2 Years Later Q8	Latest Estimate
1998 Q3	10.3	10.3	9.7	10.5	10.7
Q4	6.7	6.7	6.0	5.5	5.1
1999 Q1	9.1	9.0	8.6	9.9	9.7
Q2	7.8	8.1	8.0	7.9	7.2
Q3	11.0	10.5	10.5	11.2	10.6
Q4	12.1	12.1	14.3	14.3	15.4
2000 Q1	11.7	11.4	10.2	10.2	8.2
Q2	12.2	12.6	13.4	12.5	12.5
Q3	11.0	10.1	10.1	8.4	7.6
Q4	12.1	12.1	12.1	10.9	8.7
2001 Q1	13.2	12.7	12.3	12.1	10.9
Q2	9.2	9.4	6.7	6.7	5.9
Q3	3.2	2.8	4.3	5.0	4.5
Q4	0.0	0.1	1.1	1.6	2.3
2002 Q1	2.9	4.4	5.4	4.8	4.6
Q2	6.5	6.6	7.5	5.6	5.6
Q3	6.9	7.3	7.2	6.5	7.5
Q4	6.4	7.5	7.5	7.7	8.0
2003 Q1	0.5	0.7	3.6	4.1	4.3
Q2	2.1	2.4	5.3	5.2	5.1
Q3	-0.1	-0.3	0.5	1.5	2.0
Q4	2.7	5.1	5.1	6.9	6.6
2004 Q1	6.1	6.1	6.8	6.9	6.7
Q2	4.1	4.8	4.7	5.0	4.7
Q3	5.8	5.2	4.4	4.5	5.2
Q4	2.8	2.3	2.2	1.1	2.4
2005 Q1	2.4	2.1	4.0	5.1	5.3
Q2	4.1	4.6	5.6	7.0	7.6
Q3	4.8	5.1	5.9	6.4	6.7
Q4	5.7	6.5	6.5	5.2	5.9
2006 Q1	5.8	5.7	6.4	6.7	6.7
Q2	5.0	4.9	4.0		4.8
Q3	7.7	7.6	8.1		7.4
Q4	5.0	4.6	4.6		4.0
2007 Q1	7.5	8.1	8.7		8.7
Q2	5.4	5.4			5.9
Q3	4.1	3.8			4.0
Q4	3.5	5.5			5.5

Figure 1 below shows the revisions for a given quarter, between 1998 and 2004, broken into different stages of the revision process. The revisions after 3 months (Q1-Q0), further revisions after 1 year (Q4-Q1), 2 years (Q8-Q4) and further revisions since 2 years are shown. The total revision for a given quarter is equal to the sum of the negative and positive parts of each bar.

Figure 1: Revisions in Stages to Quarterly GDP Growth, 1998Q3 to 2004Q4
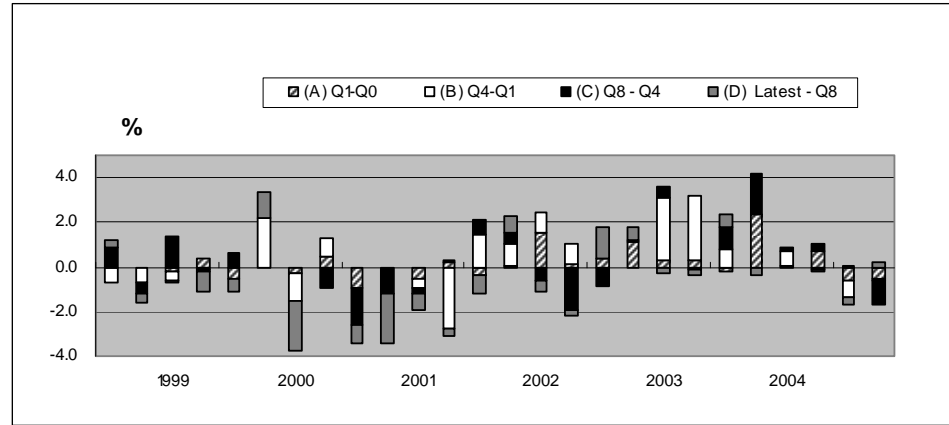
The chart shows that revisions occur in both directions. Fifteen of the total revisions (to the twenty-six quarters) are positive and eleven are negative. One notable feature is that for a given quarter, the revisions tend to be either mainly positive or mainly negative. For ten out of the twenty-six quarters, revisions are entirely of one direction and at least six others are heavily biased in one direction. This contrasts with a similar table published by the UK statistics office, Meader (2007), where a smaller propensity for revisions to be in one direction is evident. Figure 1 also shows that after 2002, most of the revisions to the data have occurred within two years of first publication (blocks A, B and C of the bar chart).

Table 2 below provides summary statistics on the revisions stages. The mean revision is the aggregate of the revisions for a given stage in the revisions process divided by the number of quarters. The number of quarters is different for each of the stages and for this reason the total mean is not equal to the sum of all the parts. The *mean absolute revision* (MAR) and *relative mean absolute revision* (RMAR) are defined as

$$MAR = \frac{1}{n}\sum |l_i - p_i|$$

and

$$RMAR = \frac{1}{n}\frac{\sum |l_i - p_i|}{\sum |p_i|}.$$

where l_i is the later estimate, p_i is the earlier estimate and n is the number of observations. The mean absolute revision is a measure of the volatility of the revisions. The relative mean absolute revision which can be interpreted as the expected proportion of the first published estimate that is likely to be revised over the revision interval being considered. These measures are used later in international comparisons.

We show the range of revisions and the percentage of revisions that is upward (positive). We also test the significance of the revisions to the series, that is, to test whether the mean revision is statistically different from zero. Because the successive revisions may have different variances it

is necessary to use a modified t-statistic, see Robinson (2005). Table 2 shows the outcome at the 5 per cent level of significance of the t-test for each category of revision.

The final column shows the total revisions, thus comparing the latest estimate with the first published estimate of GDP growth.

Table 2: Summary Statistics for Revisions to GDP Growth 1998-2007

Statistic	Q1-Q0	Q4-Q1	Q8-Q4	Since Q8	Total rev
Mean revision	0.17	0.34	0.03	-0.09	0.45
Mean absolute revision	0.45	0.81	0.70	0.62	1.61
RMAR	0.07	0.12	0.10	0.07	0.24
Max revision (-)	-0.93	-2.73	-1.93	-2.12	-3.53
Max revision (+)	2.40	2.87	1.75	1.30	3.83
% positive	55	51	61	42	61
Mean revision significant?	no	no	no	no	no

Table 2 shows that the mean revision after the first quarter is 0.17 and the mean total revision is 0.45. That is to say that the initial estimate of GDP growth is on average 0.45 percentage points below the latest estimate.

Excluding the final column, it can be seen that the largest revisions occur between three months and one year after first publication. This might be expected as initial quarterly estimates are replaced with estimates aligned with the more comprehensive annual figures. Many of the significant revisions arise at this time from the examination of the consistency of returns by large multinational enterprises, which then includes an examination of the full audited accounts.

The Q4-Q1 revisions stage has the largest mean revision and the largest mean absolute revision. Revisions in this stage of the revisions process range from -2.73 to +2.87 percentage points. (It should be noted also that, because of the revisions policy outlined in the beginning of this article, revisions to the fourth quarter in every year do not generally occur in the Q4-Q1 time period.)

There is no particular trend towards positive revisions. Indeed, in the period after the second year only 42 per cent of revisions are upward. None of the mean revisions are found to be statistically different from zero. In other words, there is no systematic bias to the revisions.

The final column of Table 2 displays the total revision, to date, to an initial estimate. As mentioned above, revisions to a given quarter tend to be either mainly positive or mainly negative. It is not surprising, therefore, that the cumulative effect of these revisions can be quite large.

$\rm T$he OECD has prepared a similar analysis for eighteen countries, see Adam and McKenzie (2007). The current analysis is based largely on the methods described there. We use their results to rank Ireland's revisions record against that of some of the other countries. There are two differences between the data of other countries and that of Ireland that might be noted. The OECD uses seasonally adjusted data, whereas the data for Ireland in this analysis is not seasonally adjusted. However, as we are comparing the GDP of one quarter compared with the same period in the previous year, this should not have an influence on the comparison. The OECD also uses data from 1995 to 2006, which is a longer time series than that available in Ireland.

The mean absolute revision for Ireland is compared with ten other countries in Figure 2. The revisions for Ireland are considerably higher than the other countries. One reason for the difference may be that CSO's first *QNA* is as recent as 1999. USA and UK, for instance, have quarterly accounts that go back to 1947 and 1955, respectively. Thus, the process of compiling quarterly national accounts for Ireland is still relatively new.

Figure 2: Mean Absolute Revision to First Published Estimates of GDP Growth Rates
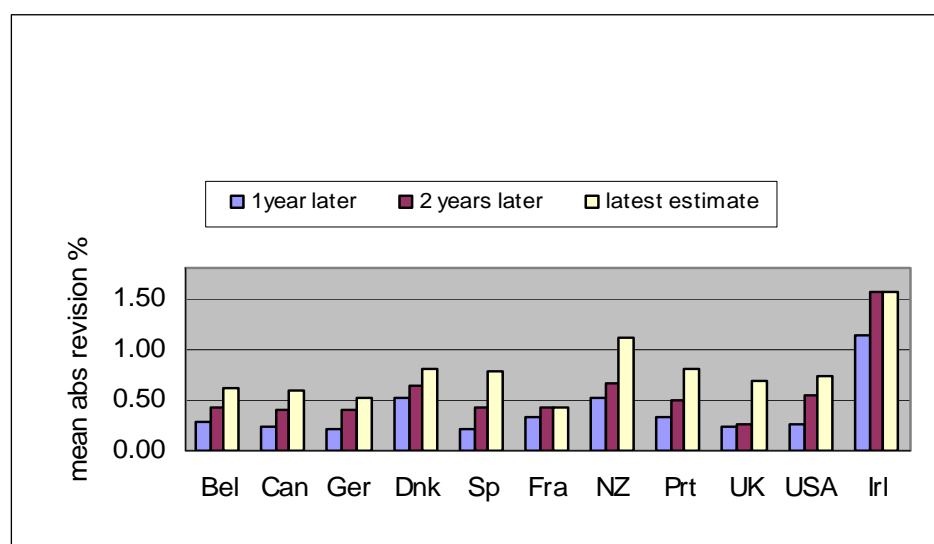
Probably a greater cause for difference is that Ireland's GDP growth rate is considerably higher than most other countries in this period. An interesting extra analysis provided by the OECD is to compare countries' revisions relative to their growth rate. This is done using the relative mean absolute revision, which is a measure of the robustness of the original estimate of the growth rate. Figure 3 shows a comparison of the same countries using the relative mean absolute revision. Ireland is midway in the table of countries, using this comparison measure.

Figure 3: Relative Mean Absolute Revision to First Published Estimates of GDP Growth Rates
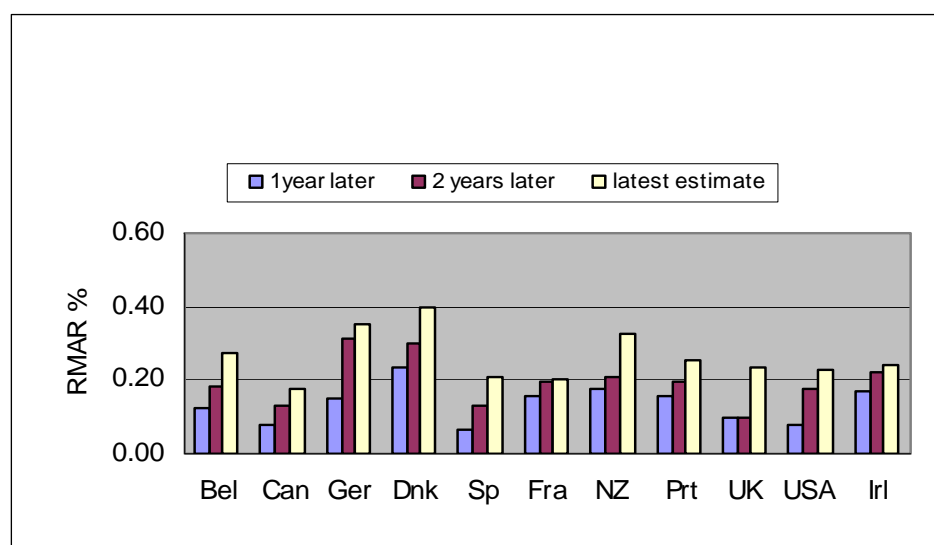
Finally, it is worth observing in this section, that among these countries, Germany and Ireland are the only ones whose mean deviation is found to be statistically insignificant across all stages in the revisions process.

4. Components of the Revisions

A different set of measures is used to identify the components of revisions to GDP growth rates. We deal only with the total revisions to a given quarter, that is, the difference between the first and latest estimates.

In this analysis we measure a component's contribution to the growth rate is as the difference between that component's contribution to the current quarter's GDP and its contribution to the GDP in the same quarter last year divided by the GDP of last year's quarter. Thus if C_t^i represents component i of GDP, G_t, in quarter t, we consider the factors,

$$(C_t^i - C_{t-4}^i) / G_{t-4}$$

for all i.

Two decompositions of GDP are presented in the *QNA*. Table 1 shows the industry components of value added, while Table 3 shows the composition by types of expenditure. In each table to ensure that GDP is consistent, it is necessary to show a statistical discrepancy.

Figure 4 presents the mean absolute revision for the main expenditure components of GDP. It shows to what extent revisions to the elements of final consumption and net exports contribute to the total revisions.

Figure 4: Mean Absolute Revision for the Expenditure Components of GDP Growth Rates, 1999-04
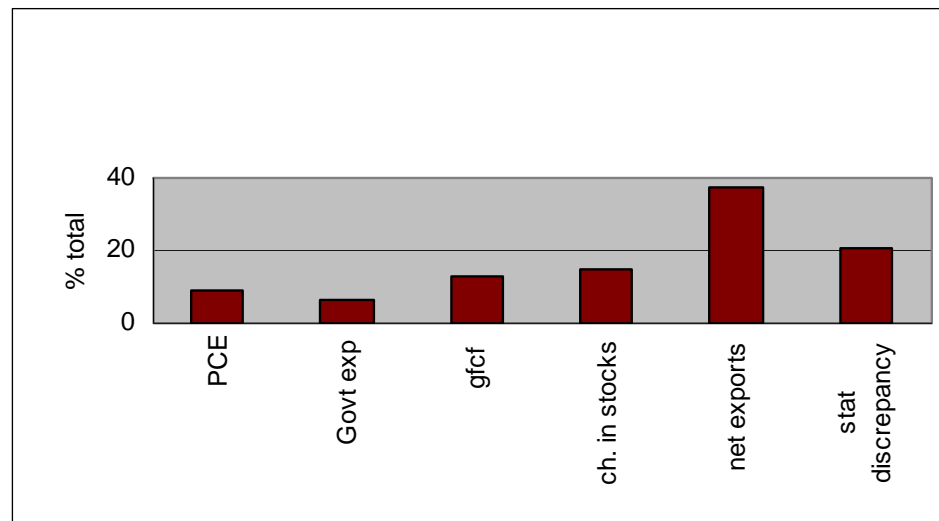
Immediately evident from Figure 4 is that net exports is the expenditure component of GDP that has the most significant effect on the revisions to GDP growth. The statistical discrepancy is also very large, followed by changes in stocks.

There is a certain interdependence between the different components in this chart. This is because a revision to any of the five components has a direct effect on the statistical discrepancy. This revision can also affect the other components indirectly if it adjusts the GDP of the previous year, which is the denominator of the growth rate.

Figure 5: Mean Absolute Revision to Quarterly Value Added Growth Rates by Sector, 1999-04
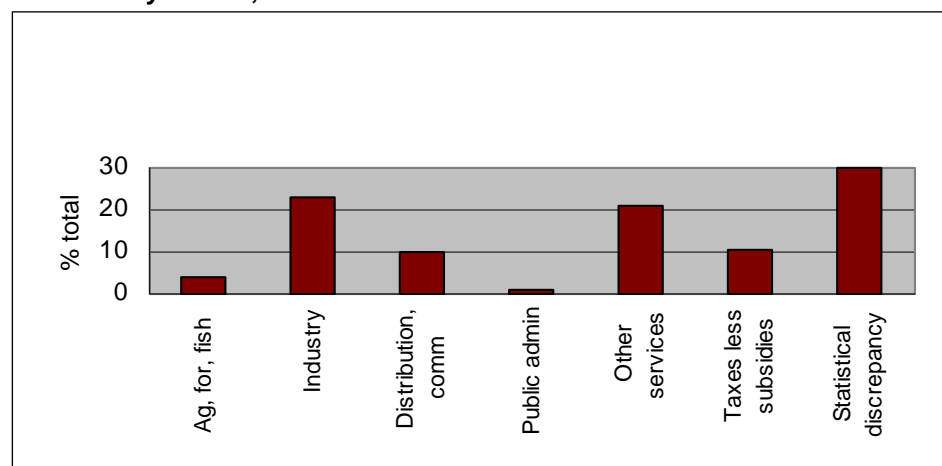
Revisions to one method of calculating GDP clearly also have a knock on effect on the other method. Figure 5 shows the mean absolute revision to the income components of GDP growth.

The revisions to industry, distribution and communication and to other services are roughly in line with the size of each sector. The revisions to the statistical discrepancy are, however, larger than revisions to any of the

component sectors. This may suggest that much of the revisions come about in the balancing of different measures of GDP. The revision to the discrepancy component of GDP growth does not have a very strong trend either upwards or downwards. The mean is -0.4 per cent and standard deviation is 1.7 per cent of GDP.

It appears, considering both Figures 4 and 5, that revisions to the expenditure components of GDP are the chief causes of revisions to GDP growth and that the main drivers of these, in turn, are revisions to net exports (of goods and services). This reflects the fact that Ireland is a small open economy with combined imports and exports equal to roughly 170 per cent of GDP, a big proportion of which is generated by large multinational enterprises and financial services companies.

5. Revision to GNP Growth

Gross national product (GNP) is equal to GDP *plus* net factor income from the rest of the world (NFI). Table 3 shows the summary statistics on the revisions stages to GNP growth.

Table 3: Summary Statistics for Revisions to GNP Growth 1998-2007

Statistic	Q1-Q0	Q4-Q1	Q8-Q4	Since Q8	Total Rev
Mean revision	-0.15	-0.20	0.42	0.31	0.19
Mean absolute revision	0.68	0.83	1.18	0.92	1.80
Max revision (-)	-4.56	-2.19	-2.96	-2.83	-4.95
Max revision (+)	2.41	2.34	4.94	1.87	6.99
% positive	50	31	61	68	45
Mean revision significant?	no	no	no	no	no

Once again, none of the mean revisions for any of the periods is statistically significant, that is, there is no bias in the revisions. However, the mean absolute revision is higher than the same statistic for the GDP growth for each period (see Table 2). Most remarkable is the range of the revisions. The range of revisions in this table is roughly double the range in Table 2. Some estimates to GNP growth are more than 4 percentage points different from a previous estimate. The latest estimate differs from the original, in one case, by almost 7 percentage points. This shows that early CSO estimates of GNP growth are prone to considerable revisions. In *QNA* 2004 quarter 1, large revisions to NFI, relating to 2001 to 2003, were made as a result of incorporating changes in trading arrangements of large multinationals. This is the main reason behind the three largest upward revisions to quarterly GNP growth rate. Another large revision occurs to the NFI of 2003Q4 due to certain company restructuring.[1] Apart from these outliers there are only two other quarters in the series of 38 quarters with a total revision greater than 3 percentage points.

Profit flows are, by far, the most unstable component of NFI. Quarterly estimates of profit flows are susceptible to revision due to changes of company structures, pricing and the domicile of intangible assets, such as

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[1] These two events are noted in releases *Balance of Payments, 2004 Quarter 1* and *National Income and Expenditure, Annual Results for 2004.*

patents, which can have a retrospective impact. Furthermore, the volatility of the underlying data, as discussed by McCarthy (2004), cannot be discounted as a contributor to the volatility of the revisions. Caution regarding quarterly GNP, is also advised in the introductory paragraph of the *Quarterly National Accounts* release. In conclusion, although in Ireland GNP is seen as an important macro indicator, it appears that early estimates can be subject to large revisions which should be noted by users of the *QNA*.

6. Revisions to Quarter-on-Quarter Growth Rates

The CSO has published seasonally adjusted estimates of the main economic aggregates in the *QNA* since the second quarter of 2003. This is a relatively short timeframe, however, and trends exhibited here may change as the series matures. There is a further reason why care should be taken when interpreting these figures. In the case of the non-adjusted series, discussed above in Sections 2 to 4, changes in the growth rate are truly down to revisions in the data. In the case of the seasonally adjusted series, this is not so straightforward. As a new point is added to the series, all preceding values are necessarily adjusted due to this extension of the series. Thus changes in the growth rate can prevail where no revision has occurred. We include here a short revisions analysis as this series is of interest to commentators on the economy.

The quarter-on-quarter seasonally adjusted growth rate is defined as

$$100(G^*_t - G^*_{t-1})/ G^*_{t-1}$$

where G^*_t is the seasonally adjusted estimate of GDP at constant prices for a given quarter.

Figure 6 shows the different stages of the quarter-on-quarter revisions process for data from 2002 to 2005. As in Figure 1, the revisions after one quarter, after 1 year, after 2 years and further revisions since 2 years are shown. The chart shows a greater tendency for the revisions of a given quarter to swing from negative to positive or vice versa than was exhibited in the year on year analysis (see Figure 2).

Figure 6: Revisions in Stages to Seasonally Adjusted Quarter-on-Quarter Growth 2002Q1-2005Q4
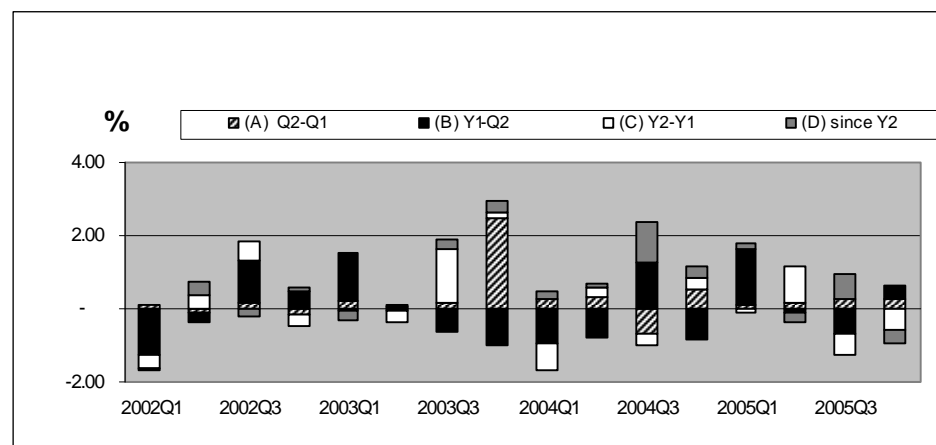
Table 4 presents summary statistics on the revisions stages to the quarter-on-quarter seasonally adjusted growth rates.

Table 4: Summary Statistics for Revisions to Seasonally Adjusted Quarter-on-Quarter Growth 2002-2007

Statistic	Q1-Q0	Q4-Q1	Q8-Q4	Since Q8	Total Rev
Mean revision	0.15	0.17	0.06	0.17	0.35
Mean absolute revision	0.43	0.83	0.45	0.31	0.94
RMAR	0.24	0.45	0.28	0.20	0.54
Max revision (-)	-1.59	-1.27	-0.73	-0.38	-1.60
Max revision (+)	2.47	1.58	1.47	1.12	2.33
% positive	71	48	46	69	54
Mean revision significant?	no	no	no	no	yes

The mean revisions and mean absolute revisions for the successive time periods is reasonably low. The relative mean absolute revision is greater than the same statistic in Table 2. This says that relative to the size of GDP growth, revisions to the quarter-on-quarter series are larger than revisions to the year on year series. It is notable perhaps that although the mean of first revisions to the quarter-on-quarter growth is not significantly different from zero, 71 per cent of these revisions are positive. This is a sample, however, of just 24 values. A straightforward test shows that this proportion is not significantly different from 50 per cent and that there is, therefore, no systematic bias towards the first revision being positive.

There is, however, evidence to suggest that the mean of the total revisions, which measures the difference between the latest and the first estimate, is statistically different from zero. As the figure of 0.35 per cent is positive, this indicates that there is a bias towards understatement. However, since this series is so short, this conclusion must remain very tentative at this stage.

7. Conclusions

- The initial estimate of GDP growth is on average 0.45 percentage points below the latest estimate.

- Revisions to GDP growth rates are greatest in the time period of 3 months to 1 year after first publication; and most revisions have occurred by 2 years.

- In the period from 3 months to 1 year after first publication the mean revision to GDP growth is 0.34 and revisions range from -2.73 to 2.87.

- None of the mean CSO revisions or the mean cumulative revisions of GDP growth rate for any period is statistically significant. That is, there is no bias towards positive or negative revisions.

- Ireland's mean absolute revision of GDP growth rates is higher than other OECD countries. However, considering the relative mean

absolute revision, Ireland compares well against other OECD countries.

- In the expenditure approach to GDP, net exports is the component with the greatest absolute revisions.

- In the income approach to GDP the scale of revisions to the main sectors is in line with the scale of each of the sectors. The statistical discrepancy, however, comprises a large part of the revisions.

- Revisions to GNP growth are much more volatile than for GDP growth.

- The initial estimate of seasonally adjusted quarter-on-quarter GDP growth is on average 0.35 percentage points below the latest estimate.

- Relative to the size of GDP growth, revisions to the quarter-on-quarter series are larger than revisions to the year-on-year series.

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APPENDIX TABLES

Table A1: Revisions Stages to Quarterly GDP Growth 1998-2007

Reference Period	Q1-Q0	Q4-Q1	Q8-Q4	L*-Q8	L-Q0
1998Q3	0.0	-0.7	0.9	0.2	0.4
Q4	0.0	-0.7	-0.6	-0.3	-1.6
1999Q1	-0.2	-0.4	1.4	-0.2	0.5
Q2	0.3	-0.1	-0.1	-0.7	-0.6
Q3	-0.5	0.0	0.6	-0.6	-0.5
Q4	0.0	2.2	0.0	1.1	3.3
2000Q1	-0.3	-1.2	0.0	-2.0	-3.5
Q2	0.4	0.8	-0.9	0.0	0.3
Q3	-0.9	0.0	-1.7	-0.8	-3.4
Q4	0.0	0.0	-1.2	-2.1	-3.3
2001Q1	-0.5	-0.4	-0.2	-1.2	-2.4
Q2	0.2	-2.7	0.1	-0.8	-3.3
Q3	-0.3	1.5	0.7	-0.5	1.4
Q4	0.0	1.0	0.5	0.7	2.3
2002Q1	1.5	0.9	-0.6	-0.2	1.7
Q2	0.1	0.9	-1.9	0.0	-0.9
Q3	0.4	-0.1	-0.8	1.1	0.6
Q4	1.1	0.0	0.1	0.3	1.6
2003Q1	0.3	2.9	0.5	0.2	3.8
Q2	0.3	2.9	-0.1	-0.1	3.0
Q3	-0.2	0.8	1.0	0.5	2.1
Q4	2.4	0.0	1.8	-0.3	3.8
2004Q1	0.1	0.7	0.1	-0.2	0.6
Q2	0.7	-0.1	0.4	-0.3	0.6
Q3	-0.6	-0.8	0.0	0.7	-0.6
Q4	-0.6	-0.1	-1.0	1.3	-0.4
2005Q1	-0.3	1.8	1.1	0.2	2.9
Q2	0.5	1.0	1.4	0.6	3.5
Q3	0.3	0.9	0.5	0.4	2.0
Q4	0.8	0.0	-1.4	0.7	0.1
2006Q1	-0.1	0.6	0.4		0.9
Q2	0.0	-1.0			-0.1
Q3	-0.2	0.5			-0.3
Q4	-0.4	0.0			-1.0
2007Q1	0.5	0.6			1.2
Q2	0.0				0.5
Q3	-0.2				-0.1
Q4	2.0				2.0
n	38	35	31	30	38

* Latest estimate.

Table A2: Revisions Stages to Quarterly GNP Growth 1998-2007

Reference Period	Q1-Q0	Q4-Q1	Q8-Q4	L-Q8	L-Q
1998Q3	0.0	-1.9	1.0	-0.1	-1.0
Q4	0.0	0.5	-0.6	-0.4	-0.5
1999Q1	-0.3	1.0	0.8	0.7	2.3
Q2	0.6	-1.1	-0.9	0.1	-1.3
Q3	-2.0	0.0	-0.2	0.4	-1.8
Q4	0.0	1.6	0.0	0.4	2.0
2000Q1	-0.3	-0.6	0.0	-2.0	-2.9
Q2	0.5	1.9	-0.5	0.2	2.1
Q3	-0.1	0.0	1.4	-1.5	-0.2
Q4	0.0	0.0	1.7	-2.8	-1.1
2001Q1	-0.6	-0.3	0.3	-0.2	-0.8
Q2	0.2	0.0	-0.2	-1.5	-1.5
Q3	-0.3	-1.7	0.3	0.3	-1.3
Q4	0.0	-0.6	-3.0	1.5	-2.0
2002Q1	-1.6	-1.7	-1.0	0.9	-3.4
Q2	0.1	-1.9	-0.4	0.9	-1.3
Q3	0.4	-0.5	4.5	1.9	6.2
Q4	2.4	0.0	2.8	1.8	7.0
2003Q1	0.2	2.3	0.5	1.0	4.1
Q2	0.4	-0.3	2.2	0.6	2.9
Q3	-0.3	-2.2	1.5	1.3	0.2
Q4	-2.0	0.0	4.9	0.3	3.2
2004Q1	0.1	2.3	0.2	-0.2	2.3
Q2	0.8	-1.9	1.4	-0.3	0.1
Q3	-0.7	-0.3	0.1	0.9	0.0
Q4	-4.6	-0.1	-1.9	1.6	-5.0
2005Q1	-0.3	0.2	0.1	0.6	0.6
Q2	0.6	-0.8	1.1	1.2	2.1
Q3	0.3	-0.1	-1.1	0.8	-0.1
Q4	1.7	-0.1	-1.7	1.2	1.0
2006Q1	-0.1	0.7	-0.2		0.4
Q2	0.0	-1.6			-0.6
Q3	-0.2	0.4			-0.8
Q4	-2.1	0.0			-2.4
2007Q1	0.5	-0.4			0.2
Q2	0.0				-2.1
Q3	-0.3				-0.5
Q4	1.1				1.1
n	38	35	31	30	38

Table A3: Revisions Stages to Seasonally Adjusted Quarter-on-Quarter Growth 2002-2007

Reference Period	Q1-Q0	Q4-Q1	Q8-Q4	L-Q8	L-Q0
2002Q1	0.1	-1.3	-0.4	0.0	-1.6
Q2	-0.1	-0.2	0.4	0.4	0.4
Q3	0.2	1.1	0.5	-0.2	1.7
Q4	-0.1	0.5	-0.3	0.1	0.1
2003Q1	0.2	1.3	-0.1	-0.3	1.2
Q2	0.1	-0.1	-0.3	0.1	-0.2
Q3	0.1	-0.6	1.5	0.3	1.2
Q4	2.5	-1.0	0.2	0.3	2.0
2004Q1	0.2	-1.0	-0.7	0.2	-1.2
Q2	0.3	-0.8	0.3	0.1	-0.1
Q3	-0.7	1.3	-0.3	1.1	1.4
Q4	0.5	-0.8	0.3	0.3	0.3
2005Q1	0.1	1.5	-0.1	0.2	1.7
Q2	0.2	-0.1	1.0	-0.3	0.8
Q3	0.3	-0.7	-0.6	0.7	-0.3
Q4	0.3	0.4	-0.6	-0.4	-0.4
2006Q1	0.1	1.2	0.2		1.5
Q2	0.2	-0.4			-0.3
Q3	-0.5	1.0			0.0
Q4	-1.6	0.6			-1.6
2007Q1	0.7	1.6			2.3
Q2	-0.1				-0.6
Q3	-0.2				-0.7
Q4	0.9				0.9
n	24	21	17	16	24