STATISTICAL POLICY WORKING PAPER 7

An Interagency Review of Time-Series Revision Policies

PREPARED BY

SUBCOMMITTEE ON GUIDELINES FOR MAKING AND PUBLISHING REVISIONS AND CORRECTIONS TO TIME SERIES,
FEDERAL COMMITTEE ON STATISTICAL METHODOLOGY

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PREFACE

The working paper was prepared by the members of the Subcommittee on Guidelines for Making and Publishing Revisions and Corrections to Time Series, Federal Committee on Statistical Methodology. The Subcommittee was chaired by Yvonne M. Bishop, Energy Information Administration, Department of Energy.

This report includes recommendations formulated by the interagency subcommittee concerning policies and practices for estimating and publishing revisions to time series. These subcommittee recommendations were not formally endorsed by the Federal Committee on Statistical Methodology nor by the Office of Management and

Budget. The findings presented here provide guidance for improving agency practices with respect to time series. Seminars will be organized to discuss the findings of this subcommittee with Federal agency personnel involved in estimating or publishing time series.

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This report represents the collective efforts of the Subcommittee on Guidelines for making and Publishing Revisions and Corrections to Time Series members of the subcommittee discussed the state of affairs and decided to obtain more specific information from the agencies represented. They prepared a questionnaire and located persons in their agencies who would complete the questionnaire. Responses were received as follows:

BEA	5
BLS	2
Census	9
EIA	2
FRB	5
FTC	1
IRS	2
SEC	2
USDA	3
Total	31

The subcommittee is grateful to all the respondents.

Various members of the subcommittee worked on tabulating the responses to the questionnaire and drafting portions of the text. Paul Werbos undertook the task of consolidating the drafts into a final report.

AN INTER-AGENCY REVIEW OF TIME-SERIES REVISION POLICIES

I. INTRODUCTION.

The Federal Committee on Statistical Methodology established the

Subcommittee on Guidelines for Making and Publishing Revisions and Corrections to Time-Series. The purpose of the subcommittee was to review current agency policies and to determine if user needs are met by the current procedures and guidelines. Revision policy guidelines were formulated In Statistical Policy Directive no. 3 of the Office of Federal Statistical Policy and Standards (OFSPS). This directive :is currently an Office of Management and Budget (OMB) standard. These guidelines Include:

a. Preliminary and revised figures should be clearly Identified as such. For principal aggregate figures, revisions should be accompanied by the previous figures to facilitate comparison.

b. Revisions occurring for various reasons such as benchmark revisions, updating of Seasonal factors, and replacement of preliminary by revised figures, should be consolidated and released simultaneously.

c. Revisions occurring for reasons other than routine and regular replacement for preliminary revised figures because of new data should be accompanied by a brief explanation at the time of release.

The subcommittee conducted a series of meetings to discuss

agency policies, and the impact of alternative policies an users. Because of the wide diversity of policies and users, a questionnaire was developed to give a clearer picture of the extent of this diversity. Agencies were asked to select time-series of Interest, and fill out the questionnaire for each series. Nine agencies submitted 31 questionnaires. Participating agencies were BEA, BLS, Census, EIA, FRB, FTC, IRS, SEC and USDA. The series chosen were not selected at random, and are too few to permit statistical inference; however, the responses were discussed by subcommittee members who represented the agencies, and It was believed that the series selected could be regarded as Illustrative of the practices In those agencies.

This report represents the work of the subcommittee and summarizes what was found In the questionnaires, and what further Issues emerged in subcommittee discussions and In the analysis of the questionnaires. Possible charges in policy will be discussed.

II. SUMMARY OF THE QUESTIONNAIRE RESULTS.

The initial version of the questionnaire contained several questions on the data users and their needs. This was considered important to cost-benefit analysis of Policy because the costs Of any data collection activity are concentrated In the agencies while the benefits are to the users. However, this question had to be deleted because of an almost universal lack of information about users. A handful of agencies do send out questionnaires on user satisfaction with their data packages, but these do not permit in-depth analysis of revisions policy without further information.

The final version of the questionnaire contained eight substantive questions, and this discussion is based on series-by-series tabulation of the responses. From the responses it was found that most agencies selected monthly time-series to review, presumably because revision is considered a bigger problem in these series. Thus, annual time-series as a group are not adequately covered by this analysis. A few quarterly and weekly series are covered.

Questions an collection procedures and the timing of release highlighted a major reason for revision: tight deadlines and reliance an replies by mail. It was also found that the deadlines

are set by the agencies themselves, in all but one agency; however, most subcommittee members had a sense that the tight deadlines resulted from agency response to pressure from users. Users such as the Office of Management and Budget, the Council of Economic Advisors, the Treasury and the Federal Reserve Board were cited.

Tabulations of the reasons for revision showed that two - thirds are revised because of late responses or corrections from respondents; all but a few are also revised because of errors detected by the agencies. Half are revised to update the seasonal adjustment. Seasonal adjustment in almost always done by use of the Census Bureau X-11 program whose final results d"nd an future observations. Thus, of the 19 series reported which are seasonally adjusted, 17 have the seasonal adjustment factors revised %&an; the actual data become available. In addition to these ongoing reasons for revisions, there are occasional needs for adjusting more than one past time period. One example is change in definition of the variable being measured. Another example is "benchmarking"; in other words, data from sources such as an annual survey are adjusted retroactively to make the series fit smoothly to another data source, such as a five year census. Additionally, revisions

can occur because of a major change in the "frame," the list from which respondents are sampled.

Respondents were asked whether information war available on the magnitude and direction of revisions. The committee found that there has been relatively little formal analysis of the magnitude and direction of revisions. However, those performing the revisions do typically notice the changes they are making. Thus, In almost half the cases the direction of revision was known. In three cases, It was stated that the revisions are much smaller than the actual change from period to period; in other cases, It was indicated (on the survey or in discussion) that revisions are "small" (on the order of 1 to 3 percent apparently). In three cases, the magnitude was quantified at between 0.25 and 1.4 percent

In order to determine cost-effectiveness of any revision policy, It is necessary to consider

the method of disseminating data and revisions. It was found that preliminary data and revisions or* both still disseminated primarily by traditional means. All data series discussed are Published and, In all but two cases, the revisions are published. In the bulk of cases, the original is also sent out in a press release; in most cases the revision is also released. In less than half the cases, the original and the revision are available in tape form; furthermore, It Is relatively rare for current, revised fears to be available in a user accessible databank or in microfiche form.

The OFSPS Directive no. 3 states that revisions should be accompanied by previous figures, so as to provide an Indication of the magnitude of the change. After Initial checks, It was found that only 8 out of the 31 data-series follow this guideline. The directive also indicates that preliminary figures should be adjusted when the direction of revisions in predictable; from the answers to the questionnaire, it seems doubtful that this is ever done, on the other hand, with almost half the series, some

information is published at times about the past history of revisions or the like. In most cases, the actual methodologies used in revision are published.

The committee was concerned as to bow the unit is notified that a large revision has been made. For those series reported an being available in tape form, for about half the existence of a revised tape is announced in periodicals such as the "Survey of Current Business," "SEC Monthly Statistical Review"; for other series a press release is used, or the revisions are indicated in regularly scheduled updates. For all but three of the data series discussed, users are notified of gross errors by such means as a note in published periodicals, errata sheets, or letters to sponsors.

Almost half of the series discussed are both benchmarked and seasonally adjusted. Therefore, the interactions of these two forms of revision need more serious study; it is possible that benchmarking, if timed incorrectly, may introduce mathematical artifacts into the seasonal adjustment process. Tight deadlines for data release require not only revision, but also a heavy reliance on imputation methods to estimate responses which are not

available in time for the new initial deadline. In all but a few of the 31 data series examined, imputation is used. These methods are very diverse, and do not seem to result from a statistical evaluation of the various alternatives. Sometimes the trend of the overall series is used to impute individual responses are imputed in other ways (by judgement, or by "hot deck," or by estimation using prior data, or by unspecified estimation method, or by matching to other data). Often non-respondents as a group are imputed (by assuming non-respondents are the same as respondents, or that they change at the same rate, or by the use of trends, adjusted weights or some ratio technique).

The committee observed that for some series the size of the change associated with each revision decreases over time. Nevertheless, it is rare for the decision as to whether to publish a revised number to be dependent on the size of the revision. For one series discussed - the Consumer Price Index - revisions are not made public except when a very large error occurs, because such revisions might confuse the contracts and laws which refer to the value of that index; the potential revisions have been studied and are probably comparable to those of the other series described

here.

III. ISSUES RAISED BY QUESTIONNAIRE ANALYSIS AND DISCUSSION.

The results of the questionnaires, by themselves, raise as many questions as they answer. Solution of some of these questions will require Statistical research. In some cases, however, the discussions of the subcommittee can provide a more complete (if speculative) picture. The discussion below is partly based an the subcommittee work and partly based on last-minute efforts by a few subcommittee members to understand these results. Concern focused an the impact on users, the effects of benchmarking, and how bias and the number of revisions might be minimized.

Impact of Revisions on Users.

The lack of Information about users does not mean that agencies are unconcerned about users. Borrowing terms from private Industry, one might say that most statistical agencies have large sales departments, often with a major customer relations function;

however, market analysis is not possible within their budgets. In some agencies, requirements reviews are beginning to fill the gap; but even when these are available, they tell us little about the interaction between data collection options and the methods used to apply the data to analysis or elsewhere.

In its discussions, the Subcommittee emphasized two categories of usage: (1) Monitoring current developments to detect any indication of improvement or worsening in some situation, or more generally, to obtain an accurate relative indication of what is going on today; and (2) using an accurate historical record to develop a statistical model of a system, so that reasonable inferences about cause and affect might be made.

The educated analyst of current problems would actually combine both because a proper Interpretation of the present requires an understanding of as past.

Most agencies are primarily concerned about keeping the monitor happy. The reasons for this are straightforward. The monitors include Congressional Committees that ask for briefings the current situation, and sometimes press hard for explanations for delays, revisions or discrepancies between one source of data

and another. Likewise, the monitors include those who brief the President on the current situation; they also include TV stations and newspapers who gave broad publicity to the latest statistics.

Some monitors are highly conscious of revisions and will complain strongly to an agency if there are too many versions of the same number; other monitors may be less conscious of the accuracy factor, and simply assume that a preliminary estimate reflects very recent reality.

In almost all cases, if is important for monitors that the agency define a data variable in a way which corresponds to the concepts

they use it as an indicator for: as a practical matter, they have to assume such a correspondence in any event.

The subcommittee located three reports and conducted one interview to gauge the effect of revisions on causal analysts. They typically need accurate time-series data. In most cases, they cannot afford to study the discrepancy between preliminary and revised figures; therefore, it is important for them to have access to the best possible prediction of what the final, revised figure will be if they use anything but final data at all. Indications of the likely error can help them decide whether to include recent data at all in their analysis. Causal analysts are less likely to be policymakers than are monitors, but the products of their work can be important to the policymaker; therefore, more consideration of their needs may be warranted. Fortunately, most analysts have access to computers; thus more frequent revisions may be made available to them, either in tape or databank form without necessitating multiple publications or press releases. Private databank services have recently begun to offer on line interactive retrieval to the mass market; well planned cooperation with such services could relieve the government of much of the labor involved in disseminating revisions, and speed Up the distribution process.

Experiments with electronic dissemination by the government

have sometimes encountered bad results in the past. User costs of obtaining data have sometimes increased, especially when analysts need access to only a small set of variables (e.g., U.S. Gross National Product by Year). However, technology has changed rapidly In this area, and, if barriers to interagency cooperation and government/industry cooperation can be overcome, it may be possible to reduce the costs to users. (Dollar cost and the cost in term of user effort both need to be considered.) Where large databases are being revised, or where many users need simultaneous access to data from different agencies, electronic dissemination may become cheaper to the user and is preferable to not publishing the latest estimates.

It is important, however, that changes in dissemination policy be analyzed together with agencies policies on computer use an a creative and government wide basis, so as to ensure that future user costs are reduced as such as possible.

Analysts typically use statistical or "econometric" methods which assume that the data are "clean"; some degree of inaccuracy is acceptable, but it is important that the inaccuracy be random. Unlike monitors, analysts are often able to analyze seasonal factors themselves if given accurate unadjusted data.

Benchmarking

The subcommittee spent considerable time discussing the reasons for benchmarking, and the problems it presents. For users such as monitors, the goal is simply to minimize error; to achieve this goal, ones estimate should account for all relevant information, including both the original unadjusted data and other sources (benchmarks). However, it is not obvious how best to do this, and current methods are diverse and variable In the degree of theoretical sophistication. For analysts, it may be more important to Preserve the randomness if the error rather than reduce its size, so as to ensure the validity of normal analytic procedures and avoid systematic biases. To achieve this goal one would want to publish "clean" data series, with a minimum of benchmarking or of other revisions which introduce systematic alterations of the original data. To compromise between these two types of use, one might make the "clean" series available on tape or in databank form in cases where one cannot afford to publish both. For some users,

benchmarking may create a misleading impression of consistency if the user is not aware that the original unadjusted measurements from different sources were actually in disagreement with each other. Related to this In the problem of whether, or how, to "smooth" data when major changes in definition have changed the numbers drastically.

Benchmarking is used to remove bias that has accumulated over time. For example, if an annual survey has drawn from a frame which is updated only at ten year intervals, then deterioration of the frame may lead to a growing systematic bias. While the optimal way to correct for this bias is unknown (despite some exploratory research) the usual straightline adjustment used in "benchmarking" may be better than nothing. Thus, benchmarking may lead to less systematic bias, and "cleaner" data at times.

Unfortunately, the subcommittee did not have a chance to study the problem of updating frames. Many sample surveys, based on response by mail, telephone or interview, come from frames based on administrative records. Thus, it may be possible to minimize the degree of benchmarking by updating frames more often. A more expensive possibility might be to take larger surveys. In some

cases (especially with monthly series and annual frames) sample deterioration rather than frame deterioration may be the problem; in such cases, sample renewal and related procedures may minimize the systematic bias, and minimize the degree of benchmarking needed for a "clean" database. It seems likely that sample deterioration, like missing value Imputation, is commonly handled via a diversity of informal procedures, despite the possibility of more rigorous statistical tools.

Indication of Bias.

The former OFSPS Directive no. 3 states that adjustments for bias In the preliminary figures should be made, and that preliminary figures should be published alongside their revisions. While a few of the agencies do publish both figures, the latter guideline was opposed vigorously. Given that several revisions of a series are often necessary, publications might become far more complex, confusing and also more expensive if the guidelines were followed literally. In press releases, however, it may be reasonable to ask that the initial preliminary figure be mentioned

whenever a revision is announced. It is important that the preliminary figure cited correspond exactly to the revision (e.g., they refer to the same month), because citation of other preliminary figures may confuse the reader; for example, If variable X grows by one percent per month, and its revisions add one percent to the preliminary figure, this months preliminary figure may equal the revision of last months data exactly even though there is significant revision error.

In principle, it was agreed that users actually

need an indication of expected bias and of random revision error. To do this professionally would require an effort to develop time-series models to predict revised values as a function of preliminary figures and previous data. This would cost more resources, however, by reducing the size of subsequent revisions.

It might allow a reduction in subsequent expenses in publishing and announcing multiple revisions. Also, it is unclear what fraction of users would still want access to adjusted preliminary figures. In theory, agencies could be given the freedom to pick a very simple model (e.g., normally distributed revisions), if they were willing to accept the need to then publish a larger standard error.

Reduction of Revision.

The subcommittee discussed at length the possibility of reducing costs and user confusion by reducing the number of revisions. The most promising approach seems to be a reduction of the number of scheduled revisions. Also, benchmarking, seasonal readjustment and historical publication of late revisions can be scheduled simultaneously.

One Initial suggestion was to establish cutoff on the size of changes: in other words, a revised number would be published only if it differed from the previous version by more than the cutoff. This suggestion was not popular. Agencies typically schedule a complete calculation of revisions, publication and tables rather

than individual numbers, deleting half of the numbers from a table, at random, would not reduce publication expense. In any event, adhering to a fixed schedule makes it possible for users to know they have the latest revision without extensive checking. Furthermore, agencies in the United States prefer to publish statistics and revisions on a preannounced, regular schedule, because this reduces the fear that political factors might bias the timing decisions.

Another suggestion was to relax some of the tight deadlines. If the expected error in a preliminary figure exceeds the month-to-mouth fluctuation, it may be a waste of money to publish it; it may also mislead the public. OFSPS Directive no. 3 endorses this view, however, without a clear indication of how early is too early, agency policies may not change. One possibility Is simply to require that agencies estimate the expected revision error rigorously and that the "preliminary figure" not be published if the random component of this error exceeds the mean period-to-period fluctuation. In other words, if this inequality holds over a significant period of time, the schedule should change so that the first scheduled revision now becomes the first published number.

Likewise, after the first or second monthly (periodic) revision of a number, no more revisions need be published on paper, or released to the press, until the usual consolidated time-series publications (e.g., annual review) are printed. Such a policy would not preclude exceptions for unusual circumstances. The rationale for the policy is that monitors are likely to lose interest after three months, while analysts can get the revisions from databanks. Updated tapes or databanks should still be provided; if data are well managed within an agency, this should not be expensive. With some data series; however, analysts make direct use of the printed data (perhaps because electronic distribution is not fully available yet), and the cost of publishing an updated time-series is relatively small; such series should be treated as an exception.

Benchmarking and Seasonal Analysis.

The subcommittee strongly agrees with the OFSPS Directive that benchmarking and seasonal analysis should be consolidated, for reasons of accuracy as well as expense. However, we have not

examined present practices or their implications, as they relate to this guideline. In some cases, seasonal readjustments can be performed sooner than benchmarking, as actual data become available to replace the X-11 projections of the seasonal factors. The development of better tim-series models to make these projections could reduce the sit* of the correction, however, so that a delay In the revision would be more acceptable. The subcommittee notes that there is Important research wall underway to try to Improve upon X-11 seasonal adjustment. This too might reduce the need for revision, but it is too early to be sure. Preliminary studies suggest strongly that concurrent seasonal adjustment, which requires less revision, is a viable alternative to present procedures.

IV. RECOMMENDATIONS.

The subcommittees found that they were in general agreement with Directive no. 3, but that they would strengthen some of the guidelines. They formulated eight recommendations as follows:

1. Agencies should be required to maintain statistical models (however simple) to determine whether bias has been removed and to compute the standard error of revisions for all published (printed) series. The standard errors should be published along with all preliminary figures. This should override any need to publish revised and preliminary figure together, except possibly in press releases.

2. Schedules for data release and revision should continue to be regular and fixed in advance. Schedules should be adjusted and consideration given to deleting versions so early that the standard error of revision (as in recommendation 1) exceeds the period-to-period fluctuations. Any such changes of schedule should be subject to the joint agreement of producing and using agencies. This recommendation should not be construed to mean that an aggregate figure should be delayed when its components are not ready for publication.

3. No more than three consecutive monthly versions of the same statistic should be scheduled for publication within a year (not counting revisions for annual or less frequent publications). This does not mitigate the need to disseminate tapes and databanks

containing the latest version, or to publish the revised time-series when historic publications are printed.

4. As In the OFSPS Directive, benchmarking and seasonal readjustment should be made simultaneously.

5. Resources should be made available for research into the impact of benchmarking and ways of minimizing it. Going beyond the benchmark itself, the interpolation and extrapolation procedures also need serious study. This should include formal study of alternative sample designs, frame updating procedures, and data estimation

6. Resources should be made available for more research into the process of imputation, throughout government agencies.

7. Mechanisms are needed to help agencies better understand

and respond to the needs of users of various types. Some users want the most recent value in as short a time-frame as possible; others require extended time-series. The cost effective approach from the point of view of both producers and users to meeting these needs may require dissemination, not only through printed publications, but also through mechanisms such as computer data networks.

8. Where possible, better seasonal adjustment models should be developed so as to minimize the revision of seasonal factors, and make a less frequent revision schedule more acceptable.

Availability of Further Detail.

Copies of the questionnaire and tabulations of responses are available on request from OMB, Regulatory and Statistical Analysis Division, Washington, D.C. 20503 or from EIA, Office of Statistical Standards, Washington, D.C. 20585.

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