

This PDF is a selection from an out-of-print volume from the National Bureau of Economic Research

Volume Title: Errors in Provisional Estimates of Gross National Product

Volume Author/Editor: Rosanne Cole

Volume Publisher: UMI

Volume ISBN: 0-870-14207-0

Volume URL: <http://www.nber.org/books/cole70-1>

Publication Date: 1970

Chapter Title: Front matter, Errors in Provisional Estimates of Gross National Product

Chapter Author: Rosanne Cole

Chapter URL: <http://www.nber.org/chapters/c3284>

Chapter pages in book: (p. -16 - 0)

2,005,924

National Bureau of Economic Research, Inc.
Cole, Rosanne.

Errors in provisional estimates of gross national product.
New York, National Bureau of Economic Research; distributed by Columbia University Press, 1969.

xiv, 109 p. illus. 24 cm. (National Bureau of Economic Research. Studies in business cycles, 21) 6.00

1. Gross national product—U. S. I. Title. (Series)

HC110.I5C58

339.3'73

69-12463

MATERIAL SUBMITTED BY PUBLISHER.



**Errors in Provisional Estimates
of Gross National Product**

NATIONAL BUREAU OF ECONOMIC RESEARCH

Studies in Business Cycles

1. *Business Cycles: The Problem and Its Setting*, by Wesley C. Mitchell
2. *Measuring Business Cycles*, by Arthur F. Burns and Wesley C. Mitchell
3. *American Transportation in Prosperity and Depression*, by Thor Hultgren
4. *Inventories and Business Cycles, with Special Reference to Manufacturers' Inventories*, by Moses Abramovitz
5. *What Happens during Business Cycles: A Progress Report*, by Wesley C. Mitchell
6. *Personal Income during Business Cycles*, by Daniel Creamer with the assistance of Martin Bernstein
7. *Consumption and Business Fluctuations: A Case Study of the Shoe, Leather, Hide Sequence*, by Ruth P. Mack
8. *International Financial Transactions and Business Cycles*, by Oskar Morgenstern
9. *Federal Receipts and Expenditures During Business Cycles, 1879-1958*, by John M. Firestone
10. *Business Cycle Indicators: Volume I, Contributions to the Analysis of Current Business Conditions; Volume II, Basic Data on Cyclical Indicators*; edited by Geoffrey H. Moore
11. *Postwar Cycles in Manufacturers' Inventories*, by Thomas M. Stanback, Jr.
12. *A Monetary History of the United States, 1867-1960*, by Milton Friedman and Anna J. Schwartz
13. *Determinants and Effects of Changes in the Stock of Money, 1875-1960*, by Phillip Cagan
14. *Cost, Prices and Profits: Their Cyclical Relations*, by Thor Hultgren
15. *Cyclical Fluctuations in the Exports of the United States Since 1879*, by Ilse Mintz
16. *Information, Expectations, and Inventory Fluctuation: A Study of Materials Stock on Hand and on Order*, by Ruth P. Mack
17. *Forecasting and Recognizing Business Cycle Turning Points*, by Rendigs Fels and C. Elton Hinshaw
18. *The Business Cycle in a Changing World*, by Arthur F. Burns
19. *Economic Forecasts and Expectations*, by Jacob Mincer et al.
20. *Monetary Statistics of the United States: Estimates, Sources, Methods*, by Milton Friedman and Anna Jacobson Schwartz
21. *Errors in Provisional Estimates of Gross National Product*, by Rosanne Cole

ERRORS IN PROVISIONAL
ESTIMATES OF GROSS
NATIONAL PRODUCT

Rosanne Cole



National Bureau of Economic Research

NEW YORK 1969

DISTRIBUTED BY *Columbia University Press*

NEW YORK AND LONDON

Copyright © 1969 by the
National Bureau of Economic Research, Inc.
All rights reserved
L. C. CARD: 69-12463
SBN: 87014-207-0
Printed in the United States of America

National Bureau of Economic Research

OFFICERS

Arthur F. Burns, *Honorary Chairman*
Theodore O. Yntema, *Chairman*
Walter W. Heller, *Vice Chairman*
John R. Meyer, *President*
Donald B. Woodward, *Treasurer*

Victor R. Fuchs, *Vice President-Research*
F. Thomas Juster, *Vice President-Research*
Douglas H. Eldridge, *Vice President-Administration*
Hal B. Lary, *Director of International Studies*

DIRECTORS AT LARGE

Joseph A. Beirne, *Communications Workers of America*
Arthur F. Burns, *Board of Governors of the Federal Reserve System*
Wallace J. Campbell, *Foundation for Cooperative Housing*
Erwin D. Canham, *Christian Science Monitor*
Robert A. Charpie, *The Cabot Corporation*
Solomon Fabricant, *New York University*
Frank W. Fetter, *Hanover, New Hampshire*
Eugene P. Foley, *Dreyfus Corporation*
Marion B. Folsom, *Rochester, New York*
Eli Goldston, *Eastern Gas and Fuel Associates*
Crawford H. Greenewalt, *E. I. du Pont de Nemours & Company*

David L. Grove, *IBM Corporation*
Walter W. Heller, *University of Minnesota*
Vivian W. Henderson, *Clark College*
John R. Meyer, *Yale University*
J. Irwin Miller, *Cummins Engine Company, Inc.*
Geoffrey H. Moore, *Bureau of Labor Statistics*
J. Wilson Newman, *Dun & Bradstreet, Inc.*
James J. O'Leary, *United States Trust Company of New York*
Robert V. Roosa, *Brown Brothers Harriman & Co.*
Boris Shishkin, *AFL-CIO*
Lazare Teper, *ILGWU*
Donald B. Woodward, *Riverside, Connecticut*
Theodore O. Yntema, *Oakland University*

DIRECTORS BY UNIVERSITY APPOINTMENT

Moses Abramovitz, *Stanford*
Gary S. Becker, *Columbia*
Charles H. Berry, *Princeton*
Francis M. Boddy, *Minnesota*
Tom E. Davis, *Cornell*
Otto Eckstein, *Harvard*
Walter D. Fisher, *Northwestern*
R. A. Gordon, *California*

Robert J. Lampman, *Wisconsin*
Maurice W. Lee, *North Carolina*
Lloyd G. Reynolds, *Yale*
Robert M. Solow, *Massachusetts Institute of Technology*
Henri Theil, *Chicago*
Thomas A. Wilson, *Toronto*
Willis J. Winn, *Pennsylvania*

DIRECTORS BY APPOINTMENT OF OTHER ORGANIZATIONS

Emilio G. Collado, *Committee for Economic Development*
Thomas D. Flynn, *American Institute of Certified Public Accountants*
Nathaniel Goldfinger, *AFL-CIO*
Harold G. Halcrow, *American Agricultural Economics Association*

Douglas G. Hartle, *Canadian Economics Association*
Walter E. Hoadley, *American Finance Association*
Douglass C. North, *Economic History Association*
Murray Shields, *American Management Association*
George Cline Smith, *National Association of Business Economists*
Willard L. Thorp, *American Economic Association*

W. Allen Wallis, *American Statistical Association*

DIRECTORS EMERITI

Percival F. Brundage
Gottfried Haberler

Albert J. Hettinger, Jr.
Harry W. Laidler

George B. Roberts
George Soule

Jacob Viner
Joseph H. Willits

SENIOR RESEARCH STAFF

Gary S. Becker
Phillip Cagan *
Alfred H. Conrad
James S. Earley
Solomon Fabricant
Milton Friedman
Victor R. Fuchs

Raymond W. Goldsmith
Jack M. Guttentag
Daniel M. Holland
F. Thomas Juster
C. Harry Kahn
John F. Kain
John W. Kendrick

Irving B. Kravis
Hal B. Lary
Robert E. Lipsey
John R. Meyer
Jacob Mincer
Ilse Mintz
Geoffrey H. Moore *

M. Ishaq Nadiri
Nancy Ruggles
Richard Ruggles
Robert P. Shay
George J. Stigler
Victor Zarnowitz

* On leave.

Relation of the Directors to the Work and Publications of the National Bureau of Economic Research

1. The object of the National Bureau of Economic Research is to ascertain and to present to the public important economic facts and their interpretation in a scientific and impartial manner. The Board of Directors is charged with the responsibility of ensuring that the work of the National Bureau is carried on in strict conformity with this object.

2. The President of the National Bureau shall submit to the Board of Directors, or to its Executive Committee, for their formal adoption all specific proposals for research to be instituted.

3. No research report shall be published until the President shall have submitted to each member of the Board the manuscript proposed for publication, and such information as will, in his opinion and in the opinion of the author, serve to determine the suitability of the report for publication in accordance with the principles of the National Bureau. Each manuscript shall contain a summary drawing attention to the nature and treatment of the problem studied, the character of the data and their utilization in the report, and the main conclusions reached.

4. For each manuscript so submitted, a special committee of the Board shall be appointed by majority agreement of the President and Vice Presidents (or by the Executive Committee in case of inability to decide on the part of the President and Vice Presidents), consisting of three directors selected as nearly as may be one from each general division of the Board. The names of the special manuscript committee shall be stated to each Director when the manuscript is submitted to him. It shall be the duty of each member of the special manuscript committee to read the manuscript. If each member of the manuscript committee signifies his approval within thirty days of the transmittal of the manuscript, the report may be published. If at the end of that period any member of the manuscript committee withholds his approval, the President shall then notify each member of the Board, requesting approval or disapproval of publication, and thirty days additional shall be granted for this purpose. The manuscript shall then not be published unless at least a majority of the entire Board who shall have voted on the proposal within the time fixed for the receipt of votes shall have approved.

5. No manuscript may be published, though approved by each member of the special manuscript committee, until forty-five days have elapsed from the transmittal of the report in manuscript form. The interval is allowed for the receipt of any memorandum of dissent or reservation, together with a brief statement of his reasons, that any member may wish to express; and such memorandum of dissent or reservation shall be published with the manuscript if he so desires. Publication does not, however, imply that each member of the Board has read the manuscript, or that either members of the Board in general or the special committee have passed on its validity in every detail.

6. Publications of the National Bureau issued for informational purposes concerning the work of the Bureau and its staff, or issued to inform the public of activities of Bureau staff, and volumes issued as a result of various conferences involving the National Bureau shall contain a specific disclaimer noting that such publication has not passed through the normal review procedures required in this resolution. The Executive Committee of the Board is charged with review of all such publications from time to time to ensure that they do not take on the character of formal research reports of the National Bureau, requiring formal Board approval.

7. Unless otherwise determined by the Board or exempted by the terms of paragraph 6, a copy of this resolution shall be printed in each National Bureau publication.

*(Resolution adopted October 25, 1926 and revised February 6, 1933,
February 24, 1941, and April 20, 1968)*

Contents

<i>Acknowledgments</i>	<i>xiii</i>
<i>Introduction</i>	<i>3</i>
<i>I. Errors in Estimates of GNP and Its Components</i>	<i>7</i>
Data and Methods Used in GNP Estimation	8
Personal Consumption Expenditures: Commodities	9
Personal Consumption Expenditures: Services	10
New Construction	11
Producers' Durable Equipment	12
Change in Business Inventories	12
Net Exports of Goods and Services	13
Government Purchases of Goods and Services: Federal	13
Government Purchases of Goods and Services: State and Local	13
Types of Errors and Potential of the Revisions	14
<i>II. Characteristics of the Revisions</i>	<i>16</i>
Resemblance to Extrapolation Errors	17
Cyclical Characteristics	22
Overestimation, Underestimation, and Direction of Change Errors	23
<i>III. Relative Accuracy of the Provisional Estimates</i>	<i>28</i>
Provisional Estimates Compared with Forecasts	29
Provisional Estimates Compared with Extrapolations	35
<i>IV. Gains in Accuracy from Additional Information</i>	<i>48</i>
Gains Through Successive Revisions	48
Gains Over Time	56
<i>V. Expenditures Estimates Compared with Income Estimates</i>	<i>62</i>
Accuracy of Successive Estimates	62
Use of the Statistical Discrepancy to Measure Error	64

VI. Revisions in Major Patterns of Change	68
Cyclical Changes	68
Amplitudes	69
Turning-Point Dates	73
Revisions of Seasonal Factors	81
Postwar Trends	84
Comparison of Trend and Cyclical Errors	90
VII. Summary	91
Accuracy of the Provisional Estimates	92
Success of Revisions and Gains in Accuracy	93
Bias in the Initial Estimates of Change in GNP	94
Expenditures Compared to Income Estimates of GNP	95
Consequences for Users of Preliminary Data	96
Appendix: An Error Model	97
Errors in Provisional Estimates	101
Errors Measured by the Revisions	100
Index	104

Tables

1. Error Statistics for Provisional Estimates of Quarterly Levels and Changes in Gross National Product and Its Components, 1947 II–1961 IV	20
2. Selected Error Statistics for Average Business Forecasts of Annual Levels of GNP and Its Major Components: Comparison of Errors Computed with Provisional and Revised Estimates of Actual Values, 1953–62	22
3. Mean Errors in Provisional Estimates of Quarterly Levels of GNP and Its Components Classified According to Cyclical Characteristics of Quarter Covered, 1947 II–1961 IV	23
4. Types of Error in Provisional Estimates of Quarterly Change in Gross National and Its Components, 1947 II–1961 IV	24
5. Errors in Successive Forecasts and Estimates of Annual Levels of Gross National Product and Its Major Components, 1953–62	31
6. Errors in Forecasts, Naive Model Projections, and Successive Estimates of Quarterly Levels of Gross National Product and Its Major Components, 1957 IV–1962 IV	36
7. Errors in Naive Model Projections and Successive Estimates of Quarterly Levels and Changes in Gross National Product and Its Components, 1947 II–1961 IV	41
8. Percentage of Error in Provisional Estimates of Quarterly Levels and Changes in Gross National Product and Its Components Eliminated in Each Successive Revision, 1947 II–1961 IV	50
9. Coefficients of Correlation between Successive Revisions and Errors Eliminated in Subsequent Revisions of Estimates of Quarterly Levels and Changes in Gross National Product and Its Components, 1947 II–1961 IV	52
10. Successive Revisions in Estimates of Quarterly Change in Gross National Product and Its Components Classified According to Success or Failure of Revisions	53

11. Errors in Provisional Estimates of Quarterly Levels and Changes in Gross National Product and Its Components, 1947-54 Compared with 1955-61	57
12. Errors in Expenditures Estimates Compared with Errors in Income Estimates of Quarterly Levels and Changes in Gross National Product, 1947 II-1961 IV	63
13a. Revisions in Two Estimates of Peak to Trough Decline in GNP During Four Postwar Contractions, Classified by First to Latest Date Decline Measured	71
13b. Revisions in Two Estimates of Trough to Peak Increase in GNP During Three Postwar Expansions, Classified by First to Latest Date Increase Measured	72
14a. Revisions in Estimates of Peak to Trough Changes in Major Components of GNP During Four Postwar Contractions, Classified by First to Latest Date Contraction Measured	74
14b. Revisions in Estimates of Trough to Peak Changes in Major Components of GNP During Three Postwar Expansions, Classified by First to Latest Date Expansion Measured	76
15. Revisions in Major Turning Point Dates in Two Estimates of Gross National Product	78
16. First Compared with Revised Average Annual Rates of Increase in Two Estimates of GNP: 1947-63 and Subperiods	87
17. First Compared with Revised Average Annual Rates of Increase in Three Major GNP Components: 1947-55 and 1955-63	89

Charts

1. Root Mean Square Errors of Successive Forecasts and Estimates of Gross National Product and Its Major Components, Annual Levels, 1953-62	30
2. Root Mean Square Errors of Naive Projections, Forecasts, and Successive Estimates of Quarterly Levels in Gross National Product and Its Major Components, 1957 IV-1962 IV	34
3. Root Mean Square Errors of Naive Projections and Successive Estimates of Quarterly Levels and Changes in Gross National Product and Its Components, 1947 II-1961 IV	38
4. Errors in Provisional Estimates of Quarterly Levels of Gross National Product and Its Components, 1947 II-1961 IV	60
5. First and Revised Estimates of the Decline in GNP During Four Postwar Contractions and the First Year of Recovery	69
6. First and Revised Estimates of the Implicit Seasonal Factors for Gross National Product, Change in Business Inventories, and Total Final Purchases, 1947-63	83

Acknowledgments

This is one in a series of reports on the accuracy of short-term economic forecasting, a National Bureau project directed by Victor Zarnowitz. Financial support for the project has been provided by grants to the National Bureau from Whirlpool Corporation, General Electric Company, Ford Motor Company Fund, U.S. Steel Corporation, and the Relm Foundation, as well as by other funds of the National Bureau. A grant of electronic computer time to the National Bureau by the International Business Machines Corporation was used for some of the statistical analyses in this report.

Both Jacob Mincer and Victor Zarnowitz read and criticized the manuscript throughout its various stages. I am grateful for their encouragement, good advice, and important suggestions.

Geoffrey Moore, Julius Shiskin, and Phillip Cagan also provided many helpful suggestions. Stanley Diller, with whom I shared an office, was subjected almost daily to run-downs of problems and fine points, and gave help, richly laced with humor, on each one. Other members of the National Bureau staff, John Kendrick and Victor Fuchs, made useful comments on earlier versions of this report.

In the early stages of the study, I benefited from discussions with officials of several government agencies: George Jaszi of the Office of Business Economics and Milton Moss and Benjamin Teeter of the Office of Statistical Standards. In addition, Lawrence Grose of the OBE and Raymond Nassimbene of the OSS provided very helpful criticisms of the preliminary manuscript. I would also like to thank Francis M. Boddy, Gus Tyler and W. Allen Wallis of the National Bureau Directors' Reading Committee.

I am especially indebted to Johanna Stern under whose painstaking care the massive job of compiling the complete postwar record of gross national product estimates was done. Research assistants on the short-

term forecasting project who helped with some of the statistical tabulations were Martha Callaghan Bergsten, Micaela Hickey, Dorothy Finger, and Cecilia Weidemann. The charts were expertly drawn by H. Irving Forman and the manuscript was edited by Gnomi Schrift Gouldin.