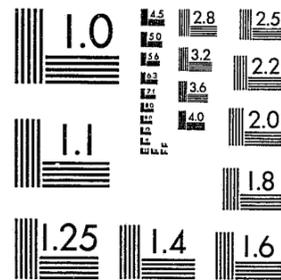


National Criminal Justice Reference Service



This microfiche was produced from documents received for inclusion in the NCJRS data base. Since NCJRS cannot exercise control over the physical condition of the documents submitted, the individual frame quality will vary. The resolution chart on this frame may be used to evaluate the document quality.



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

Microfilming procedures used to create this fiche comply with the standards set forth in 41CFR 101-11.504.

Points of view or opinions stated in this document are those of the author(s) and do not represent the official position or policies of the U. S. Department of Justice.

National Institute of Justice
United States Department of Justice
Washington, D. C. 20531

8/3/83

FORECASTS OF PRISON AND FIELD POPULATIONS
FOR THE OREGON CORRECTIONS DIVISION

Prepared by the
OREGON LAW ENFORCEMENT COUNCIL

August, 1982



NCJRS

FEB 16 1983

ACQUISITIONS

Victor Atiyeh
Governor

Hon. Dave Frohnmayer
Chairman
n Law Enforcement Council

Keith A. Stubblefield
Administrator
Oregon Law Enforcement Council

87914



U. S. DEPARTMENT OF JUSTICE
Office of Justice Assistance, Research, and Statistics

CATEGORICAL GRANT PROGRESS REPORT

This recordkeeping requirement falls under the authority of P.L. 96-511, Sec. 3507. The information provided will be used by grant monitors to track grant progress. No further monies or other benefits may be paid out under this program unless this report is completed and filed as required by existing laws and regulations (OMB Circulars A-102 and A-110; Omnibus Crime Control and Safe Streets Act of 1968, as amended; Juvenile Justice and Delinquency Prevention Act of 1974, as amended; and the Justice System Improvement Act of 1979, as amended).

1. GRANTEE Oregon Law Enforcement Council		2. AGENCY GRANT NUMBER 81-SS-AX-K014	3. REPORT NO. 5
4. IMPLEMENTING SUBGRANTEE (Above)		5. REPORTING PERIOD (Dates) FROM: 7-1-82 TO: 8-31-82	
6. SHORT TITLE OF PROJECT Prison and Field Population Forecasts		7. GRANT AMOUNT \$29,948	8. TYPE OF REPORT <input type="checkbox"/> REGULAR <input checked="" type="checkbox"/> FINAL REPORT <input type="checkbox"/> SPECIAL REQUEST
9. NAME AND TITLE OF PROJECT DIRECTOR Dr. Clinton Goff, Supervisor Crime Analysis Center		10. SIGNATURE OF PROJECT DIRECTOR <i>Clinton Goff</i>	11. DATE OF REPORT 11-29-82

12. COMMENCE REPORT HERE (Continue on plain paper)

Progress on the tasks for the Final Progress Report was as follows:

- The report was completed and draft reviewed by Corrections Division personnel, Bureau of Justice Statistics staff, and Rita Folan of the Criminal Justice Statistics Association. Helpful comments were provided and incorporated in the final report.
- The completed report was disseminated to a variety of interested agencies and individuals.
- Project staff have met and discussed the forecasts with the Executive Department's budget analyst assigned to work with the Corrections Division. Corrections Division's management have utilized the forecasts in preparing their budget requests.

We have utilized the forecasts produced in combination with the Colorado Commitment Propagation Matrix technique to provide average daily total population and bedspace population estimates for the Budget Division and Corrections Division.

- The forecasting work has generated quite a lot of interest across agencies and staff involved with corrections policy and budget issues and we definitely hope to continue work in this area.

13. CERTIFICATION OF RECEIPT BY GRANTEE CRIMINAL JUSTICE COUNCIL (Official signature) 93-0576145 <i>Clinton Goff</i>	14. DATE Dec 3, 1982
---	-------------------------

U.S. Department of Justice
National Institute of Justice

This document has been reproduced exactly as received from the person or organization originating it. Points of view or opinions stated in this document are those of the authors and do not necessarily represent the official position or policies of the National Institute of Justice.

Permission to reproduce this copyrighted material has been granted by
Public Domain/Bureau of Justice Statistics/US Dept of Justice
to the National Criminal Justice Reference Service (NCJRS).

Further reproduction outside of the NCJRS system requires permission of the copyright owner.

FORECASTS OF PRISON AND FIELD POPULATIONS
FOR THE
OREGON CORRECTIONS DIVISION

by

Clinton Goff, Ph.D.
Supervisor, Crime Analysis Center

and

Stanley T. Woodwell
Statistical/Programmer Analyst
Crime Analysis Center

ACKNOWLEDGEMENTS

This work was produced by the Crime Analysis Center of the Oregon Law Enforcement Council (OLEC) with primary assistance on the time series analysis from Dr. Richard McCleary and Dr. L. A. Wilson II, of Arizona State University.

We would like to extend our appreciation to the following individuals for their roles and assistance:

Ms. Enid Preuitt and Mrs. Jeanne Bittner, of the Oregon Law Enforcement Council, and Mrs. Pearl B. Heath, Volunteer, for assistance in organizing data and preparing some of the graphs. Mrs. Jeanne Bittner typed the report on our word processing system. Keith Stubblefield, Administrator, provided helpful comments as did former OLEC staff member, Richard A. Jones.

Special thanks are extended to Mr. Robert J. Watson, Administrator; Niel Chambers, Executive Assistant; and Lou Lewandowski, Data Processing Manager of the Corrections Division for their excellent cooperation and support in providing the Corrections data, comments, and assistance. Niel Chambers was our primary contact and coordinator at the Division. We would also like to thank Ms. Pat Garris, Mike Madison, and Carl Zenon, Regional Chiefs of the Corrections Division, for their review and comments on the draft report.

In addition, the following assisted in providing necessary data and/or reviewed and commented on the draft report:

Elizabeth Belshaw, State Court Administrator
Kelly Freels, Employment Division, Research and Statistics Unit
Leo Hegstrom, Director, Department of Human Resources
Tom Lynch, Employment Division, Research and Statistics Unit
Jon Roberts, Data Center, Intergovernmental Relations Division,
Executive Department
Ed Schafer, Director, Center for Population Research and Census,
Portland State University
Lloyd Smith, Manager, Law Enforcement Data Systems, Executive Dept.

Finally, we appreciate the cooperation and assistance of Mr. Ben Renshaw, Acting Director of the Bureau of Justice Statistics, and his staff for this work as well as co-sponsoring the National Workshop on Prison Population Forecasting. The National Workshop on Prison Population Forecasting was also co-sponsored by the Criminal Justice Statistics Association, Rita Folan, Project Director, and the Criminal Justice Center at Sam Houston State University.

Information or further details regarding this study or supporting data can be obtained by writing or calling:

Clinton Goff, Supervisor
Crime Analysis Center
Executive Department
155 Cottage Street N.E.
Salem, OR 97310
Phone: (503) 378-8056

Prepared under Grant #81-SS-AX-K014 from the U.S. Department of Justice and the Bureau of Justice Statistics. Points of view or opinions stated in this document are those of the author and do not necessarily represent official positions or policies.

TABLE OF CONTENTS

	<u>Page</u>
LIST OF TABLES AND CHARTS	ii
INTRODUCTION.	1
Forecasting.	2
CURRENT FORECASTING WORK.	3
Multiple Regression.	4
Forecasts of New Commitments	6
Forecasts of Felony Probation Receptions	9
Time Series Analysis (ARIMA Models).	11
DISCUSSION.	43
New Commitments to Institutions.	43
Felony Probation Receptions.	43
Felony and Misdemeanant Probation Receptions	43
Parole Subgroup(s) Forecasts	44
Future Forecasting Work.	45
Multiple Regression (Lag Procedures)	45
ARIMA Models	46
Forecasts of Institutions Releases	46
CONCLUSIONS	47
BIBLIOGRAPHY.	49
APPENDICES.	51

LIST OF TABLES & CHARTS

	<u>Page</u>
Table 1 - Forecast and Actual Total New Commitments by Year 1 Year and 2-Year Lag Procedures	7
Table 2 - Confidence Boundaries of New Commitment Forecasts for 1-Year and 2-Year Lag Procedures	8
Table 3 - Forecast and Actual Felony Probation Receptions by Year 1-Year and 2-Year Lag Procedures	10
Table 4 - Confidence Boundaries of Felony Probation Reception Forecasts for 1-Year and 2-Year Lag Procedures	11
Table 5 - Series of Forecasts for Population Subgroups	13
Forecast of Total Admissions to Institutions	
Series 1-A	14
Series 1-B With Trend.	16
Forecast of New Commitments to Institutions - Series 2	18
Forecast of Total Admissions to Field Supervision - Series 3	20
Forecast of Admissions to Probation - Series 4	22
Forecast of Institutions' Total Responsibility - Series 6.	24
Forecast of Institutions' Bedspace Total - Series 7.	26
Forecast of Field Cases In and Out of State - Series 9	28
Forecast of Probation Cases In and Out of State - Series 10.	30
Forecast of Total Parole Cases In and Out of State - Series 11	32
Forecast of Total Number In-State Responsibility - Series 12	34
Forecast of Total Number Probation Cases in State - Series 13	36
Forecast of Total Number of Parole Cases in State - Series 14	38
Forecast of Corrections Division Total Responsibility - Series 15	40

INTRODUCTION

The need for improved prison population forecasts has become critical as the need for correctional facilities and programs are increasing at the time that resources are decreasing. Prison populations have been rising rapidly during the past decade resulting in overcrowding in the prison systems of most states in the country. A prime example is the crisis that several states are facing today with "overcrowding" at their correctional facilities. Recent figures from the National Criminal Justice Association indicates "...37 states and territories are currently wrestling with federal court orders to eliminate institutional overcrowding and to improve living conditions in prisons."¹

Oregon was among this group of states and a U.S. District Court judge ordered, in mid-1980, that Oregon was to reduce its institutional population by 750 inmates by March 31, 1981.²

The increase in prisoners is still occurring nationwide. Figures released by the Bureau of Justice Statistics (BJS) for the end of the first quarter (March 31, 1982) showed total prisoner population under the jurisdictions of state and federal institutions at 384,316. Oregon's figures at the end of the quarter were 3,476 compared to 3,063 the previous year (see Appendix A).

Traditionally, corrections departments have had little control over the incoming population either sentenced to institutions or placed on probation. However, corrections' officials, together with the Executive and Legislative branches, have the responsibility and problem of planning and budgeting to provide a complex variety of services, including facility space. A recent document entitled Criminal Justice and Corrections (published by the National Governors' Association Center for Policy Research) discusses these issues and problems, plus a review of possible alternatives (Feeley, M. M. & Ohlin, L. E., February, 1982).

¹National Criminal Justice Association "NEWSRELEASE," (82-1), Washington, D.C., July, 1982.

²This decision was later appealed and "suspended" by the U.S. Ninth Circuit Court of Appeals.

Thus, a major issue facing the states (with great fiscal and legal implications) is how long this upward trend in prison populations will continue and what level of capacity and services will be required.

Forecasting

A brief discussion is included relating to the general area and methods of forecasting. Forecasts can be based on various techniques or methods. There are two broad categories of forecasts--(a) intuitive methods and (b) mathematical or statistical methods. Intuitive methods are those that rely on personal experience, general knowledge, or a combination. "Intuitive methods have the advantage of being able to incorporate all information that is relevant. One may anticipate the effects of some factors that, as yet, may not have occurred. For instance, the impact of a legislative statutory change cannot be mathematically analyzed before the effects have been realized" (Oregon Law Enforcement Council (OLEC), 1980, pg. 1).

Mathematical, or quantitative, methods have the advantage of being able to analyze a given set of data from the past with considerably more precision. Makridakis and Wheelwright (1978, pg. 7) indicate that:

"...quantitative forecasting can be applied when three conditions exist:

- "1. There is information about the past.
- "2. This information can be quantified in the form of data.
- "3. It can be assumed that the pattern of the past will continue into the future.

"This last condition is known as the assumption of constancy and it is an underlying premise of all quantitative and many technological forecasting methods, no matter how sophisticated they may be."

In support of the quantitative approaches Makridakis and Wheelwright (1978, pg. 8) state:

"Persons unfamiliar with quantitative forecasting methods often think that the past cannot describe the future accurately because everything is

constantly changing. After some familiarity with data and forecasting techniques, however, it becomes clear that although nothing remains the same, history does repeat itself in a sense. Application of the right method can often identify the relationship between the factor to be forecasted and time itself (or several other factors), thus making accurate forecasting possible."

Chambers et al. (1971) and Makridakis and Wheelwright (1978) provide an array of techniques that may be applied depending on your purposes, data restraints, and resources. The Illinois Department of Corrections recently published a review of methods used to project prison populations (Miller, 1981). Some of the recognized authorities in forecasting prison populations have been the work of A. Blumstein, et al. (1980) and S. Stollmack (1973).

Previous forecasting work has been completed for the Oregon Corrections Division. A small group was formed (Department of Human Resources Contingency Task Force on Corrections Division's Institution Populations) in November, 1979 to explore forecasting methods which might supplement the projections developed by the Corrections Division. The group agreed that two forecasting methodologies had the potential to improve the Division's projections: (1) multiple regression and (2) time series analysis.

The statistical staff of the Oregon Law Enforcement Council, working with the Corrections Division, developed some short-range (1-3 years) and long-range (5-20 years) population subgroup estimates utilizing multiple regression analysis. The results and forecasts from this effort were provided in a report published in June, 1980 (Oregon Law Enforcement Council, 1980).

CURRENT FORECASTING WORK

The current work and results in developing forecasts of various Corrections Division subgroups' population are presented in this section. The forecasts were developed through the use of two different forecasting techniques: (1) multiple regression and (2) time series analysis, specifically ARIMA¹

¹ARIMA is the acronym derived from AutoRegressive Integrated Moving Average models. This time series forecasting technique was originally developed in the 1930's but did not become widely known until Box and Jenkins publications.

models originally developed by Box and Jenkins (1976). The forecasts developed by these techniques will be discussed separately.

Multiple Regression

This statistical technique was utilized to develop short-range forecasts for two Corrections Division subgroups populations: (1) New Commitments to the institutions and (2) Felony Probation receptions. For the lay person, this technique provides for the analysis of the relationship between a dependent variable (what we want to forecast) and a set of independent or predictor variables. The forecast equations were developed utilizing the step-wise multiple regression routines within the SPSS¹ computer software program. The procedures followed and variables utilized this year were very similar to those used two years ago. The predictor variables utilized to develop the "best" forecast equations included the selection from the following variables:

Offense Data - Seven (7) Part I (Index) crime offenses of:

- | | |
|--------------------|---------------------|
| Murder | Burglary |
| Rape | Larceny |
| Robbery | Motor Vehicle Theft |
| Aggravated Assault | |

Arson was not included in the offense group as it did not become an Index crime until 1979.

Adult Arrests Data - The numbers of adult arrests for the following crimes were available for the development of the forecast equations:²

- | | | |
|---------------------|-----------------|--------------------|
| Murder | Other Assaults | Drugs |
| Rape | Arson | Gambling |
| Robbery | Forgery | Family Offenses |
| Aggravated Assault | Fraud | DUII |
| Burglary | Stolen Property | Liquor Laws |
| Larceny | Vandalism | Disorderly Conduct |
| Motor Vehicle Theft | Weapons | All Other Offenses |
| | Sex Offenses | |

¹SPSS--Statistical Package for the Social Sciences, (2nd ed.)

²This differs from the previous work which utilized the numbers for total (adults and juveniles) arrests by crime offense.

Circuit Court Filings

The numbers of cases filed annually in the Circuit Courts for the following three (3) categories of cases.

- Criminal
- Civil
- Dissolution (Divorce)

Employment Data

Data was obtained from the Employment Division for the numbers of (a) Total Employment and (b) Total Unemployment in the civilian labor force. The annual average figures were utilized.

Population Data

Population estimates (by year) for the following age and sex groupings were obtained from the Center for Population Research at Portland State University. The 1980 figures are from the official U.S. Census.

- | | |
|--------------------------|------------------|
| Males 15-19 years of age | Total Males |
| Males 20-24 | Total Females |
| Males 25-29 | Total Population |
| Males 30-34 | |

The age by sex groupings were more refined this time contrasted to the groupings of males 15-29, males 30 and over, and males 0-14 in the previous analyses.

The unit of measurement is on a county basis and the 36 counties have been aggregated into seven (7) geographical subgroupings. A listing of the counties forming each subgroup, together with their location, is provided in Appendix B. We think that more accurate forecasts can be developed on subgroupings of counties due to major demographic (urban-rural) factors and some criminal justice system variations (such as Community Corrections programs), as opposed to the state as a whole.

The forecast values developed for the various regions (groupings of counties) are summed to provide the forecast for the total state.

Additionally, the county groupings may be helpful to the Corrections Division Field (probation and parole) Management, particularly for the Felony Probation receptions, as the Division has three regional chiefs who assist in policy and program operations for specific geographical regions.

We have utilized a lagging procedure for the short-term forecasts of one- and two-years forward. As an example, to develop the forecasts for one year forward we lag the 1974 independent variables values with the 1975 dependent variables values and so on through the 1980 predictor values with the 1981 dependent variable values. Similar lagging procedures are followed to develop the forecasts two years forward (1973/1975 thru 1979/1981). Following this procedure, forecasts can be developed from the predictor values that are currently available and one does not have to forecast the future values of this set of variables, which would be a major task.

Forecasts of New Commitments

Utilizing the procedures discussed above, the number of actual and forecasted new commitments by year are shown in Table 1. New commitments are the subgroup of inmates sentenced to incarceration for the commission of a new crime.¹

The forecast values developed from the one-year and two-year lag procedures are shown in the top and bottom half of the table respectively. The predictor variables in the equations together with the regression coefficient values, multiple R, and standard error values for each of the seven subgroups of counties are presented in Appendix C and D.

¹New commitments comprise approximately 70-75 percent of total admissions to the institutions. The majority of the balance comes from "parole revocation and suspension" cases with a small number from recommits and other state and federal prisoners.

TABLE 1

FORECAST AND ACTUAL TOTAL NEW COMMITMENTS BY YEAR

		1-Year Lag Procedures								
		<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	
Forecast		1,255	1,376	1,552	1,657	1,782	1,687	1,608	1,624	
Actual		<u>1,260</u>	<u>1,385</u>	<u>1,536</u>	<u>1,666</u>	<u>1,785</u>	<u>1,682</u>	<u>1,604</u>		
Difference		-5	-9	16	-9	-3	5	4		
Difference as a Percent of Actual		(0.40%)	(0.65%)	(1.04%)	(0.54%)	(0.17%)	(0.30%)	(0.25%)		

		2-Year Lag Procedures								
		<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>
Forecast		1,251	1,380	1,532	1,648	1,794	1,683	1,615	1,775	1,741
Actual		<u>1,260</u>	<u>1,385</u>	<u>1,536</u>	<u>1,666</u>	<u>1,785</u>	<u>1,682</u>	<u>1,604</u>		
Difference		-9	-5	-4	-18	9	1	11		
Difference as a Percent of Actual		(0.71%)	(0.36%)	(0.26%)	(1.08%)	(0.50%)	(0.06%)	(0.69%)		

The difference between the forecast and actual number of new commitments as well as the difference expressed as a percent of actual are also presented in Table 1. The reader is cautioned that the past accuracy may not be maintained because the forecasting equations are derived from the data over those years and the variables are selected in such a manner as to minimize the difference between the forecast and actual values.

The confidence boundaries for the forecasted values are presented in Table 2. These upper and lower boundaries are based on the standard error of estimate for the subgroups. Values are given for both the 95 percent and 65 percent confidence intervals. These levels translate to "expectations" of the forecasted values to be within these bounds 19 out of 20 times for the 95 percent level and 2 out of 3 times for the 67 percent level.

TABLE 2
CONFIDENCE BOUNDARIES OF NEW COMMITMENT FORECASTS
FOR 1-YEAR AND 2-YEAR LAG PROCEDURES

		1-year Lag	
<u>Year</u>	<u>Forecast</u>	<u>95% Boundary</u> (Lower) (Upper)	<u>67% Boundary</u> (Lower) (Upper)
1980	1,687	1,617 to 1,757	1,652 to 1,722
1981	1,608	1,538 to 1,678	1,573 to 1,643
1982	1,624	1,554 to 1,694	1,589 to 1,659
		2-year Lag	
<u>Year</u>	<u>Forecast</u>	<u>95% Boundary</u> (Lower) (Upper)	<u>67% Boundary</u> (Lower) (Upper)
1980	1,683	1,593 to 1,773	1,639 to 1,727
1981	1,615	1,525 to 1,705	1,571 to 1,659
1982	1,775	1,685 to 1,865	1,731 to 1,819
1983	1,741	1,651 to 1,831	1,697 to 1,785

Forecasts of Felony Probation Receptions

Forecasts of Felony Probation Receptions (including compact cases in-state) from the courts were also developed using the same procedures.¹ Table 3 contains the actual and forecasted numbers received on a calendar year basis.

The forecasts developed utilizing the one-year lag procedures are shown in the top part with the two-year lag values in the lower part. The difference between the forecast and actual number of felony probation receptions, including the difference expressed as a percent of actual are also provided.

The predictor variables in the forecast equations, together with the regression coefficient values, multiple R, and standard error values for each of the seven subgroups, are presented in Appendix E and F.

The confidence boundaries for the forecasted values are presented in Table 4. The upper and lower boundaries are based on the standard error of estimate for the subgroups. Similarly, the values are given for both the 95 percent and 67 percent confidence intervals. The confidence interval is smaller (less wide) for the two-year lag procedures than for the one-year lag procedure.

¹These specific forecasts do not include misdemeanor cases assigned to probation. The reporting of misdemeanor cases in the past has not been as complete as for the felony cases. The Corrections Division reported 635 misdemeanor receptions in 1975, 1,113 in 1979, and 2,925 in 1981. Misdemeanant and felony probation receptions were forecast by ARIMA models in Series 4.

TABLE 3

FORECAST AND ACTUAL FELONY PROBATION RECEPTIONS BY YEAR

		1-Year Lag Procedures								
		<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	
Forecast		2,721	2,112	2,630	2,873	3,557	3,780	4,009	3,950	
Actual		<u>2,742</u>	<u>2,029</u>	<u>2,680</u>	<u>2,855</u>	<u>3,510</u>	<u>3,835</u>	<u>3,975</u>		
Difference		-21	83	-50	18	47	-55	34		
Difference as a Percent of Actual		(0.77%)	(4.09%)	(1.87%)	(0.63%)	(1.34%)	(1.43%)	(0.86%)		

		2-Year Lag Procedures								
		<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>
Forecast		2,751	2,019	2,710	2,855	3,473	3,750	3,977	4,263	3,832
Actual		<u>2,742</u>	<u>2,029</u>	<u>2,680</u>	<u>2,855</u>	<u>3,510</u>	<u>3,835</u>	<u>3,975</u>		
Difference		9	-10	30	0	-37	-85	2		
Difference as a Percent of Actual		(0.33%)	(0.49%)	(1.12%)	(0.00%)	(1.05%)	(2.22%)	(0.05%)		

TABLE 4

CONFIDENCE BOUNDARIES OF FELONY PROBATION RECEPTION FORECASTS
FOR 1-YEAR AND 2-YEAR LAG PROCEDURES

1-year Lag			
Year	Forecast	95% Boundary (Lower) (Upper)	67% Boundary (Lower) (Upper)
1980	3,780	3,512 to 4,048	3,647 to 3,913
1981	4,009	3,741 to 4,277	3,876 to 4,142
1982	3,950	3,682 to 4,218	3,817 to 4,083
2-year Lag			
Year	Forecast	95% Boundary (Lower) (Upper)	67% Boundary (Lower) (Upper)
1980	3,750	3,536 to 3,964	3,644 to 3,856
1981	3,977	3,762 to 4,191	3,871 to 4,083
1982	4,263	4,049 to 4,477	4,157 to 4,369
1983	3,832	3,618 to 4,046	3,726 to 3,938

Time Series Analysis (ARIMA Models)

In addition to the forecasts of new commitments to the adult institutions and felony probation receptions, the Corrections Division has the need for other subgroups' forecasts. The Division maintains monthly records for management/administrative purposes of population counts in various subgroup categories/locations.

The development of forecasts for the majority of these groups requires a different analytical approach. Administrative policy decisions and Parole Board actions are larger factors in influencing population counts in these various subgroup categories than in the previous two sets of forecasts. Additionally, the multiple regression analyses were developed utilizing individual county measures grouped in the seven regions. Hence, for the forecasts of these particular subgroups we have applied a different technique--Time Series Analysis.

Specifically, the forecasts were developed through the application of AutoRegressive Integrated Moving Average (ARIMA) statistical models developed by Box and Jenkins (1976) and Box and Tiao (1965, 1975). There are several books in addition to the above discussing the models' descriptions and applications. Some of the more recent are those by Makridakis and Wheelwright (1978), McCleary and Hay (1980), and Ostrom (1978). A very brief overview of ARIMA statistical models and the steps involved in the development of forecasts is included in Appendix G.

The forecasts that follow were developed by Dr. Richard McCleary and Dr. L. A. Wilson at Arizona State University working with the Council's statistical staff and the Corrections Division. Using the PACK computer software, ARIMA models were identified for each of the univariate time series. Using the estimation procedures, the various specified parameters were evaluated for adequacy and, once a model was diagnosed as both adequate and parsimonious, the univariate forecasts were prepared.

Table 5 lists the various subgroups' categories and/or locations for which forecasts were developed. All of the series were developed from monthly data covering the time periods indicated. Two of the series are based on 96 observations but the majority are based on 72 data values (from July, 1975 through June, 1981).

The individual subgroup forecasts for the next 36 months (beginning July, 1981) together with the 95 percent confidence interval (lower and upper limits) are presented below. Accompanying each table is a graph of the actual values (from July, 1975 through June, 1981) together with the forecast values for the next 36 months. The forecast values are indicated as the mid-points between the lower and upper 95 percent confidence interval values.

A brief discussion of each of the subgroups model(s); description of the model parameters (components); strength or weakness of the model, etc. is provided in Appendix H. The discussion is fairly technical and those individuals who use the forecasts as well as those interested in the specifics of the ARIMA models are encouraged to review this material.

TABLE 5
SERIES OF FORECASTS FOR POPULATION SUBGROUPS

Series	Developed from Time Period	Number of Months
1. Total admissions to institutions	7/73 - 6/81	96
2. New commitments (admissions) to the Oregon corrections institutions	7/75 - 6/81	72
3. Total admissions to field supervision	7/73 - 6/81	95
4. Total admissions to probation (includes felony, misdemeanants, and in-state compact cases)	7/75 - 6/81	72
6. Institutions totals plus work-release plus other out	7/75 - 6/81	72
7. Institutions totals (bedspace total)	7/75 - 6/81	72
9. Total number of field cases in- and out-of-state	7/75 - 6/81	72
10. Total number of probation cases including out-of-state	7/75 - 6/81	72
11. Total number of parole cases including out-of-state	7/75 - 6/81	72
12. Total in-state responsibility	7/75 - 6/81	72
13. Total number of probation cases in-state	7/75 - 6/81	72
14. Total number of parole cases in-state	7/75 - 6/81	72
15. Total Corrections Division responsibility	7/75 - 6/81	72

FORECAST OF TOTAL ADMISSIONS¹ TO INSTITUTIONS
 For 36 Months--July, 1981 through June, 1984
 (Includes Upper and Lower Values for the 95% Confidence Interval)

SERIES 1-A

	Forecast Value*	Lower Value	Upper Value		Forecast Value	Lower Value	Upper Value		Forecast Value	Lower Value	Upper Value
July 1981	182	136	228	July 1982	176	101	251	July 1983	176	86	266
Aug. 1981	181	133	229	Aug. 1982	176	99	252	Aug. 1983	176	85	267
Sept. 1981	178	126	230	Sept. 1982	176	98	254	Sept. 1983	176	84	268
Oct. 1981	179	124	233	Oct. 1982	176	97	255	Oct. 1983	176	83	269
Nov. 1981	176	116	235	Nov. 1982	176	96	256	Nov. 1983	176	82	270
Dec. 1981	173	110	235	Dec. 1982	176	94	257	Dec. 1983	176	81	271
Jan. 1982	180	114	246	Jan. 1983	176	93	259	Jan. 1984	176	80	272
Feb. 1982	174	105	243	Feb. 1983	176	92	260	Feb. 1984	176	79	273
Mar. 1982	176	107	245	Mar. 1983	176	91	261	Mar. 1984	176	78	274
Apr. 1982	175	104	246	Apr. 1983	176	90	262	Apr. 1984	176	77	275
May 1982	176	104	249	May 1983	176	88	263	May 1984	176	76	276
June 1982	176	102	250	June 1983 ²	176	87	264	June 1984	176	75	277

-14-

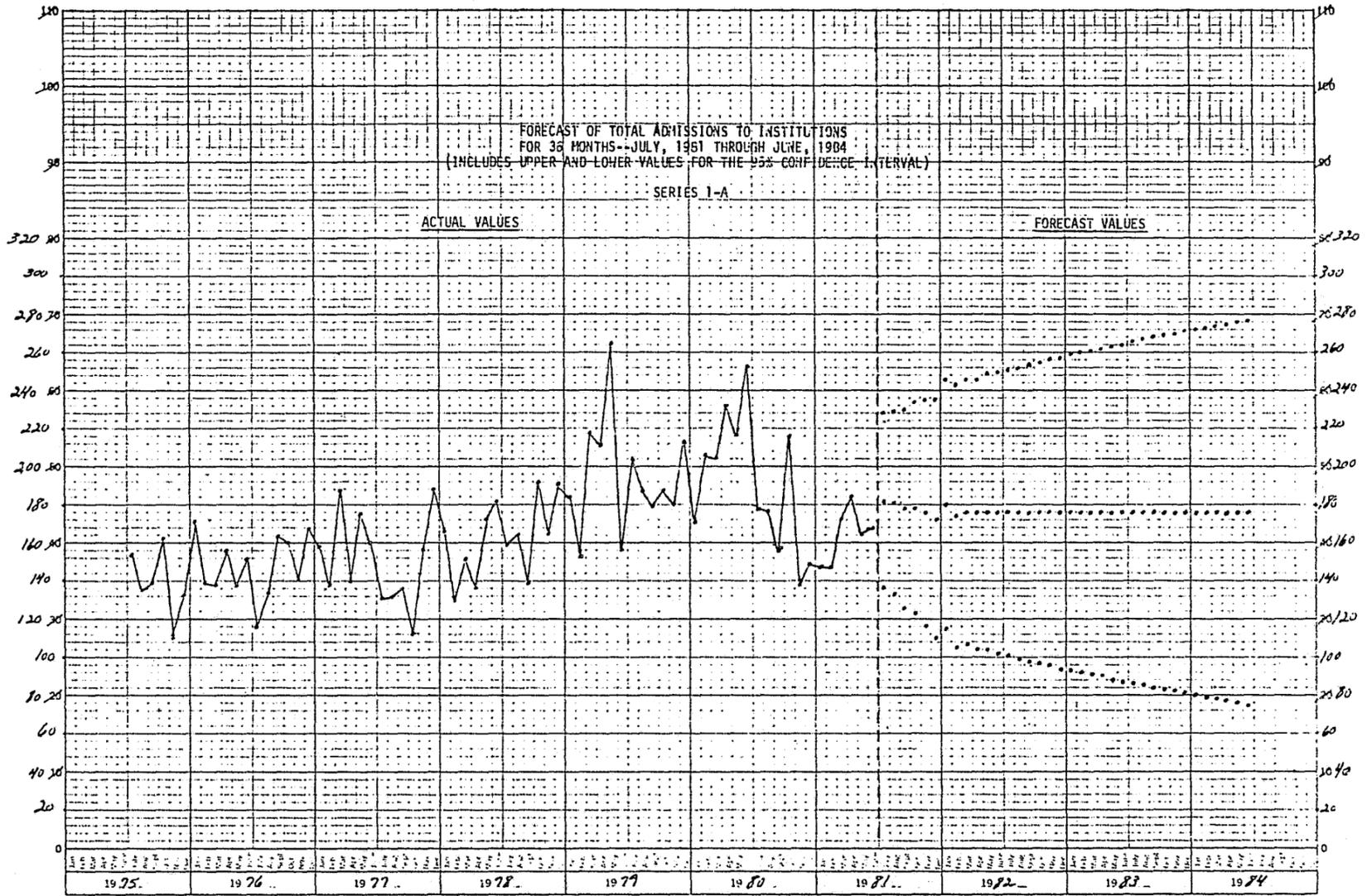
¹Total Admissions include new commitments, parole revocation and suspension, and other cases.

²End of FY 81-83 Biennium

	1981						1982					
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
*Actual Values	195	145	171	206	165	210	186	188	228	211	216	197

47 3732

MOE 10 YEARS BY MONTHS & 110 DIVISIONS - 91 -



FORECAST OF TOTAL ADMISSIONS¹ TO INSTITUTIONS
 For 36 Months--July, 1981 through June, 1984
 (Includes Upper and Lower Values for the 95% Confidence Interval)

SERIES 1-B WITH TREND

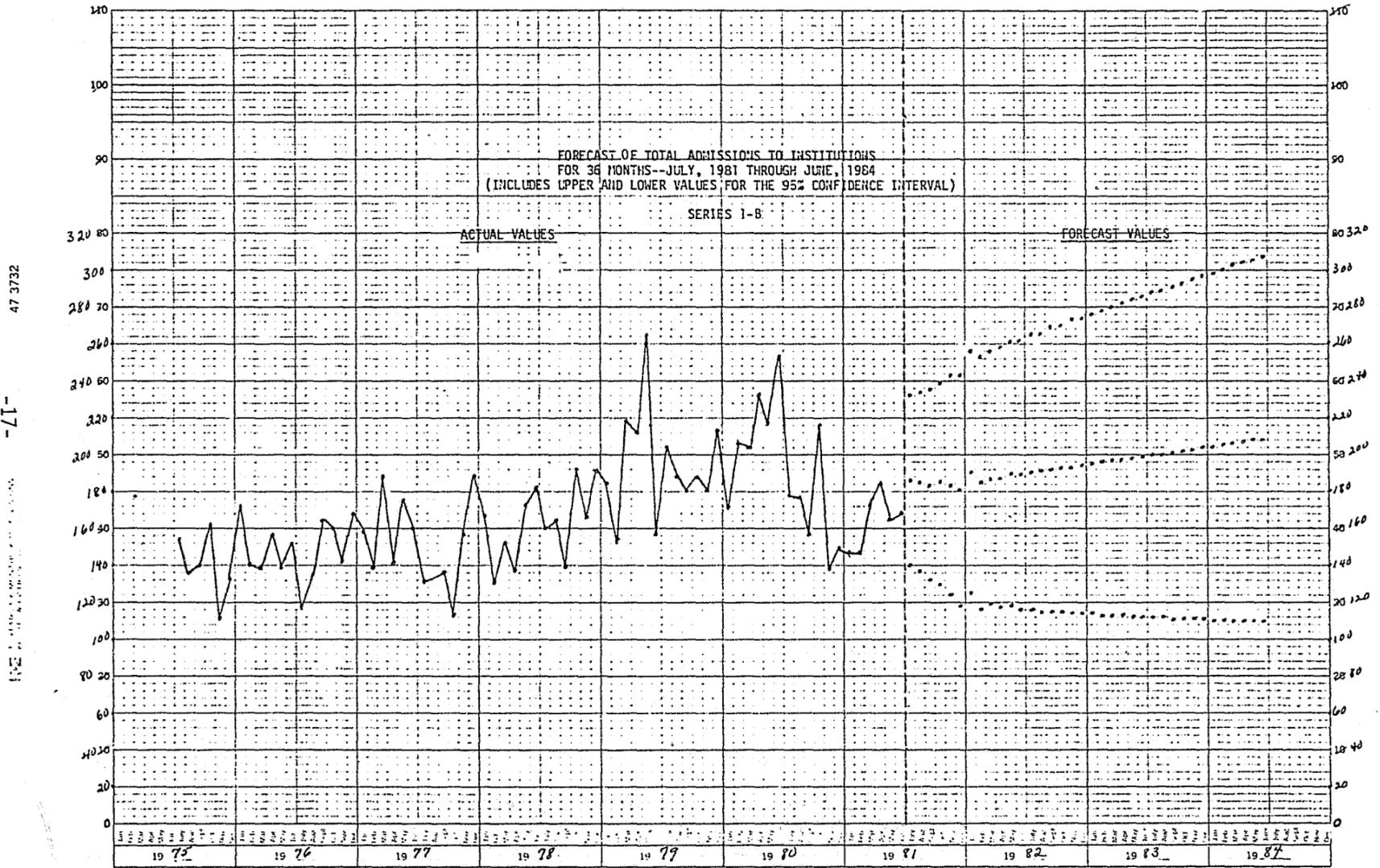
	Forecast Value*	Lower Value	Upper Value		Forecast Value	Lower Value	Upper Value		Forecast Value	Lower Value	Upper Value
July 1981	186	140	232	July 1982	190	116	265	July 1983	200	112	288
Aug. 1981	185	137	233	Aug. 1982	191	115	266	Aug. 1983	200	112	289
Sept. 1981	183	132	235	Sept. 1982	192	115	269	Sept. 1983	201	111	291
Oct. 1981	185	130	239	Oct. 1982	192	115	270	Oct. 1983	202	111	293
Nov. 1981	183	124	243	Nov. 1982	193	114	272	Nov. 1983	203	111	295
Dec. 1981	181	118	243	Dec. 1982	194	114	274	Dec. 1983	204	111	297
Jan. 1982	190	125	256	Jan. 1983	195	114	276	Jan. 1984	204	110	298
Feb. 1982	185	116	253	Feb. 1983	196	113	278	Feb. 1984	205	110	300
Mar. 1982	187	119	256	Mar. 1983	196	113	280	Mar. 1984	206	110	302
Apr. 1982	187	117	258	Apr. 1983	197	113	282	Apr. 1984	207	110	304
May 1982	189	118	261	May 1983	198	112	284	May 1984	208	110	305
June 1982	189	116	262	June 1983 ²	199	112	286	June 1984	208	110	307

-16-

¹Total Admissions include new commitments, parole revocation and suspension, and other cases.

²End of FY 81-83 Biennium.

	1981						1982					
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
*Actual Values	195	145	171	206	165	210	186	188	228	211	216	197



47 3732

-11-

FIG. 1. ADMISIONS TO INSTITUTIONS

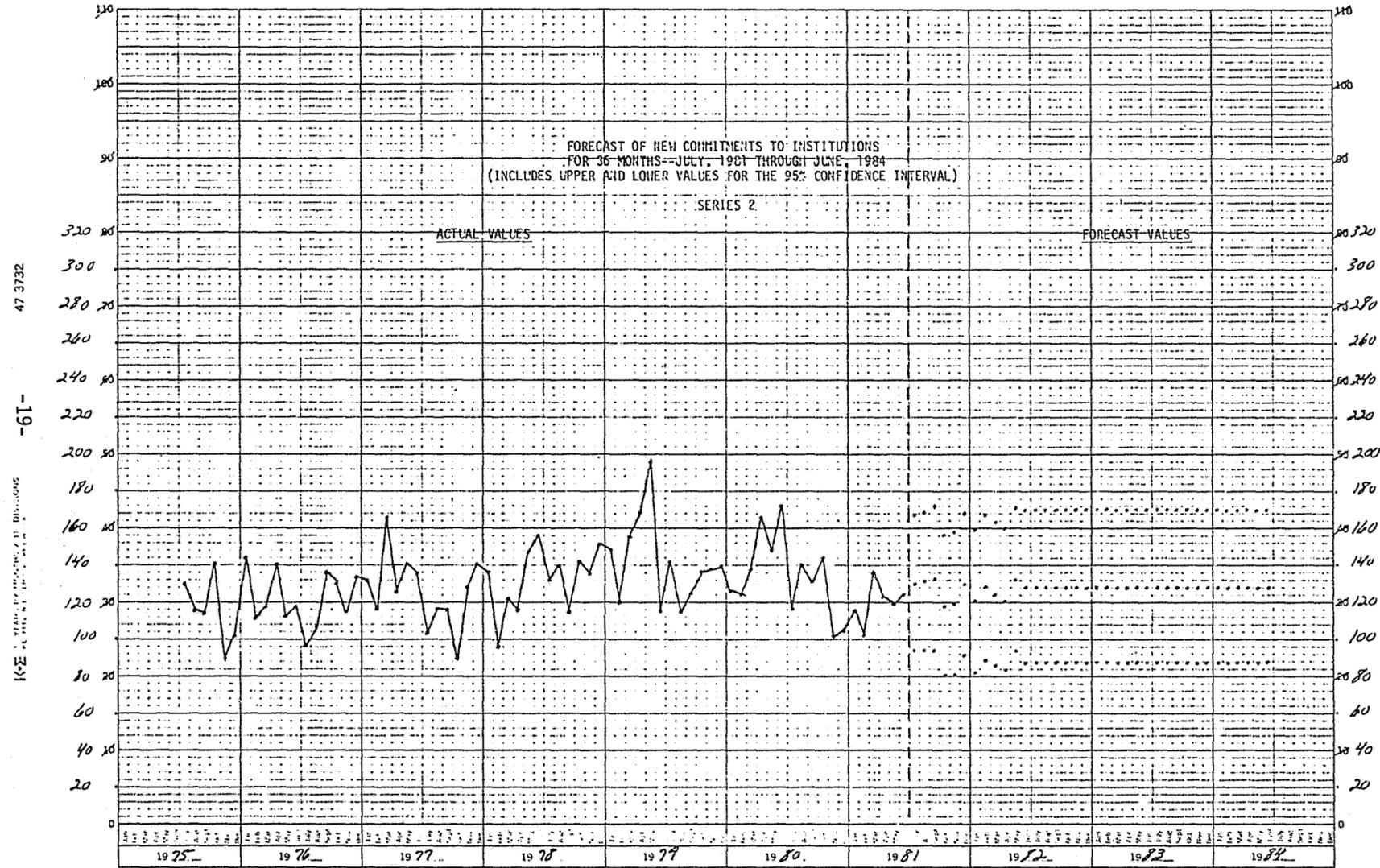
FORECAST OF NEW COMMITMENTS TO INSTITUTIONS
 For 36 Months--July, 1981 through June, 1984
 (Includes Upper and Lower Values for the 95% Confidence Interval)

SERIES 2

	Forecast Value*	Lower Value	Upper Value		Forecast Value	Lower Value	Upper Value		Forecast Value	Lower Value	Upper Value
July 1981	130	93	167	July 1982	128	87	170	July 1983	128	87	170
Aug. 1981	131	94	169	Aug. 1982	128	87	170	Aug. 1983	128	87	170
Sept. 1981	133	94	172	Sept. 1982	128	87	170	Sept. 1983	128	87	170
Oct. 1981	118	80	157	Oct. 1982	128	87	170	Oct. 1983	128	87	170
Nov. 1981	119	81	158	Nov. 1982	128	87	170	Nov. 1983	128	87	170
Dec. 1981	129	91	168	Dec. 1982	128	87	170	Dec. 1983	128	87	170
Jan. 1982	121	82	159	Jan. 1983	128	87	170	Jan. 1984	128	87	170
Feb. 1982	128	89	167	Feb. 1983	128	87	170	Feb. 1984	128	87	170
Mar. 1982	124	86	163	Mar. 1983	128	87	170	Mar. 1984	128	87	170
Apr. 1982	121	83	160	Apr. 1983	128	87	170	Apr. 1984	128	87	170
May 1982	132	94	171	May 1983	128	87	170	May 1984	128	87	170
June 1982	128	87	170	June 1983 ¹	128	87	170	June 1984	128	87	170

¹End of FY 81-83 Biennium.

	1981						1982					
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
<u>*Actual Values</u>	156	114	127	155	119	171	145	138	165	175	173	157



FORECAST OF TOTAL ADMISSIONS¹ TO FIELD SUPERVISION
 For 36 Months--July, 1981 through June, 1984
 (Includes Upper and Lower Values for the 95% Confidence Interval)

SERIES 3

	Forecast Value	Lower Value	Upper Value		Forecast Value	Lower Value	Upper Value		Forecast Value	Lower Value	Upper Value
July 1981	678	522	882	July 1982	639	465	879	July 1983	704	457	1084
Aug. 1981	681	516	899	Aug. 1982	645	464	896	Aug. 1983	710	457	1101
Sept. 1981	726	543	972	Sept. 1982	650	463	913	Sept. 1983	715	457	1119
Oct. 1981	803	592	1090	Oct. 1982	655	462	929	Oct. 1983	721	457	1137
Nov. 1981	771	568	1046	Nov. 1982	660	461	946	Nov. 1983	727	457	1154
Dec. 1981	703	518	954	Dec. 1982	666	460	963	Dec. 1983	733	458	1173
Jan. 1982	700	516	951	Jan. 1983	671	459	980	Jan. 1984	739	458	1191
Feb. 1982	685	504	930	Feb. 1983	676	459	997	Feb. 1984	745	458	1210
Mar. 1982	695	512	944	Mar. 1983	682	458	1014	Mar. 1984	750	459	1228
Apr. 1982	687	505	933	Apr. 1983	687	458	1031	Apr. 1984	757	459	1247
May 1982	655	482	890	May 1983	693	458	1049	May 1984	763	459	1266
June 1982	634	467	862	June 1983 ²	698	457	1066	June 1984	769	460	1285

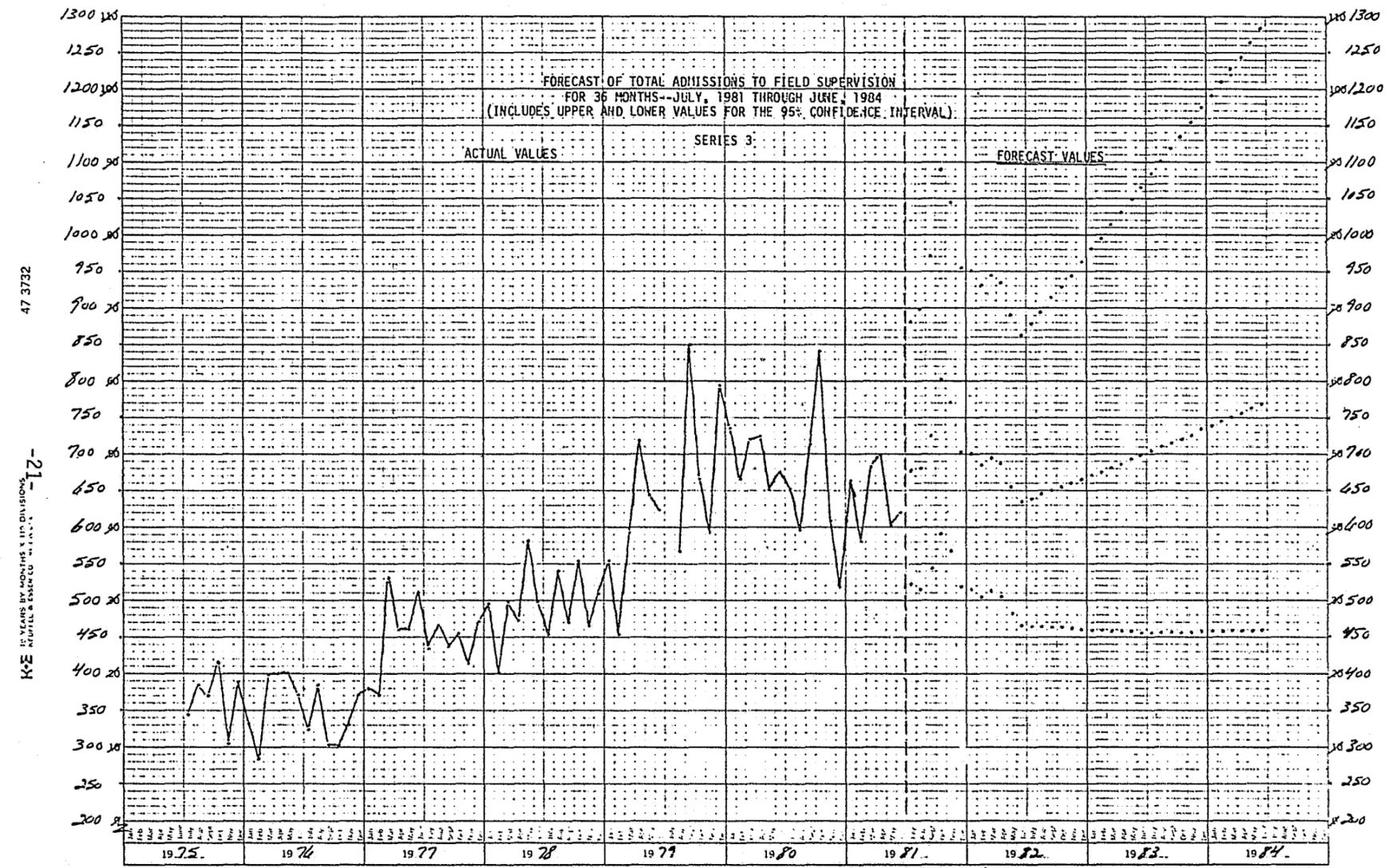
-20-

¹Total Admissions include probation + parole + other.

²End of FY 81-83 Biennium

	1981						1982					
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
*Actual Values	764	726	767	857	812	932	897	825	1076	1012		

(See discussion on Felony and Misdemeanant Probation (p. 43) and Parole Forecasts (p.44-45.)



FORECAST OF ADMISSIONS TO PROBATION¹
 For 36 Months--July, 1981 through June, 1984
 (Includes Upper and Lower Values for the 95% Confidence Interval)

SERIES 4

	Forecast Value	Lower Value	Upper Value		Forecast Value	Lower Value	Upper Value		Forecast Value	Lower Value	Upper Value
July 1981	510	370	702	July 1982	600	341	1058	July 1983	673	337	1344
Aug. 1981	533	381	747	Aug. 1982	606	340	1080	Aug. 1983	679	337	1369
Sept. 1981	577	399	835	Sept. 1982	612	339	1103	Sept. 1983	686	337	1395
Oct. 1981	555	367	839	Oct. 1982	618	339	1126	Oct. 1983	692	337	1421
Nov. 1981	553	356	858	Nov. 1982	624	339	1149	Nov. 1983	699	337	1448
Dec. 1981	569	356	909	Dec. 1982	630	338	1172	Dec. 1983	706	338	1475
Jan. 1982	564	343	926	Jan. 1982	636	338	1196	Jan. 1984	712	338	1502
Feb. 1982	573	347	946	Feb. 1983	642	338	1220	Feb. 1984	719	338	1530
Mar. 1982	579	345	972	Mar. 1983	648	337	1244	Mar. 1984	726	338	1558
Apr. 1982	583	342	992	Apr. 1983	654	337	1268	Apr. 1984	733	339	1586
May 1982	589	343	1014	May 1983	660	337	1293	May 1984	740	339	1615
June 1982	595	341	1036	June 1983 ²	667	337	1318	June 1984	747	340	1644

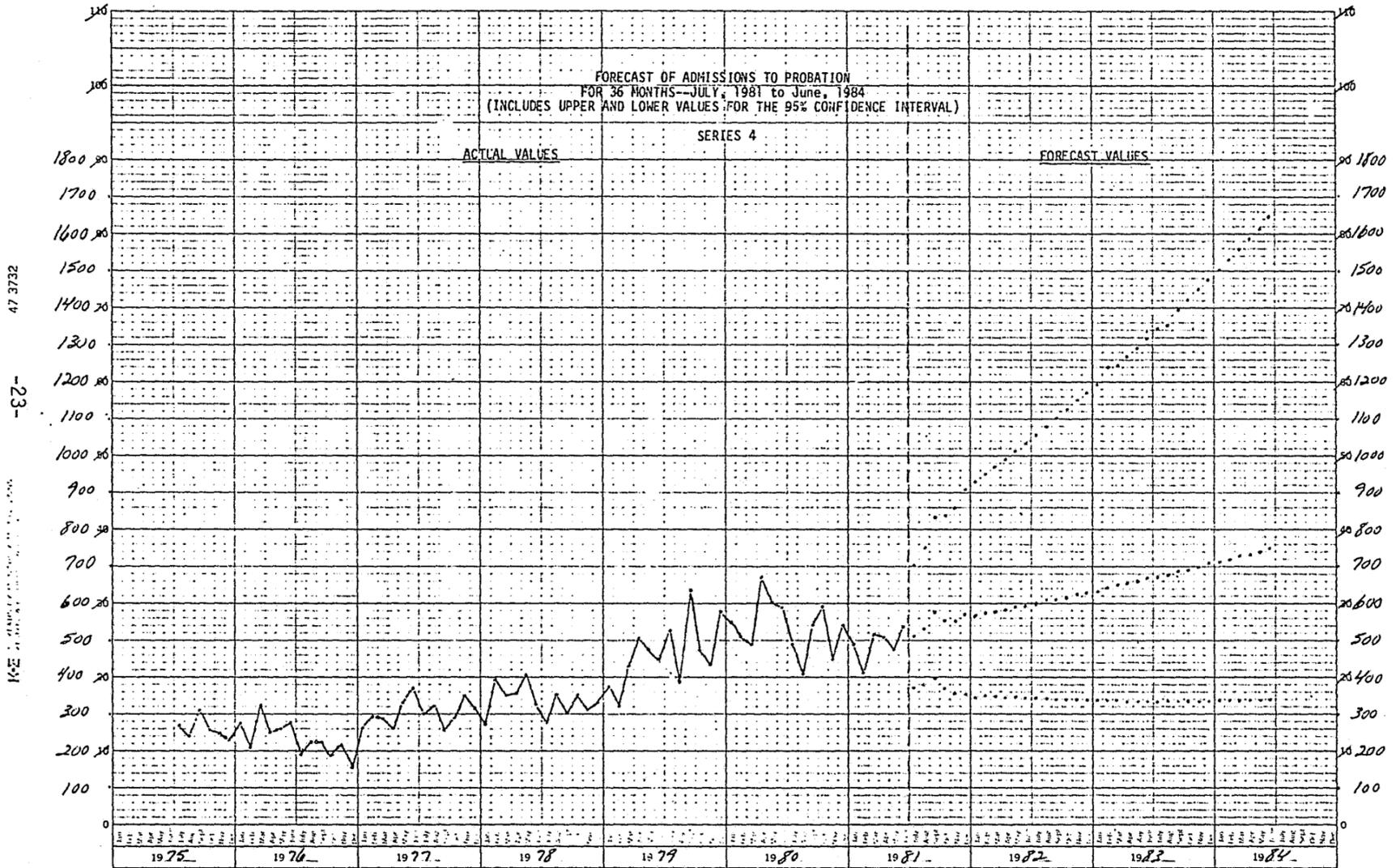
-22-

¹Includes Felony + Misdemeanant + Compact Cases

²End of FY 81-83 Biennium

	1981						1982					
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
*Actual Values	632	601	674	744	704	789	783	699	926	904		

(See discussion on Felony and Misdemeanant Probation (p. 43-44.)



3732

-23-

301

FORECAST OF INSTITUTIONS' TOTAL RESPONSIBILITY¹
 For 36 Months--July, 1981 through June, 1984
 (Includes Upper and Lower Values for the 95% Confidence Interval)

SERIES 6

	Forecast Value*	Lower Value	Upper Value		Forecast Value	Lower Value	Upper Value		Forecast Value	Lower Value	Upper Value
July 1981	3392	3329	3456	July 1982	3606	3217	4043	July 1983	3832	3244	4526
Aug. 1981	3416	3315	3520	Aug. 1982	3624	3216	4084	Aug. 1983	3851	3249	4566
Sept. 1981	3425	3280	3576	Sept. 1982	3643	3216	4126	Sept. 1983	3871	3254	4605
Oct. 1981	3437	3259	3625	Oct. 1982	3661	3217	4167	Oct. 1983	3891	3259	4645
Nov. 1981	3448	3242	3667	Nov. 1982	3680	3219	4207	Nov. 1983	3910	3265	4684
Dec. 1981	3476	3244	3724	Dec. 1982	3699	3220	4248	Dec. 1983	3930	3270	4724
Jan. 1982	3498	3243	3773	Jan. 1983	3717	3223	4288	Jan. 1984	3950	3276	4763
Feb. 1982	3516	3235	3822	Feb. 1983	3736	3226	4328	Feb. 1984	3970	3282	4803
Mar. 1982	3534	3228	3868	Mar. 1983	3755	3229	4368	Mar. 1984	3990	3288	4843
Apr. 1982	3552	3224	3913	Apr. 1983	3774	3232	4407	Apr. 1984	4011	3294	4883
May 1982	3570	3220	3957	May 1983	3793	3236	4447	May 1984	4031	3301	4922
June 1982	3588	3218	4000	June 1983 ²	3813	3240	4487	June 1984	4051	3308	4962

¹Total based on cases in categories of those in the institutions, on job search leave, former work release program, and other outs (including absconds/escapes).

²End of FY 81-83 Biennium.

	1981						1982					
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
*Actual Values	3362	3384	3400	3448	3511	3499	3548	3611	3672	3732	3767	3830

FORECAST OF INSTITUTIONS' BEDSPACE TOTAL
 For 36 Months--July, 1981 through June, 1984
 (Includes Upper and Lower Values for the 95% Confidence Interval)

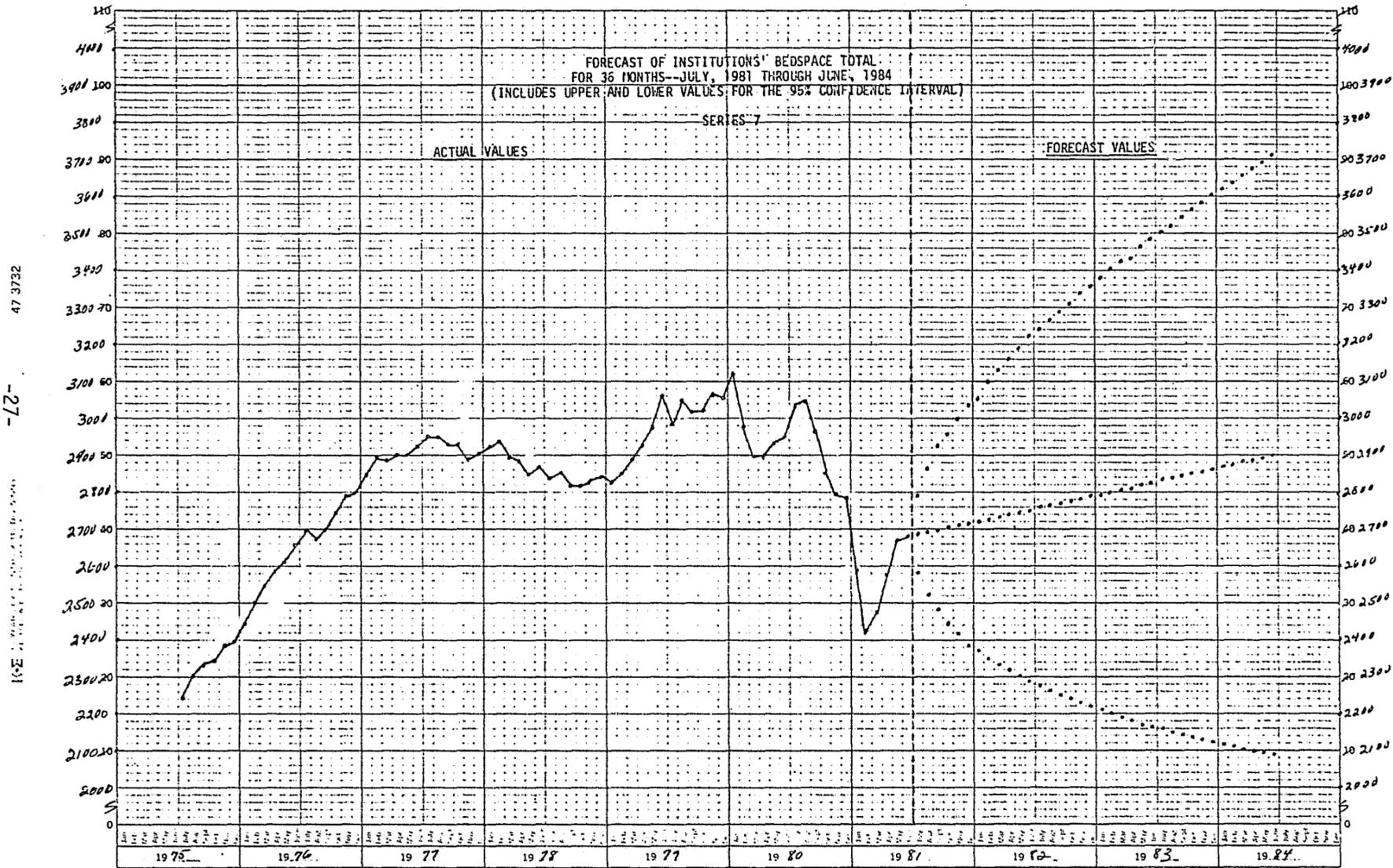
SERIES 7

	Forecast Value*	Lower Value	Upper Value		Forecast Value	Lower Value	Upper Value		Forecast Value	Lower Value	Upper Value
July 1981	2684	2582	2787	July 1982	2758	2276	3240	July 1983	2832	2158	3506
Aug. 1981	2690	2520	2861	Aug. 1982	2764	2264	3265	Aug. 1983	2838	2151	3525
Sept. 1981	2697	2479	2915	Sept. 1982	2770	2252	3289	Sept. 1983	2844	2143	3545
Oct. 1981	2703	2446	2960	Oct. 1982	2777	2240	3313	Oct. 1983	2850	2137	3564
Nov. 1981	2709	2418	3000	Nov. 1982	2783	2229	3336	Nov. 1983	2856	2130	3583
Dec. 1981	2715	2394	3036	Dec. 1982	2789	2219	3359	Dec. 1983	2863	2123	3602
Jan. 1982	2721	2373	3070	Jan. 1983	2795	2209	3381	Jan. 1984	2869	2117	3620
Feb. 1982	2727	1235	3101	Feb. 1983	2801	2200	3403	Feb. 1984	2875	2111	3639
Mar. 1982	2734	2336	3132	Mar. 1983	2807	2191	3424	Mar. 1984	2881	2105	3657
Apr. 1982	2740	2319	3160	Apr. 1983	2813	2182	3445	Apr. 1984	2887	2100	3675
May 1982	2746	2304	3188	May 1983	2820	2174	3465	May 1984	2893	2094	3693
June 1982	2752	2290	3214	June 1983 ¹	2826	2166	3486	June 1984	2899	2089	3710

-26-

¹End of FY 81-83 Biennium

	1981						1982					
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
<u>*Actual Values</u>	2718	2766	2826	2807	2853	2858	2927	2989	3031	3069	3142	3182



47 3732

-27-

152

FORECAST OF FIELD CASES IN AND OUT OF STATE
 For 36 Months--July, 1981 through June, 1984
 (Includes Upper and Lower Values for the 95% Confidence Interval)

SERIES 9

	Forecast Value*	Lower Value	Upper Value		Forecast Value	Lower Value	Upper Value		Forecast Value	Lower Value	Upper Value
July 1981	15,709	15,480	15,941	July 1982	17,632	15,993	19,440	July 1983	20,093	17,409	23,190
Aug. 1981	15,761	15,437	16,091	Aug. 1982	17,825	16,094	19,743	Aug. 1983	20,313	17,544	23,518
Sept. 1981	15,830	15,432	16,237	Sept. 1982	18,020	16,198	20,047	Sept. 1983	20,535	17,681	23,849
Oct. 1981	15,987	15,430	16,563	Oct. 1982	18,218	16,306	20,353	Oct. 1983	20,760	17,820	24,184
Nov. 1981	16,162	15,426	16,933	Nov. 1982	18,417	16,418	20,659	Nov. 1983	20,987	17,962	24,521
Dec. 1981	16,339	15,455	17,273	Dec. 1982	18,619	16,533	20,968	Dec. 1983	21,217	18,105	24,862
Jan. 1982	16,518	15,504	17,598	Jan. 1983	18,822	16,650	21,278	Jan. 1984	21,449	18,251	25,207
Feb. 1982	16,698	15,566	17,913	Feb. 1983	19,028	16,770	21,590	Feb. 1984	21,683	18,399	25,555
Mar. 1982	16,881	15,638	18,223	Mar. 1983	19,237	16,893	21,905	Mar. 1984	21,921	18,549	25,906
Apr. 1982	17,066	15,718	18,529	Apr. 1983	19,447	17,018	22,222	Apr. 1984	22,161	18,701	26,261
May 1982	17,253	15,804	18,833	May 1983	19,660	17,146	22,542	May 1984	22,403	18,855	26,620
June 1982	17,441	15,896	19,137	June 1983 ¹	19,875	17,277	22,864	June 1984	22,648	19,011	26,983

-28-

¹End of FY 81-83 Biennium

	1981						1982					
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
*Actual Values	15,705	15,921	16,058	15,895	15,626	15,993	16,088	16,616	16,837	17,193	17,485	17,716

(See discussion on p. 43-45.)

FORECAST OF PROBATION CASES IN AND OUT OF STATE
 For 36 Months--July, 1981 through June, 1984
 (Includes Upper and Lower Values for the 95% Confidence Interval)

SERIES 10

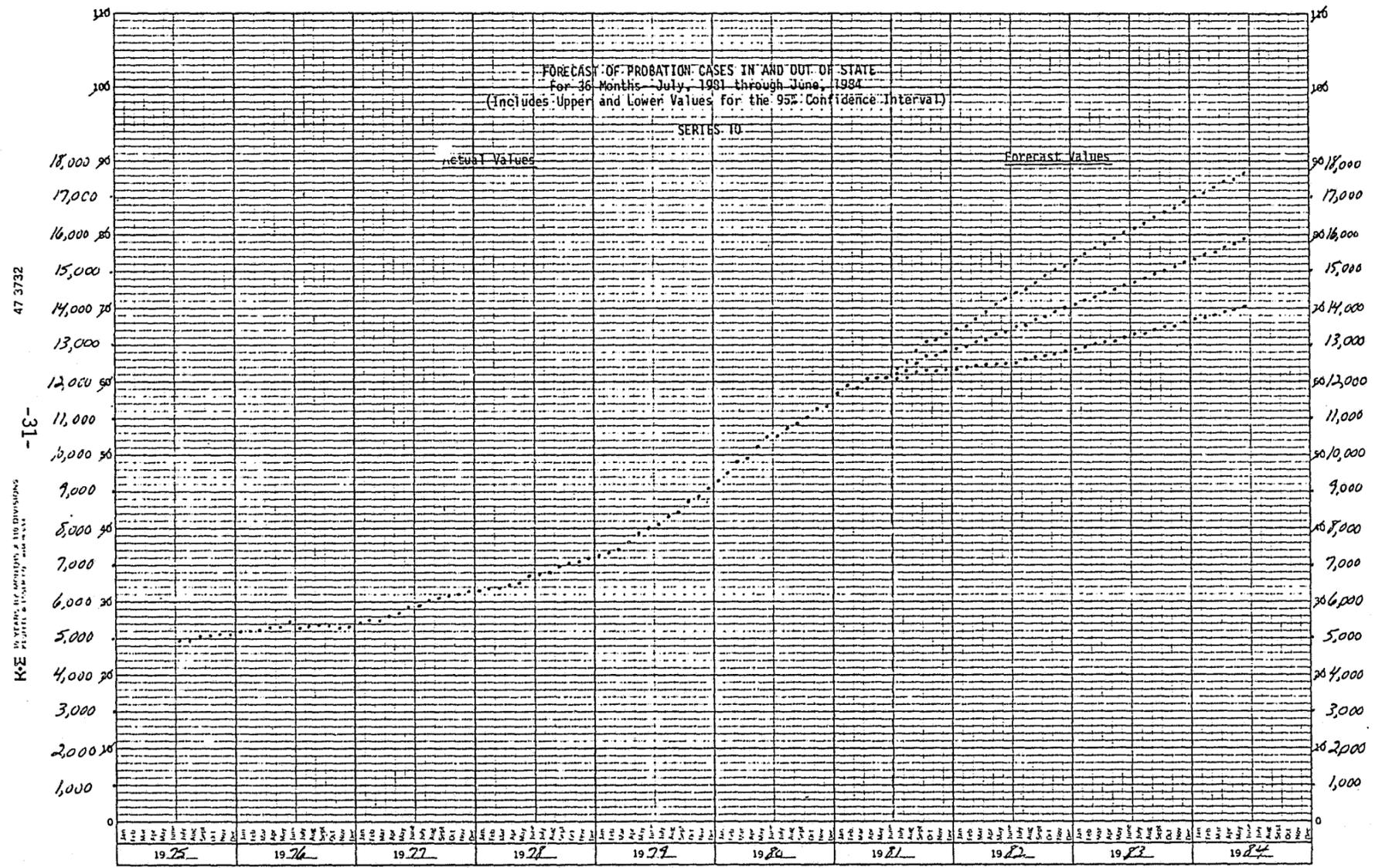
	Forecast Value*	Lower Value	Upper Value		Forecast Value	Lower Value	Upper Value		Forecast Value	Lower Value	Upper Value
July 1981	12,218	12,056	12,379	July 1982	13,485	12,560	14,410	July 1983	14,729	13,266	16,192
Aug. 1981	12,356	12,128	12,584	Aug. 1982	13,588	12,607	14,569	Aug. 1983	14,833	13,334	16,331
Sept. 1981	12,536	12,239	12,833	Sept. 1982	13,692	12,658	14,726	Sept. 1983	14,936	13,402	16,470
Oct. 1981	12,709	12,342	13,076	Oct. 1982	13,796	12,711	14,880	Oct. 1983	15,040	13,472	16,608
Nov. 1981	12,726	12,301	13,152	Nov. 1982	13,899	12,767	15,032	Nov. 1983	15,144	13,542	16,746
Dec. 1981	12,830	12,353	13,307	Dec. 1982	14,003	12,824	15,182	Dec. 1983	15,247	13,612	16,883
Jan. 1982	12,889	12,366	13,413	Jan. 1983	14,107	12,883	15,330	Jan. 1984	15,351	13,684	17,019
Feb. 1982	12,966	12,400	13,533	Feb. 1983	14,211	12,944	15,477	Feb. 1984	15,455	13,755	17,154
Mar. 1982	13,070	12,416	13,724	Mar. 1983	14,314	13,006	15,622	Mar. 1984	15,558	13,828	17,289
Apr. 1982	13,174	12,442	13,905	Apr. 1983	14,418	13,070	15,766	Apr. 1984	15,662	13,901	17,423
May 1982	13,277	12,476	14,078	May 1983	14,522	13,134	15,909	May 1984	15,766	13,975	17,557
June 1982	13,381	12,516	14,246	June 1983 ¹	14,625	13,200	16,051	June 1984	15,870	14,049	17,690

-30-

¹End of FY 81-83 Biennium

	1981						1982					
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
*Actual Values	12,222	12,397	12,575	12,785	12,899	13,454	13,729	14,330	14,594	14,912	15,188	15,412

(See discussion on p. 43-44.)



FORECAST OF TOTAL PAROLE CASES IN AND OUT OF STATE
 For 36 Months--July, 1981 through June, 1984
 (Includes Upper and Lower Values for the 95% Confidence Interval)

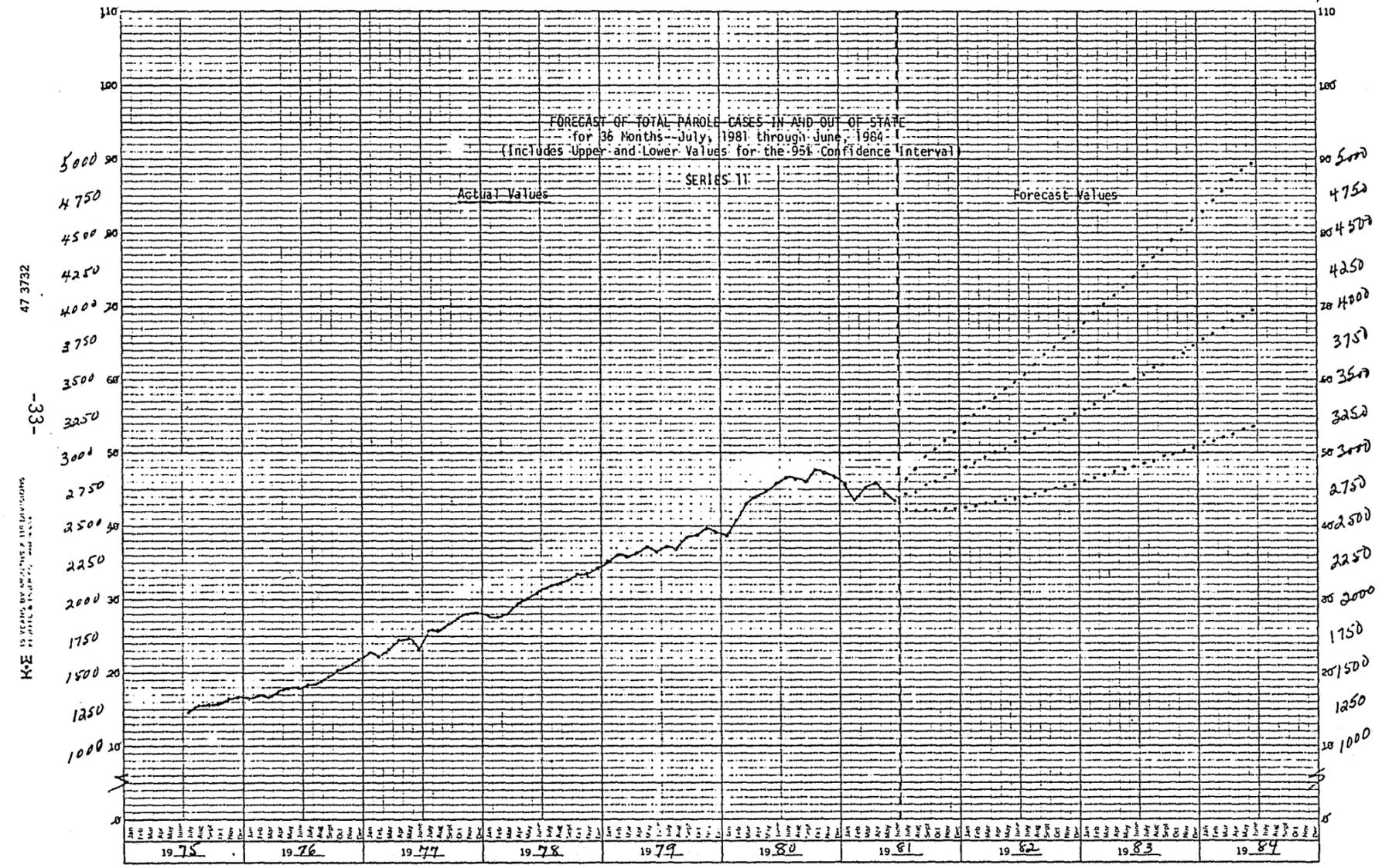
SERIES 11

	Forecast Value*	Lower Value	Upper Value		Forecast Value	Lower Value	Upper Value		Forecast Value	Lower Value	Upper Value
July 1981	2715	2614	2819	July 1982	3096	2703	3545	July 1983	3530	2926	4260
Aug. 1981	2744	2602	2894	Aug. 1982	3130	2719	3602	Aug. 1983	3569	2947	4323
Sept. 1981	2775	2600	2961	Sept. 1982	3164	2736	3660	Sept. 1983	3609	2968	4387
Oct. 1981	2805	2602	3024	Oct. 1982	3199	2753	3718	Oct. 1983	3648	2990	4451
Nov. 1981	2836	2608	3085	Nov. 1982	3234	2770	3776	Nov. 1983	3688	3013	4516
Dec. 1981	2867	2615	3144	Dec. 1982	3270	2788	3835	Dec. 1983	3729	3035	4581
Jan. 1982	2899	2625	3202	Jan. 1983	3306	2806	3894	Jan. 1984	3770	3058	4648
Feb. 1982	2931	2635	3259	Feb. 1983	3342	2825	3954	Feb. 1984	3812	3082	4714
Mar. 1982	2963	2647	3317	Mar. 1983	3379	2845	4014	Mar. 1984	3854	3105	4782
Apr. 1982	2996	2660	3374	Apr. 1983	3416	2864	4075	Apr. 1984	3896	3129	4850
May 1982	3029	2674	3431	May 1983	3454	2884	4136	May 1984	3939	3154	4920
June 1982	3062	2688	3488	June 1983 ¹	3492	2905	4198	June 1984	3982	3178	4989

¹End of FY 81-83 Biennium

	1981						1982					
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
*Actual Values	2722	2768	2749	2377	2000	1771	1649	1569	1520	1557	1589	1605

(See discussion on Parole forecasts on p. 44-45 for explanation of large discrepancy between forecast and actual values from October, 1981 forward.)



47 3732

-33-

KE 15 YEARS BY MONTHS & DIVISIONS
IN JUNE & JULY, 1984

FORECAST OF TOTAL NUMBER IN-STATE RESPONSIBILITY
 For 36 Months--July, 1981 through June, 1984
 (Includes Upper and Lower Values for the 95% Confidence Interval)

SERIES 12

	Forecast Value*	Lower Value	Upper Value		Forecast Value	Lower Value	Upper Value		Forecast Value	Lower Value	Upper Value
July 1981	14,218	14,017	14,423	July 1982	15,898	14,583	17,330	July 1983	18,104	15,929	20,577
Aug. 1981	14,242	13,957	14,532	Aug. 1982	16,071	14,680	17,593	Aug. 1983	18,302	16,057	20,861
Sept. 1981	14,361	13,991	14,741	Sept. 1982	16,246	14,780	17,856	Sept. 1983	18,501	16,186	21,147
Oct. 1981	14,499	13,988	15,029	Oct. 1982	16,423	14,884	18,121	Oct. 1983	18,703	16,317	21,437
Nov. 1981	14,632	14,008	15,283	Nov. 1982	16,602	14,990	18,386	Nov. 1983	18,906	16,450	21,729
Dec. 1981	14,791	14,069	15,550	Dec. 1982	16,782	15,099	18,653	Dec. 1983	19,112	16,585	22,024
Jan. 1982	14,917	14,107	15,773	Jan. 1983	16,965	15,211	18,922	Jan. 1984	19,320	16,722	22,322
Feb. 1982	15,059	14,168	16,006	Feb. 1983	17,150	15,325	19,192	Feb. 1984	19,531	16,861	22,623
Mar. 1982	15,223	14,239	16,275	Mar. 1983	17,337	15,441	19,465	Mar. 1984	19,743	17,002	22,927
Apr. 1982	15,389	14,318	16,541	Apr. 1983	17,526	15,560	19,739	Apr. 1984	19,959	17,145	23,234
May, 1982	15,557	14,402	16,805	May 1983	17,716	15,681	20,016	May 1984	20,176	17,290	23,544
June, 1982	15,726	14,490	17,068	June 1983 ¹	17,909	15,804	20,295	June 1984	20,396	17,436	23,857

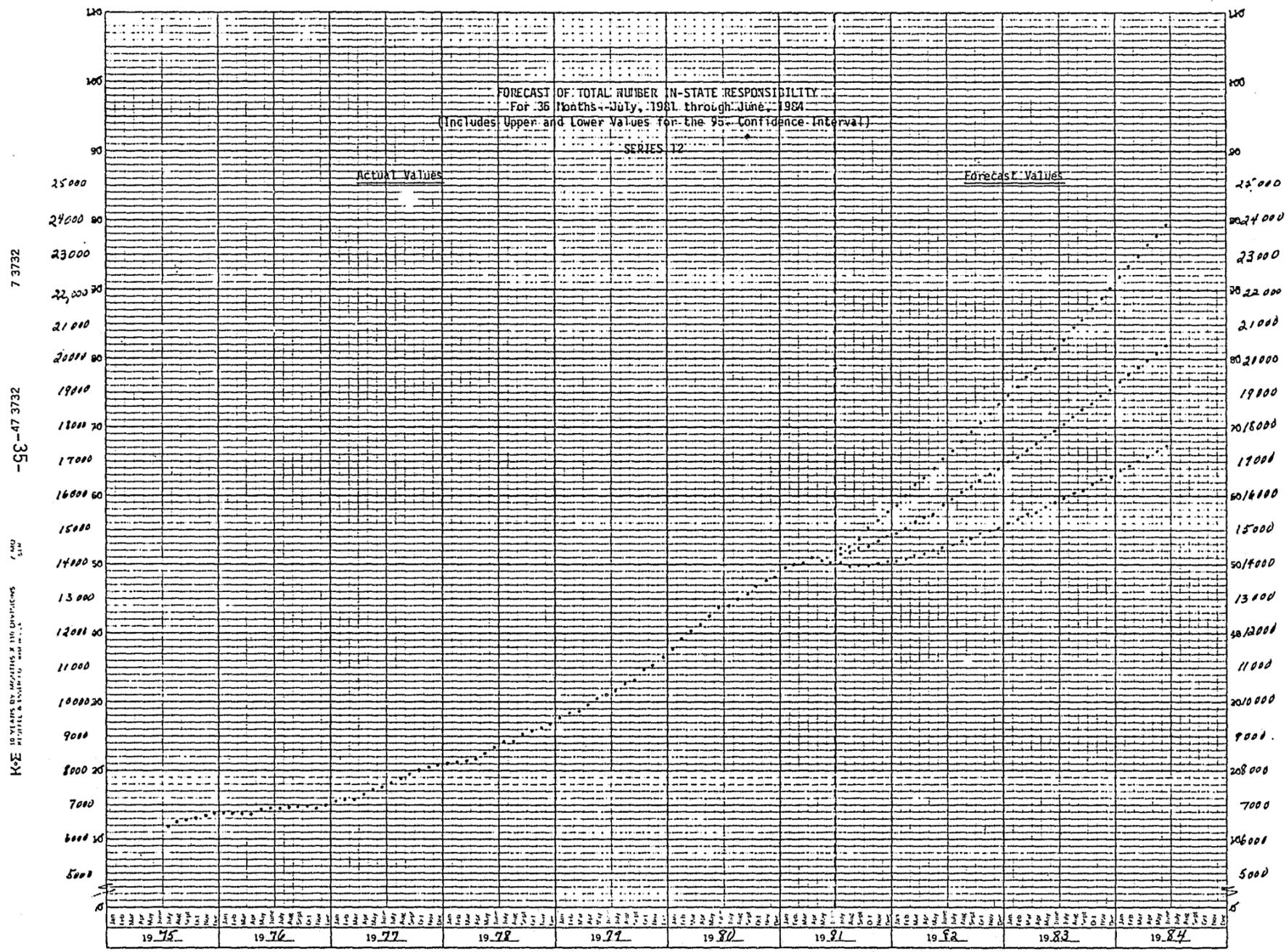
-34-

¹End of FY 81-83 Biennium

	1981					1982						
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
*Actual Values	14,160	14,347	14,416	14,272	14,057	14,425	14,544	15,046	15,212	15,551	15,803	16,009

(See discussion on p. 43-45.)

Oregon Law Enforcement Council



7 3732

-9C-47 3732

1 MO

10 YEARS BY MONTHS X 100 DIVISIONS
MILE & BARFO... 100

FORECAST OF TOTAL NUMBER PROBATION CASES IN STATE
 For 36 Months--July, 1981 through June, 1984
 (Includes Upper and Lower Values for the 95% Confidence Interval)

SERIES 13

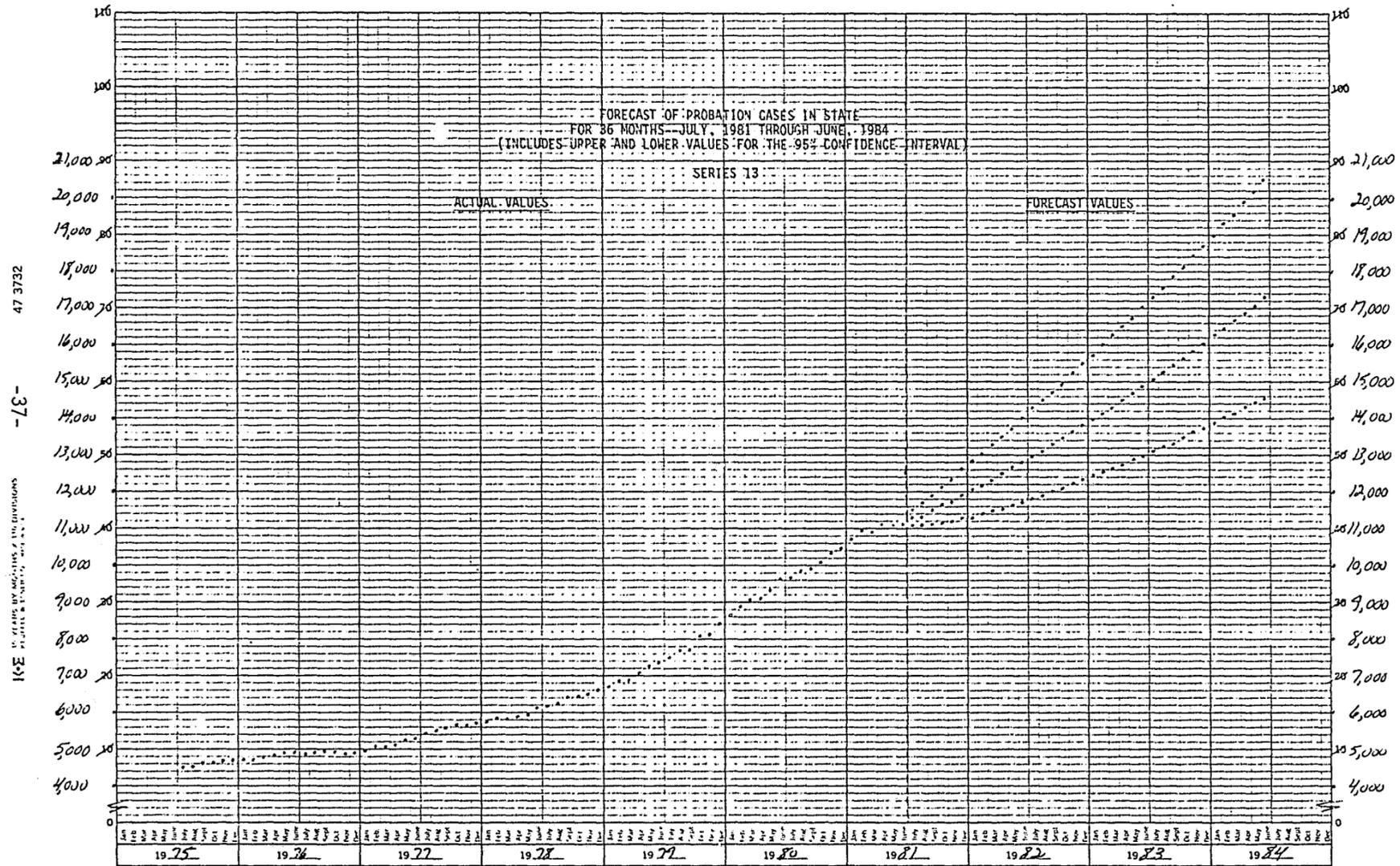
	Forecast Value*	Lower Value	Upper Value		Forecast Value	Lower Value	Upper Value		Forecast Value	Lower Value	Upper Value
July 1981	11,282	11,064	11,504	July 1982	12,973	11,810	14,250	July 1983	15,073	13,115	17,323
Aug. 1981	11,373	11,064	11,691	Aug. 1982	13,136	11,904	14,497	Aug. 1983	15,262	13,238	17,596
Sept. 1981	11,519	11,137	11,915	Sept. 1982	13,302	12,001	14,743	Sept. 1983	15,454	13,364	17,872
Oct. 1981	11,669	11,185	12,175	Oct. 1982	13,469	12,101	14,991	Oct. 1983	15,649	13,492	18,151
Nov. 1981	11,775	11,206	12,374	Nov. 1982	13,638	12,204	15,241	Nov. 1983	15,846	13,621	18,433
Dec. 1981	11,932	11,284	12,617	Dec. 1982	13,810	12,310	15,493	Dec. 1983	16,045	13,753	18,719
Jan. 1982	12,051	11,332	12,815	Jan. 1983	13,984	12,418	15,747	Jan. 1984	16,247	13,887	19,008
Feb. 1982	12,187	11,401	13,027	Feb. 1983	14,160	12,529	16,003	Feb. 1984	16,451	14,023	19,300
Mar. 1982	12,340	11,472	13,274	Mar. 1983	14,338	12,641	16,262	Mar. 1984	16,658	14,160	19,597
Apr. 1982	12,496	11,550	13,519	Apr. 1983	14,518	12,756	16,523	Apr. 1984	16,868	14,300	19,896
May 1982	12,653	11,632	13,763	May 1983	14,701	12,874	16,787	May 1984	17,080	14,442	20,200
June 1982	12,812	11,719	14,007	June 1983 ¹	14,886	12,993	17,054	June 1984	17,295	14,586	20,507

-36-

¹End of FY 81-83 Biennium

	1981						1982					
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
*Actual Values	11,173	11,333	11,454	11,634	11,728	12,242	12,493	13,072	13,288	13,599	13,855	14,063

(See discussion on p. 43-45.)



47 3732

-37-

16E 10 STATE BY MONTHS & DIVISIONS

FORECAST OF TOTAL NUMBER OF PAROLE CASES IN STATE
 For 36 Months--July, 1981 through June, 1984
 (Includes Upper and Lower Values for the 95% Confidence Interval)

SERIES 14

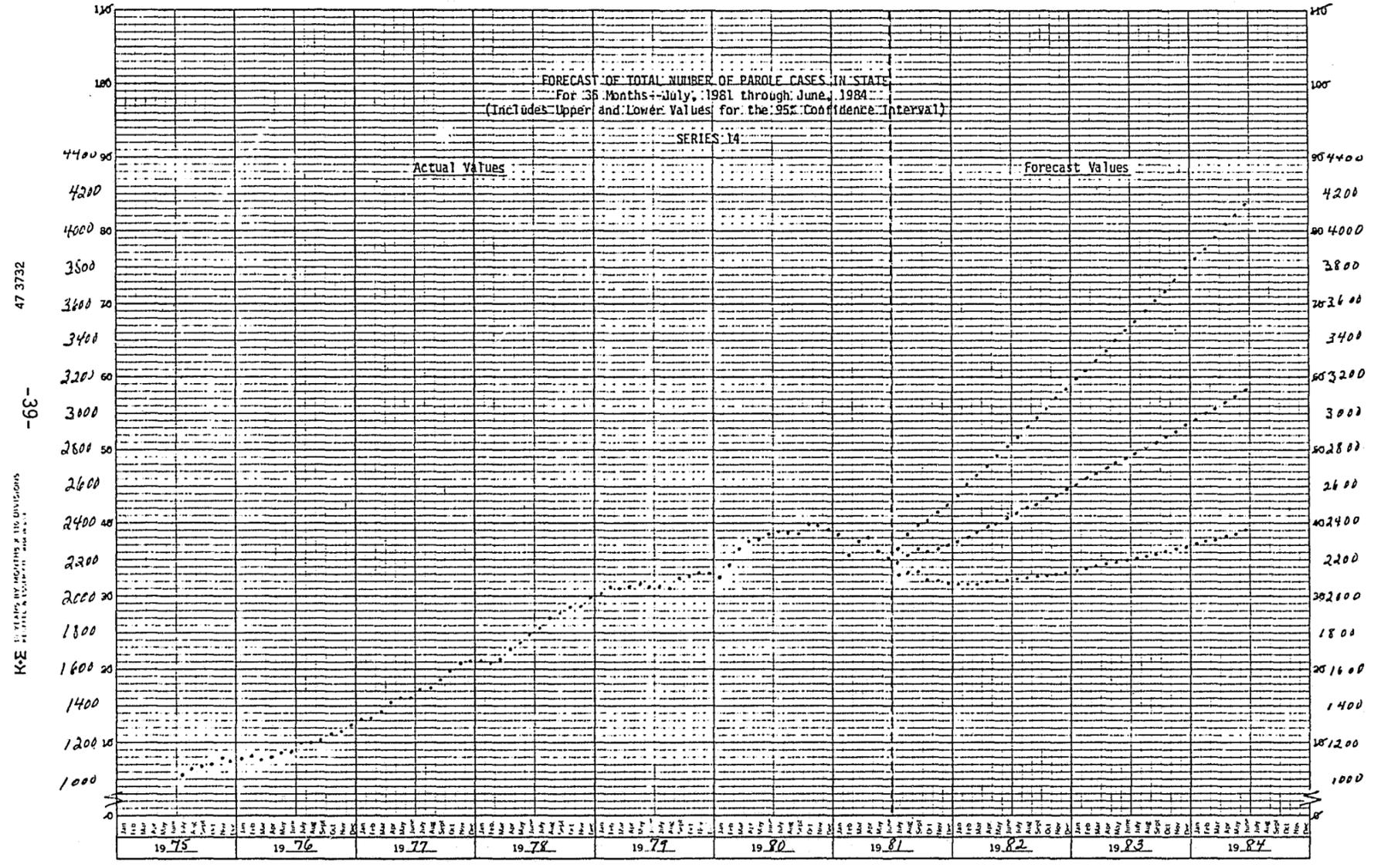
	Forecast Value*	Lower Value	Upper Value		Forecast Value	Lower Value	Upper Value		Forecast Value	Lower Value	Upper Value
July 1981	2186	2119	2255	July 1982	2452	2093	2873	July 1983	2783	2209	3506
Aug. 1981	2231	2127	2340	Aug. 1982	2478	2100	2924	Aug. 1983	2813	2221	3561
Sept. 1981	2254	2130	2393	Sept. 1982	2504	2108	2976	Sept. 1983	2842	2234	3617
Oct. 1981	2244	2093	2407	Oct. 1982	2531	2116	3028	Oct. 1983	2873	2247	3673
Nov. 1981	2254	2083	2438	Nov. 1982	2558	2124	3080	Nov. 1982	2903	2260	3730
Dec. 1981	2278	2076	2498	Dec. 1982	2585	2134	3132	Dec. 1983	2934	2273	3787
Jan. 1982	2302	2073	2555	Jan. 1983	2612	2143	3184	Jan. 1984	2965	2287	3844
Feb. 1982	2326	2073	2610	Feb. 1983	2640	2153	3237	Feb. 1984	2996	2300	3903
Mar. 1982	2351	2075	2664	Mar. 1983	2668	2164	3290	Mar. 1984	3028	2315	3962
Apr. 1982	2376	2078	2717	Apr. 1983	2696	2175	3343	Apr. 1984	3060	2329	4021
May 1982	2401	2082	2769	May 1983	2725	2186	3397	May 1984	3093	2344	4081
June, 1982	2426	2087	2821	June 1983 ¹	2754	2197	3451	June 1984	3125	2359	4142

-38-

¹End of FY 81-83 Biennium

	1981						1982					
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
*Actual Values	2226	2258	2228	1905	1602	1469	1341	1257	1201	1228	1240	1247

(See discussion on p. 44-45 for explanation of large discrepancy between forecast and actual values beginning with October, 1981 forward.)



47 3732

-63-

KE 10 YEARS BY MONTHS & DIVISIONS
OF PAROLE & PROBATION

FORECAST OF CORRECTIONS DIVISION TOTAL RESPONSIBILITY¹
 For 36 Months--July, 1981 through June, 1984
 (Includes Upper and Lower Values for the 95% Confidence Interval)

SERIES 15

	Forecast Value*	Lower Value	Upper Value		Forecast Value	Lower Value	Upper Value		Forecast Value	Lower Value	Upper Value
July 1981	19,093	18,860	19,329	July 1982	21,340	20,158	22,591	July 1983	23,975	22,105	26,003
Aug. 1981	19,214	18,883	19,550	Aug. 1982	21,548	20,306	22,866	Aug. 1983	24,209	22,283	26,301
Sept. 1981	19,367	18,959	19,783	Sept. 1982	21,758	20,457	23,142	Sept. 1983	24,445	22,452	26,602
Oct. 1981	19,555	19,033	20,092	Oct. 1982	21,970	20,610	23,420	Oct. 1983	24,683	22,644	26,905
Nov. 1981	19,746	19,128	20,384	Nov. 1982	22,184	20,767	23,699	Nov. 1983	24,924	22,828	27,211
Dec. 1981	19,939	19,235	20,668	Dec. 1982	22,401	20,925	23,980	Dec. 1983	25,167	23,015	27,520
Jan. 1982	20,133	19,351	20,947	Jan. 1983	22,619	21,087	24,262	Jan. 1984	25,412	23,203	27,831
Feb. 1982	20,392	19,474	21,222	Feb. 1983	22,840	21,251	24,547	Feb. 1984	25,660	23,394	28,145
Mar. 1982	20,527	19,602	21,497	Mar. 1983	23,062	21,417	24,834	Mar. 1984	25,910	23,586	28,462
Apr. 1982	20,728	19,735	21,770	Apr. 1983	23,287	21,586	25,123	Apr. 1984	26,163	23,781	28,782
May 1982	20,930	19,873	22,043	May 1983	23,514	21,756	25,414	May 1984	26,418	23,978	29,105
June 1982	21,134	20,014	22,316	June 1983 ²	23,743	21,930	25,707	June 1984	26,675	24,178	29,431

¹Total Responsibility includes Institutions' total and Parole and Probation's total (including those out-of-state)

²End of FY 81-83 Biennium

	1981						1982					
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
*Actual Values	19,067	19,305	19,458	19,343	19,137	19,438	19,636	20,227	20,509	20,925	21,252	21,546

(See discussion on p. 43-45.)

DISCUSSION

The following discussion is offered to emphasize some of the previous material, some precautions, and plans for future work.

New Commitments to Institutions

We have provided forecasts for this population subgroup using two separate analytical techniques--multiple regression and time series analysis (ARIMA models). The forecasts for calendar year 1982 derived from multiple regression from the one-year and two-year lag procedures are 1,624 and 1,775, respectively (see Table 1). The forecast from the ARIMA model for the 12 months equals 1,522 (see Series 2 Table). Based on the actual total from January through July, 1982, of 1,101 new commits, if a monthly average of 157.29 were to continue through the end of the year the institutions would receive a total of 1,887 new commitments. The 95 percent upper limit from the two-year lag procedure is 1,865 (Table 2) while the upper limit value from ARIMA is 2,010 (Series 2).

If this monthly average continues through the last five months of 1982, the Corrections Division will have received approximately 280 more new commits than for 1981 (1,604) as well as surpassing the previous high of 1,785 in 1979. Obviously, the figures for the full calendar year of 1982 will be of great interest to the analysts, as well as the Corrections Division.

Felony Probation Receptions (Includes compact cases in-state)

Forecasts for 1982 developed for this population subgroup by the multiple regression one- and two-year lag procedures amounted to 3,950 and 4,263 receptions, respectively (Table 3). Actual receptions for the first half of 1982 equal 2,083, for a monthly average of 347.17. Extending this average for 12 months would provide a total of 4,166 receptions, well within the 95 percent confidence intervals for either the one- or two-year lags.

Felony and Misdemeanant Probation Receptions (Includes Compact Cases In-state)

This population subgroup contains the misdemeanor cases as well as the felony and in-state compact cases. Forecasts for this population subgroup were

developed by time series analysis (ARIMA models) as presented in Series 4. Dr. Wilson and Dr. McCleary indicated in the discussion for this series that the model "...is complex. This forecasting model contains both autogressive and moving average parameters, as well as a significant trend parameter" (Appendix H-1).

By inspecting the graph for Series 4 (page 23), one can observe the trend increase of monthly receptions that began in early 1979. An indication of the growth in this population subgroup is the change in annual receptions moving from 4,040 in 1978, 5,570 in 1979, 6,428 in 1980, to a total of 7,089 in 1981. The total receptions for 1981 represents a 75 percent increase over the total for calendar year 1978.

Some probable factors that are contributing to this large increase are the Community Corrections programs that operate within the state under the Community Corrections Act, as well as some regions or counties that are providing services and/or now reporting a backlog of cases of offenders convicted of misdemeanor(s). The reduction in the length of parole period to six months has reduced the parole case counts and allowed placing additional offenders on probation (see Parole discussion immediately following this narrative).

The actual figures for receptions from July, 1981 through April, 1982 are provided at the bottom of the data for Series 4 (page 22). If these very large increases in monthly receptions for this subgroup do not begin to stabilize or decrease, one should consider using the forecast values for the upper confidence limit in planning and budgeting resources.

Parole Subgroup(s) Forecasts

Forecasts were developed by ARIMA models for several population subgroups that involved parole cases. Due to a change in the Oregon law (H.B. 2327) that shortens the period of parole to six months (effective late July, 1981) a drastic decrease in the number of active parole cases (counts) has occurred in the subsequent months. Consequently, the forecasts developed from the data sets ending with June, 1981 figures could not account for this policy change and the forecast values will be too high.

The forecast series most directly affected by this administrative policy change are Series 11 - Number of Parole Cases In- and Out-of-State and Series 14 - Number of Parole Cases In State. The actual figures for the period of July, 1981 through June, 1982 are provided at the bottom of these respective tables and one can observe the large discrepancy that occurs.

Parole case counts are a component of other population categories/location forecasts and the decrease in active parole cases can be expected to influence them also. The ARIMA forecasts for Series 3, 9, 12 and 15 involve parole case counts. The decrease in number of parole cases has been offset to some extent by an increase in probation case counts. Consequently, the forecast values for these respective subgroups and the actual counts to date over the past 12 months (July, 1981 - June, 1982) have been fairly close and within the confidence interval limits.

Future Forecasting Work

The following comments are offered regarding future work and updating of the forecasts provided.

Multiple Regression (Lag Procedures)

We plan to combine some of the adult arrest categories in order to have a smaller number of predictor variables to develop the forecast equations. We will also examine the results from combining the seven offense variables into, perhaps, two to four larger categories. The objective is to reduce the number of predictor (independent) variables.

In developing and updating future forecasts of Felony Probation Receptions we plan to omit the first two years (1975 and 1976) of the data set. The receptions for 1976 vary greatly from the 1975, 1977 and later years counts. The

Corrections Division reported 2,742 in 1975, 2,029 in 1976, and 2,680 in 1977. Some possible factors that may have contributed to this large decrease, apart from a major change in sentencing dispositions by the courts, could be a decrease in resources and programs provided by the OLEC/LEAA in the counties. Several of the community corrections programs operating via these resources were phasing out or greatly reduced at that time. County/regional programs began operating under the state funds provided by the Community Corrections Act in 1978 and later. Hopefully, the drastic change in the number of receptions for 1976 is not a factor of changes in reporting to and within the Division.

ARIMA Models

A benefit from forecasts developed from ARIMA models is that the analyst, Corrections Division, and others can begin to receive almost immediate feedback in terms of the forecast precision. We are not recommending that the forecasts' users totally accept or reject the precision of the forecasts based on only a few months of comparing forecast and actual values but an indication may be obtained in five to eight months. This feature does not occur with forecasts on an annual basis unless one arbitrarily divides the annual figure into quarterly or monthly values.

Additionally, the analyst has the option of re-examining the models' adequacy and/or updating the forecasts with the additional months of more recent data.

It is recommended that the various series forecasts developed by ARIMA models be re-examined by including the most recent 12-15 months of actual values. The ending data value for the ones herein was June, 1981. This would extend the base for most of the series to seven years (84 months). The series forecasts based entirely on parole cases (Series 11 and 14) should be withheld unless the consultants can statistically adjust for the drastic decrease in parole case counts due to the law change.

Forecasts of Institutions Releases

The forecasting work completed to date has primarily focused on the admissions component to the institutions without explicitly accounting for the length of stay and number of releases leaving the institutions. We have not examined

and developed this component of the over-all operation determining average daily population and/or "turn-over" of prisoners. The factors of length of stay and releases have been intrinsically considered in the ARIMA univariate forecasts for the counts in the various subgroup populations of Series 6, 7, 9, 11, 12, 14, and 15.

We hope to examine these factors in a more explicit manner in future work. The methods discussed by Lonnie Fouty of the Florida Department of Corrections and Tom Crago of the Colorado Department of Corrections for their respective states at a National Workshop on Prison Population Forecasting in May, 1982 provides us with different analytical techniques to consider (see documents and reports by Charles Friel, 1982; Florida Department of Corrections, 1978; Colorado Department of Corrections, February, 1982).

CONCLUSIONS

In summary, we think it is crucial that the State of Oregon continue to work on Corrections prison and field (probation and parole) population forecasting. We think forecasting is a necessary component of management for operations and budgeting. The size and growth of the a) institutional and b) field populations of the Corrections Division have tremendous fiscal and planning implications.

We have now established a data base of crime and arrest information, court filings, population estimates and characteristics (demographics), and employment/unemployment statistics that provide the possible correlates for forecasting in this area. We urge the regional and county units of Corrections to continue to give high priority in providing timely, reliable, and valid administrative statistics to the Corrections Division. This is especially critical for monthly data that is utilized in forecasts developed through ARIMA models.

Experience from other states indicates it takes time and effort to develop forecast techniques that provide reasonably precise forecasts for a specific state. It will take the involvement of Corrections administrative and managerial personnel and others working with technical staff to develop and understand "what works" for a particular state and their system.

BIBLIOGRAPHY

- Blumstein, A., Cohen, H., and Miller, H. Demographically Disaggregated Projections of Prison Population. Journal of Criminal Justice 8 (1) pg. 1-26, 1980.
- Box, G. E. P. & Jenkins, G. M. Time Series Analysis: Forecasting and Control (Rev. ed.), San Francisco: Holden Day, 1976.
- Box, G. E. P. & Tiao, G. L. A Change in Level of a Nonstationary Time Series. Biometrika, V. 52, 1965, pp. 181-192.
- Box, G. E. P. & Tiao, G. L. Intervention Analysis with Applications to Economic and Environmental Problems. J. American Statistical Association, 1975, pp. 70-92.
- Chambers, J. C., et al. How to Choose the Right Forecasting Technique. Harvard Business Review. July-August 1971, pp. 45-74.
- Cohen, J. and Cohen, P. Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences. New York: Halstead Press, 1975.
- Colorado Department of Corrections. Inmate Population Projections, 1980-1985. Colorado Springs: 1980.
- _____. Inmate Population Projections, 1982-1987. Colorado Springs: February, 1982.
- Colorado Division of Criminal Justice. Correctional Options for the 80's. Denver: Dec. 1980.
- Dall, O. The Criminal Justice Projection Package. Washington, D.C.: Criminal Justice Statistics Association, Inc., 1982.
- Draper, N. R. and Smith, H. Applied Regression Analysis. New York: John Wiley, 1966.
- Feeley, M. M. and Ohlin, L. E. Criminal Justice and Corrections, Washington, D.C.: National Governors' Association Center for Policy Research, February, 1982.
- Florida Department of Corrections. Florida Inmate Population Projections SLAM -Phase II. Tallahassee: Nov., 1978.
- Friel, Charles M. Proceedings on the National Workshop on Prison Population Forecasting, (Denver, Colo., Jan. 1982). Huntsville, Texas: Criminal Justice Center, Sam Houston State University, 1982.
- Gilchrist, W. Statistical Forecasting. New York: John Wiley, 1976.
- Granger, C. W. J. and Newbold, P. Forecasting Economic Time Series. New York: Academic Press, 1977.

- Hanushek, E. and Jackson, J. E. Statistical Methods for Social Scientists. New York: Academic Press, 1977.
- Hull, C. H. and Nie, N. SPSS Update 7-9 New Procedures and Facilities for Releases 7-9. New York: McGraw Hill, 1981.
- Kerlinger, F. N. and Pedhazur, E. J. Multiple Regression in Behavioral Research. New York: Holt, Rinehart, & Winston, Inc., 1973.
- Makridakis, S. and Wheelwright, S. C. Forecasting Methods and Applications. New York: John Wiley, 1978.
- McCain, L. J. and McCleary, R. "The Statistical Analysis of the Simple Interrupted Time Series Quasi-Experiment," in Thomas Cook and D. Campbell (eds.), Quasi-Experimentation: Design and Analysis Issues for Field Settings. Chicago: Rand McNally, 1979, pp. 233-293.
- McCleary, R. and Hay, R. A. Jr. Applied Time Series Analysis for the Social Sciences. Beverly Hills: Sage Publications, 1980.
- Miller, Dan, Prison Population Projection Methods. Springfield: Illinois Department of Corrections, October, 1981.
- National Criminal Justice Association. "Newsrelease" (82-1), Washington, D.C.: July, 1982.
- National Institute of Justice. American Prisons and Jails Vol. I: Summary and Policy Implications of a National Survey. Washington D.C.: October, 1980.
- Vol. II: Population Trends and Projections. Washington, D.C.: October, 1980.
- Nie, N. et al. SPSS--Statistical Package for the Social Sciences (2nd ed.). New York: McGraw Hill, 1975.
- Oregon Law Enforcement Council. Forecasts of Inmate Population for the Corrections Division, Department of Human Resources. Salem: June, 1980.
- Ostrom, C. W. Time Series Analysis: Regression Techniques. Beverly Hills: Sage Publications, 1978.
- Overall, J. E. and Klett, C. Applied Multivariate Analysis. New York: McGraw-Hill, 1973.
- Stollmack, S. Predicting Inmate Populations from Arrest, Court Disposition and Recidivism Rates, Journal of Research in Crime and Delinquency, July, 1973, pp. 141-162.
- Wheelwright, S. and Makridakis, S. Forecasting Methods for Management (2nd ed.). New York: John Wiley, 1977.

APPENDICES

- Appendix A - Prisoners Under Jurisdiction of State and Federal Correctional Authorities by Region and State
- Appendix B - List of Seven Subgroupings of Counties from Oregon's 14 administrative Districts
- Appendix C - Forecast Equations for New Commitments by County Groups--1-Year Lag Procedure
- Appendix D - Forecast Equations for New Commitments by County Groups--2-Year Lag Procedure
- Appendix E - Forecast Equations of Felony Probation Receptions by County Groups - 1-Year Lag Procedure
- Appendix F - Forecast Equations of Felony Probation Receptions by County Groups - 2-Year Lag Procedure
- Appendix G - Brief Overview of ARIMA Models
- Appendix H - Description and Discussion of ARIMA Models for Series 1 through Series 15 (Prepared by Dr. Richard McCleary and Dr. L. A. Wilson)

The following page(A-1) Apperdix A contain material protected
by the Copyright Act of 1976 (U.S.C) Appendix A Table
Reproduced from the Criminal Justice Newsletter
vol. 13, no. 14 July 19, 1982

National Criminal Justice Reference Service

ncjrs

Copyrighted portion of this
document was not microfilmed
because the right to reproduce
was denied.

National Institute of Justice
United States Department of Justice
Washington, D. C. 20531

GROUPS

GP1 = Mult Co

GP2 = Ad Dist 1 & 2 (minus Mult Co)

GP3 = Ad Dist 3

GP4 = Ad Dist 4

GP5 = Lane Co

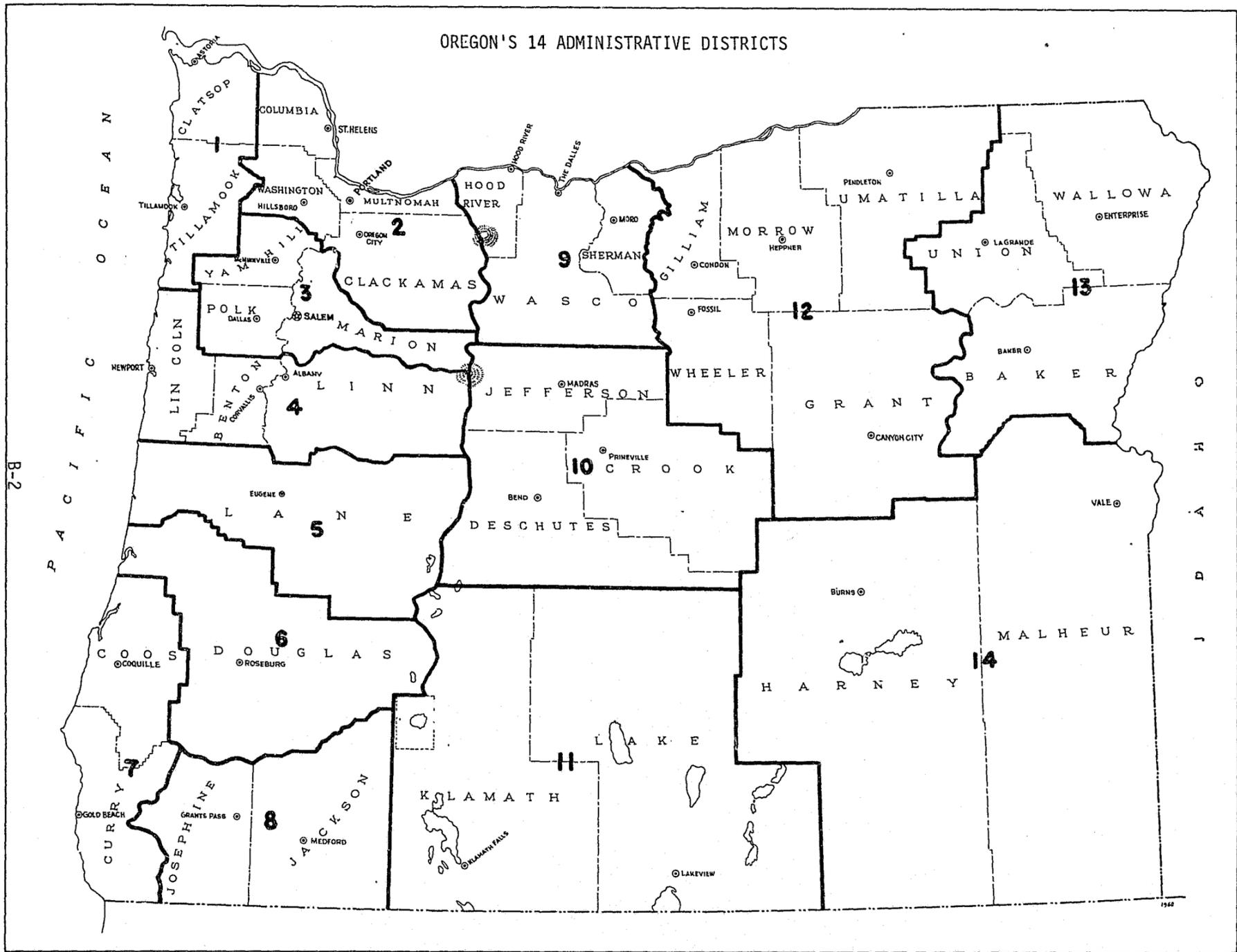
GP6 = Ad Dist 6 + 7 + 8

GP7 = Ad Dist 9 - 14

CONTINUED

1 OF 2

OREGON'S 14 ADMINISTRATIVE DISTRICTS



B-2

1962

FORECAST EQUATIONS FOR NEW COMMITMENTS
BY COUNTY GROUPS

(1-year Lag Procedure)

Group 1 - Multnomah County

	Variable	B Regression Coefficient	Multiple R	Standard Error
\hat{Y} New Commits =	Robbery Adult Arrests	.50163	.99604	7.59971
	Stolen Prop. Adult Arrests	1.92048		
	Motor Veh. Theft Adult Arrests	.92139		
	(Constant)	-94.00931		

Group 2 - Administrative Districts 1 and 2 (Less Multnomah County)

	Variable	B Regression Coefficient	Multiple R	Standard Error
\hat{Y} New Commits =	Divorce Filings	.26428	.99374	3.59452
	Larceny Offenses	-.03452		
	Motor Vehicle Theft Offenses	-.12828		
	(Constant)	-54.16876		

Group 3 - Administrative District 3

	Variable	B Regression Coefficient	Multiple R	Standard Error
\hat{Y} New Commits =	Burglary Adult Arrests	1.14953	.98978	3.45547
	Larceny Adult Arrests	-.24031		
	Civil Filings	.04607		
	(Constant)	-20.08376		

Group 4 - Administrative District 4

	Variable	B Regression Coefficient	Multiple R	Standard Error
\hat{Y} New Commits =	Divorce Filings	.27354	.99149	6.46177
	Larceny Adult Arrests	-.22106		
	Other Assault Arrests	.83851		
	(Constant)	-215.5032		

Group 5 - Lane County

	Variable	B Regression Coefficient	Multiple R	Standard Error
\hat{Y} New Commits =	Rape Offenses	.92083	.98916	7.81412
	Ag. Assault Adult Arrests	.20002		
	All Other Adult Arrests	.02901		
	(Constant)	47.17327		

FORECAST EQUATIONS FOR NEW COMMITMENTS
BY COUNTY GROUPS

(1-year Lag Procedure)
(Continued)

Variable		B Regression Coefficient	Multiple R	Standard Error
<u>Group 6 - Administrative Districts 6, 7, and 8</u>				
\hat{Y}				
New Commits =	Ag. Assault Arrests	.11604	.99840	2.17523
	Fraud Adult Arrests	-.07601		
	Burglary Adult Arrests	-.10196		
	(Constant)	185.0207		
<u>Group 7 - Administrative Districts 9-14</u>				
\hat{Y}				
New Commits =	Weapons Adult Arrests	.60963	.99554	4.64079
	Forgery Adult Arrests	-1.10349		
	Other Assaults Adult Arrests	.16848		
	(Constant)	181.1343		

FORECAST EQUATIONS FOR NEW COMMITMENTS
BY COUNTY GROUPS

(2-year Lag Procedure)

Group 1 - Multnomah County

Variable		B Regression Coefficient	Multiple R	Standard Error
\hat{Y}				
New Commits =	Larceny Offenses	.01720	.99723	6.35592
	Stolen Prop. Adult Arrests	1.01177		
	Males 20-24	.01066		
	(Constant)	-365.6318		

Group 2 - Administrative Districts 1 and 2 (Less Multnomah County)

Variable		B Regression Coefficient	Multiple R	Standard Error
\hat{Y}				
New Commits =	Motor Vehicle Theft Offenses	.19975	.99554	3.03445
	Males 20-24	-.00783		
	Larceny Adult Arrests	.02094		
	(Constant)	-27.08830		

Group 3 - Administrative District 3

Variable		B Regression Coefficient	Multiple R	Standard Error
\hat{Y}				
New Commits =	Robbery Offenses	1.16758	.98328	4.41202
	Males 20-24	-.02549		
	Civil Filings	-.05713		
	(Constant)	374.8074		

Group 4 - Administrative District 4

Variable		B Regression Coefficient	Multiple R	Standard Error
\hat{Y}				
New Commits =	Males 20-24	.02539	.99578	4.55830
	Rape Offenses	1.92501		
	Other Assault Arrests	.20726		
	(Constant)	-262.9201		

Group 5 - Lane County

Variable		B Regression Coefficient	Multiple R	Standard Error
\hat{Y}				
New Commits =	Drugs Adult Arrests	.20033	.95156	16.36388
	Unemployed Total	-.00653		
	Criminal Filings	-.07364		
	(Constant)	198.7746		

FORECAST EQUATIONS FOR NEW COMMITMENTS
BY COUNTY GROUPS

(2-year Lag Procedure)
(Continued)

Variable	B Regression Coefficient	Multiple R	Standard Error
<u>Group 6 - Administrative Districts 6, 7, and 8</u>			
\hat{Y} New Commits =			
Drugs Adult Arrests	.05851	.98802	5.94009
Fraud Adult Arrests	-.28119		
Motor Vehicle Theft Offenses	.09948		
(Constant)	125.7684		
<u>Group 7 - Administrative Districts 9-14</u>			
\hat{Y} New Commits =			
Males 20-24	.04605	.99462	5.09461
Sex Offense Adult Arrests	-1.64477		
Larceny Offenses	.01821		
(Constant)	-402.2698		

FELONY PROBATION RECEPTIONS
BY COUNTY GROUPS

(1-year Lag Procedure)

Group 1 - Multnomah County

Variable	B Regression Coefficient	Multiple R	Standard Error
\hat{Y} New Receptions =			
Males 20-24	-.03624	.98685	43.62113
Unemployed Total	-.03007		
Disord. Cond. Adult Arrests	-.44667		
(Constant)	2882.644		

Group 2 - Administrative Districts 1 and 2 (Less Multnomah County)

Variable	B Regression Coefficient	Multiple R	Standard Error
\hat{Y} New Receptions =			
Males 20-24	.11819	.99492	20.16088
Motor Vehicle Theft Offenses	-1.05652		
All Other Adult Arrests	.06978		
(Constant)	-231.5635		

Group 3 - Administrative District 3

Variable	B Regression Coefficient	Multiple R	Standard Error
\hat{Y} New Receptions =			
Males 20-24	.10986	.99834	7.50370
Other Assault Adult Arrests	-.87992		
All Other Adult Arrests	.04327		
(Constant)	-1113.821		

Group 4 - Administrative District 4

Variable	B Regression Coefficient	Multiple R	Standard Error
\hat{Y} New Receptions =			
Larceny Adult Arrests	.26926	.99214	11.03682
Burglary Offenses	.15754		
Motor Veh. Theft Adult Arrests	.70823		
(Constant)	-383.7499		

Group 5 - Lane County

Variable	B Regression Coefficient	Multiple R	Standard Error
\hat{Y} New Receptions =			
Drugs Adult Arrests	.61882	.93887	33.53798
Liquor Laws Adult Arrests	.11412		
Disorderly Adult Arrests	-.74969		
(Constant)	-103.6109		

FELONY PROBATION RECEPTIONS
BY COUNTY GROUPS

(2-year Lag Procedure)
(Continued)

Variable	B Regression Coefficient	Multiple R	Standard Error
<u>Group 6 - Administrative Districts 6, 7, and 8</u>			
\hat{Y}			
New Receptions = Males 20-24	.12082	.99982	3.15047
Liquor Laws Adult Arrests	-.34795		
Larceny Adult Arrests	.19143		
(Constant)	-909.4663		
<u>Group 7 - Administrative Districts 9-14</u>			
\hat{Y}			
New Receptions = Males 20-24	.17070	.99780	16.85996
Liquor Laws Adult Arrests	-.16029		
All Other Adult Arrests	-.06755		
(Constant)	-1250.525		

McCleary and Hay (1980) (p. 21) describe a time series as "...a set of N time-ordered observations of a process. Each observation should be an interval and measurement of the process and the time separating successive observations should be constant."

The first stage in the development is the identification of an ARIMA model for the data series. This involves the statistical and a judgemental analysis to define/select the three structural parameters, p , d , and q of the model. The p parameter is involved with the patterns of autocorrelations and partial autocorrelations. The d parameter is involved with providing stationarity or as discussed by McCain and McCleary "...a stationary series is one that has no secular trend--i.e., there is no systematic increase or decrease in the level of the series as it drifts upwards or downwards" (p. 236). If it is determined that the series is nonstationary, one usually can attain stationarity through the process of differencing the scores, i.e., subtract the first observation from the second, the second from the third, etc.

The parameter q defines the moving average order of an ARIMA (p , d , q) model. Some time series are characterized by the persistence of a random shock from one observation to the subsequent observation. These series are described by the moving average models, in the models class where q is greater than zero.

McCleary and Hay (1980) describe the next stages as estimation and diagnosis. These stages are defined as follows:

Next, the parameters of the tentative model are estimated. All parameter estimates must lie within the bounds of stationarity-invertibility and must be statistically significant. If the parameter estimates do not satisfy these criteria, a new model must be identified and its parameters estimated.

After a tentative model has been identified and its parameters satisfactorily estimated, it must be diagnosed. To pass diagnosis, the residuals of the tentative model must be white noise. If this criterion is not satisfied, the tentative model is inadequate and must be rejected; the model-building procedure begins anew. Another model is identified, its parameters estimated, and its residuals diagnosed. The iterative identification/estimation/diagnosis procedure continues until an adequate model has been created for the time series (p. 93).

Series 1-A and 1-B - Total Admissions to Institutions
(Includes New Commitments, Parole Revocation and Suspension, and Other Cases)

Two univariate forecasts have been prepared for this series. One contains trend and the other does not. Currently, the trend is not a significant parameter for this series but, if the series were longer, the trend might become significant. Comparing the forecasted values for July, 1981 through December, 1981 with the actual values recently reported for that same period shows that the model containing the trend parameter has smaller forecasting errors. Consequently, one should probably choose to select the model containing trend (Series 1-B).

Series 2 - New Commitments to Institutions

Two different models were tested for this series: one in which there is an autoregressive parameter and one in which there is a moving average parameter. In comparing the residual mean squares of the two models, the value for the moving average model (333) is smaller than for the autoregressive model (383). Consequently, one is led to adopt the moving average model as the appropriate one. The scatter of the residuals for this model is good and there is no apparent trend. While the forecasted values seem to be pretty good, when compared with the actual values for July-December, 1981, even better forecasts should be expected with a longer series.

Series 3 - Total Admissions to Field Supervision
(Includes Probation + Parole + Other)

A moving average model was selected for this series. Using a log transformation for these data, there is a nice scatter to the residuals. The trend for this series is marginally significant. With a longer series, it should be expected that the trend would increase in significance and, therefore, has been left in the model. Although we have no actual values with which to compare the forecasts, it would appear to be a pretty good model.

Series 4 - Total Admissions (Receptions) to Probation

Among the models evaluated to this time, this is the most complex. This forecasting model contains both autoregressive and moving average parameters as well as a significant trend parameter. Again, there is no actual data against

which to compare the forecasted values but there is no evidence of significant outliers among the residuals. This is thought to be a good model.

Series 5 - (Subset was too short to forecast)

Series 6 - Institutions' Total Responsibility

All parameters in this model are statistically significant. Comparison with the actual values (July through December, 1981) indicate that the forecasts are quite good. This would appear to be a series that can be very well forecast. With a longer series, one should expect excellent forecasts with some consistency.

Series 7 - Institutions' Bedspace Total

This series was analyzed using both log and nontransformed data. When using the nontransformed data, the trend parameter, while positive, was statistically nonsignificant. Once log transformed, however, this parameter does achieve statistical significance.

While this would appear to be a good model, a comparison of the univariate forecasts with the actual observations (July through December, 1981) indicates that this model gives biased forecasts (it systematically underestimates the observed values). The bias in these forecasts appears to have its origin in the last six months of the series (based upon an analysis of the residuals).

Series 8 - (Forecast was not developed for this series at this time)

Series 9 - Total Number of Field Cases In and Out of State

This series appears to be biased in its forecasts, as well. While the first forecasted value appears to be quite accurate, larger and larger deviations from observed values are found in subsequent months. An update of this model (with the inclusion of additional data) might significantly improve its ability to forecast. One should not put a great deal of faith in this model at present.

Series 10 - Total Number of Probation Cases (Including Out-of-State)

All parameters in this model are statistically significant. There is a nice scatter to the residuals, although there are some outliers. The nature of this series indicates that, overall, forecasts should be very good for this model. Occasional deviations from the forecasted values should be expected, however. One should expect to get better forecasts from this model as the series gets longer.

Series 11 - Total Number of Parole Cases (Including Out-of-State)

This appears to be nothing more than a random walk model with a trend parameter in it. As such it is not a very good series to forecast. The residuals of this model appear to be random with a couple of outliers at 24th, 25th, and 68th observations. The forecasts of this series appear to be typical of a random walk model in which the first three observations appear to be good but later forecasts are in error. One should not have much confidence in forecasts derived from such a model. (See DISCUSSION section re Parole subgroups.)

Series 12 - Total In-State Responsibility

All parameters of this model are statistically significant. The residuals look very good with only one outlier at observation 56. There is a very substantial trend in this series. Of the last five observations, four of the residuals are negative. Although there is no bias apparent in a comparison with the observed values (July through December, 1981), an analysis of the differences between expected and observed values indicates more error in the forecasts than one would desire. This is thought to be a "borderline" forecasting model.

Series 13 - Total Number of Probation Cases In-State

This would appear to be a pretty good model. It contains both moving average and trend components which are statistically significant. An evaluation of the residuals indicate a few outliers toward the end of the series which may serve to bias the forecasts in a positive direction.

Series 14 - Total Number of Parole Cases In-State

All parameters are statistically significant. There are outliers at the 68th, 69th, and 71st observations. The series seems to trend in a definite way and then drop suddenly. One should investigate the possibility of a policy shift and then use a transfer function to account for it. This change in policy might very well affect the multivariate model as well. (See DISCUSSION section.)

Series 15 - Total Corrections Division Responsibility

All parameters are statistically significant. Forecasts for this series might be overwhelmed by the very strong trend that is evident in this series, however. The residuals look good with the exception of the last six residuals which are all negative. This might be accounted for through the use of a dummy variable. Otherwise, the forecasts are likely to be underestimates of the actually observed values.

SUMMARY of Univariate Models

The following table lists the various equations for the univariate forecasts that have been presented above. These models are thought to best approximate the underlying process, given the limited amount of data with which we were working. Some of these series (e.g., Series 14) would be improved through inclusion of possible information relating to a shift in policy which might have a direct impact upon the observed data series.

TABLE H-1
UNIVARIATE FORECASTING MODELS

Series	ARIMA	Model
1	(1,1,1)	$(1-\phi_1 B-\phi_2 B^2-\phi_3 B^3)(1-B)Y_t=(1-\theta_8 B^8)a_t$
2	(0,0,1)	$Y_t=(1-\theta_1 B-\theta_2 B^2-\theta_{11} B^{11})a_t$
3	(0,1,1)	$(1-B)Y_t=(1-\theta_1 B-\theta_4 B^4-\theta_{12} B^{12})a_t$
4	(1,1,1)	$(1-\phi_1 B-\phi_2 B^2)(1-B)Y_t=(1-\theta_7 B^7)a_t$
5		series too short to forecast
6	(0,1,1)	$(1-B)Y_t=(1-\theta_1 B-\theta_2 B^2-\theta_7 B^7)a_t$
7	(0,1,1)	$(1-B)Y_t=(1-\theta_1 B)a_t$
8		yearly data not forecast
9	(0,1,1)	$(1-B)Y_t=(1-\theta_1 B-\theta_2 B^2)a_t$
10	(0,1,1)	$(1-B)Y_t=(1-\theta_2 B^2-\theta_3 B^3-\theta_8 B^8)a_t$
11	(0,1,0)	$(1-B)Y_t=a_t$
12	(0,1,1)	$(1-B)Y_t=(1-\theta_2 B^2-\theta_3 B^3-\theta_8 B^8)a_t$
13	(0,1,1)	$(1-B)Y_t=(1-\theta_3 B^3-\theta_8 B^8)a_t$
14	(0,1,1)	$(1-B)Y_t=(1-\theta_1 B-\theta_5 B^5)a_t$
15	(0,1,1)	$(1-B)Y_t=(1-\theta_3 B^3)a_t$

┌

┌

END