

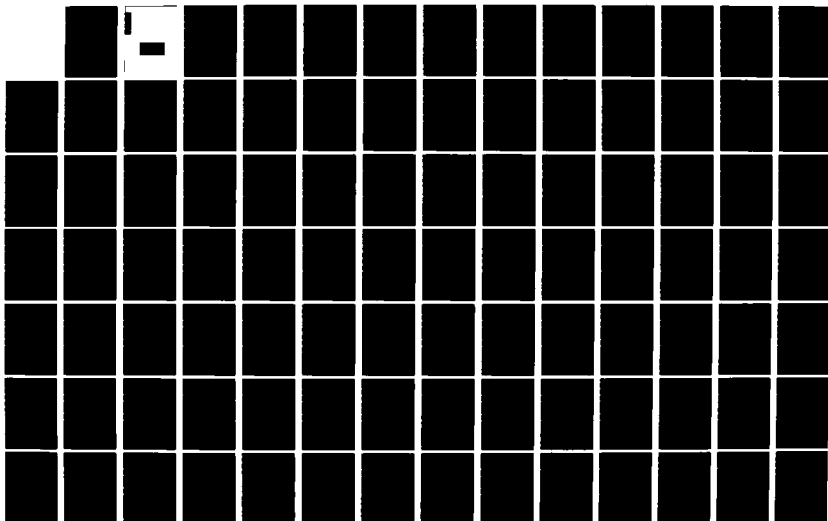
AD-A124 836

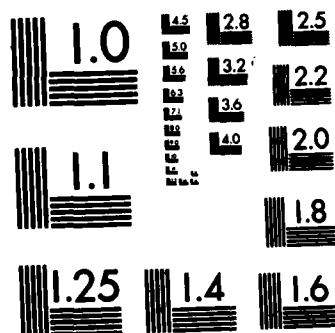
STATISTICAL TECHNIQUES FOR DETERMINING OFFICER
SEPARATION AND RETIREMENT. (U) AIR FORCE INST OF TECH
WRIGHT-PATTERSON AFB OH SCHOOL OF ENGI.. A C DREMSTEDT
DEC 82 AFIT/GOR/OS/82D-2 . F/G 12/1

1/4

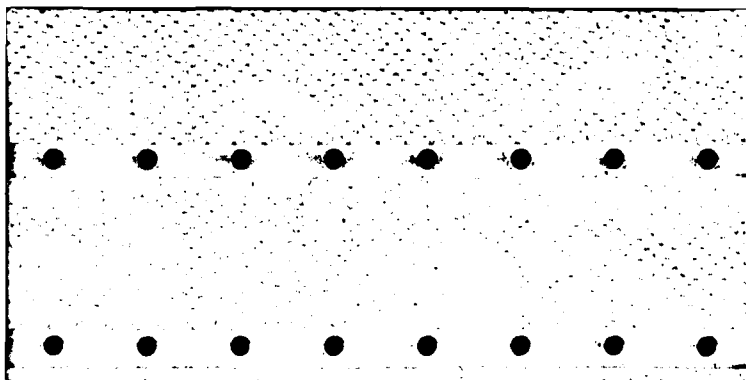
UNCLASSIFIED

NL





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



AFIT/GOR/OS/82D-2

STATISTICAL TECHNIQUES FOR
DETERMINING OFFICER SEPARATION AND
RETIREMENT TRENDS IN THE
UNITED STATES AIR FORCE

THESIS

AFIT/GOR/OS/82D-2

Albert C. Dremstedt
Capt USAF

DTIC
S
E

Approved for public release; distribution unlimited

AFIT/GOR/OS/82D-2

STATISTICAL TECHNIQUES FOR DETERMINING OFFICER SEPARATION
AND RETIREMENT TRENDS IN THE UNITED STATES AIR FORCE

THESIS

Presented to the Faculty of the School of Engineering
of the Air Force Institute of Technology

Air University

in Partial Fulfillment of the
Requirements for the Degree of
Master of Science

by

Albert C. Dremstedt

Capt USAF

Graduate Operations Research

December 1982

Accession For	
NTIS GRA&I	☒
DTIC TAB	☐
Unannounced	☐
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special



Approved for public release; distribution unlimited

Preface

This study was undertaken to provide Air Force personnel managers and analysts with an alternative loss prediction methodology. Although its application within this research was limited to specific loss areas, it is hoped that it can be extended beyond its current scope. Any user who desires additional information concerning specifics of this methodology can contact me at my next assignment:

HQ TAC/DPY
Langley AFB, Va. 23665
Autovon 432-4535

I wish to thank Lt Col Ivy Cook and Lt Col Richard Kulp for their thesis suggestions and guidance throughout my AFIT program. Also, I wish to thank Capt Gary Blum and 1st Lt JoAnn Withers for their data support. Both Capt Blum and Lt Withers are assigned to HQ AFMPC/MPCYO, Randolph AFB, Texas. Finally, I wish to express my boundless appreciation and gratitude for the understanding devotion of my wife, Sandra, and the loving assistance of my daughter, Angela, age three.

Albert C. Dremstedt

Table of Contents

	Page
Preface.	ii
List of Figures.	vi
List of Tables	ix
Abstract	xi
I. INTRODUCTION.	1
Background.	2
Actions Available to Meet End Strength.	4
Thesis Overview	7
II. REGRESSION ANALYSIS OF SEPARATION APPLICATION PATTERNS.	8
Methodology	8
Data Base Configuration	9
Regression Results.	10
Model Testing	14
Model Investigation	18
Methodology	19
Adjusted R ² and Standard Deviation.	19
Prediction Error Minimization	23
Conclusions	25
Recommendations	26
III. TIME SERIES ANALYSIS OF SEPARATION DATA	29
Methodology and Data Base	29
Model Identification.	30
Nonseasonal Differencing of the Data.	34
Residual Analysis of ARIMA(4,1,1)	38
Seasonal Differencing of Twelve	41
Nonseasonal Differencing.	41
Parameter Estimation.	44
Residual Analysis of ARIMA(2,1,0)*(0,1,0) ₁₂	45
ARIMA(2,1,0)*(1,1,0) ₁₂ Model	46
Residual Analysis of ARIMA(2,1,0)*(1,1,0) ₁₂	48
Conclusions	52
Recommendations	53

IV.	REGRESSION ANALYSIS OF RETIREMENT APPLICATION PATTERNS.	58
	Methodology	58
	Data Base Configuration	58
	Regression Results.	61
	Autocorrelation Analysis.	69
	Model Testing	73
	Conclusions	76
	Recommendations	78
V.	TIME SERIES ANALYSIS OF RETIREMENT DATA	81
	Methodology and Data Base	81
	Model Identification.	82
	Nonseasonal Differencing of the Data.	83
	R and S Array Analysis.	83
	Residual Analysis of ARIMA(1,0,0)*(0,1,0) ₁₂	86
	Model Prediction Capability	89
	Conclusions	90
	Recommendations	90
VI.	REVIEW, CONCLUSIONS, AND RECOMMENDATIONS.	92
	Review of Accomplishments	92
	Conclusions	93
	Time Series Approach.	93
	Discussion.	94
	Regression Approach	95
	Discussion.	96
	Recommendations	98
	Bibliography	100
	Appendix A: FYCOPS Report	101
	Appendix B: Listings of the Separation Data Bases used in the Regression Analysis.	109
	Appendix C: Separation's SPSS Regression Output Listings.	113
	Appendix D: Data Base Size Optimization Statistics for Separation Regression Analysis.	186
	Appendix E: Prediction Errors Associated with Separation Regression Model	205
	Appendix F: Separation's Time Series Analysis Computer Output (Undifferenced Data).	212

Appendix G:	Separation's Time Series Analysis Computer Output (Nonseasonally Differenced Data)	218
Appendix H:	Residual Analysis of Separation Data using an ARIMA(4,1,1) Model	225
Appendix I:	Separation's Time Series Analysis Computer Output (Seasonally Differenced Data)	227
Appendix J:	Residual Analysis of Separation Data using an ARIMA(2,1,0)*(1,1,0) ₁₂ Model. . . .	243
Appendix K:	Retirement's SPSS Regression Output Listings.	245
Appendix L:	RET4 Residual Analysis.	316
Appendix M:	RET4's SPSS Regression Output Listing . . .	328
Appendix N:	Retirement's Time Series Computer Output. .	340
Appendix O:	Residual Analysis of Retirement Data using an ARIMA(1,0,0)*(0,1,0) ₁₂ Model. . . .	349
Appendix P:	Copy of TS (Time Series) Analysis Program .	351
Vita		363

List of Figures

<u>Figure</u>		<u>Page</u>
1	FY81 Officer Actual Vol Seps vs Prediction . . .	15
2	FY82 Officer Actual Vol Seps vs Prediction . . .	16
3	Avg Standard Deviation vs # of Observations. . .	21
4	Avg Adjusted R ² vs # of Observations.	22
5	Autocorrelation Plot for Separation Data	31
6	Partial Autocorrelation Plot for Separation Data	32
7	Autocorrelation Plot for Nonseasonally Differenced Separation Data.	36
8	Partial Autocorrelation Plot for Nonseasonally Differenced Separation Data.	37
9	Cumulative Periodogram for ARIMA(4,1,1).	39
10	Autocorrelation Plot of Seasonally Differenced Separation Data.	42
11	Partial Autocorrelation Plot of Seasonally Differenced Separation Data.	43
12	Cumulative Periodogram for ARIMA(2,1,0)*(0,1,0) ₁₂	47
13	Autocorrelation Plot of the Residuals from the ARIMA(2,1,0)*(1,1,0) ₁₂	49
14	Partial Autocorrelation Plot of the Residuals from the ARIMA(2,1,0)*(1,1,0) ₁₂	50
15	Cumulative Periodogram for ARIMA(2,1,0)*(1,1,0) ₁₂	51
16	Long Term Trend Analysis of Separation Data. . .	55
17	FY82 Officer Actual Rets vs Prediction	77
18	Autocorrelation Plot of Nonseasonally Differenced Retirement Data.	84

19	Partial Autocorrelation Plot of Nonseasonally Differenced Retirement Data.	85
20	Cumulative Periodogram for ARIMA(1,0,0)*(0,1,0) ₁₂	88
D-1	SEP1 Standard Deviation vs # of Observations . .	199
D-2	SEP1 Adj R^2 vs # of Observations.	199
D-3	SEP2 Standard Deviation vs # of Observations . .	199
D-4	SEP2 Adj R^2 vs # of Observations.	199
D-5	SEP3 Standard Deviation vs # of Observations . .	200
D-6	SEP3 Adj R^2 vs # of Observations.	200
D-7	SEP4 Standard Deviation vs # of Observations . .	200
D-8	SEP4 Adj R^2 vs # of Observations.	200
D-9	SEP5 Standard Deviation vs # of Observations . .	201
D-10	SEP5 Adj R^2 vs # of Observations.	201
D-11	SEP6 Standard Deviation vs # of Observations . .	201
D-12	SEP6 Adj R^2 vs # of Observations.	201
D-13	SEP7 Standard Deviation vs # of Observations . .	202
D-14	SEP7 Adj R^2 vs # of Observations.	202
D-15	SEP8 Standard Deviation vs # of Observations . .	202
D-16	SEP8 Adj R^2 vs # of Observations.	202
D-17	SEP9 Standard Deviation vs # of Observations . .	203
D-18	SEP9 Adj R^2 vs # of Observations.	203
D-19	SEP10 Standard Deviation vs # of Observations. .	203
D-20	SEP10 Adj R^2 vs # of Observations	203
D-21	SEP11 Standard Deviation vs # of Observations. .	204
D-22	SEP11 Adj R^2 vs # of Observations	204

D-23	SEP12 Standard Deviation vs # of Observations. .	204
D-24	SEP12 Adj R^2 vs # of Observations	204
L-1	RET4 Time vs Residuals	319
L-2	RET4 Accomplished Retirements vs Residuals . . .	320
L-3	RET4 Voluntary Retirements vs Residuals.	321
L-4	RET4 Mandatory Retirements vs Residuals.	322
L-5	RET4 Time vs Residuals Separated by Fiscal Years.	323
L-6	RET4 Residual Autocorrelation Plot	326
L-7	RET4 Residual Partial Autocorrelation Plot . . .	327

List of Tables

<u>Table</u>		<u>Page</u>
I	Regression Summary Statistics (Part A) (Separation Data)	12
II	Regression Summary Statistics (Part B) (Separation Data)	13
III	FY82 Prediction Errors (Separation Data).	17
IV	Optimal Data Base Sizes (Separation Data)	20
V	Comparison of FY82's Predictions Maximum Number of Observations vs The Most Recent Twenty-Four Observations (Separation Data)	26
VI	Modified Model's Prediction Errors (FY82) (Separation Data)	28
VII	Time Series FY82 Prediction Error (Separation Data)	52
VIII	Regression Summary Statistics (Part A) Monthly Observations through May 82 (Retirement Data)	62
IX	Regression Summary Statistics (Part B) Monthly Observations through May 82 (Retirement Data)	63
X	Regression Summary Statistics (Part A) Monthly Observations, Oct 79 through May 82 (Retirement Data)	67
XI	Regression Summary Statistics (Part B) Monthly Observations, Oct 79 through May 82 (Retirement Data)	68
XII	Regression Summary Statistics (Part A) Monthly Observations, Oct 79 through Jul 82 (Retirement Data)	71
XIII	Regression Summary Statistics (Part B) Monthly Observations, Oct 79 through Jul 82 (Retirement Data)	72
XIV	Retirement Regression Prediction Error.	75

XV	Modified Update Procedure's Prediction Error (Retirement Data)	7
XVI	Retirement Time Series FY82 Predictions vs Actual.	87
XVII	AFCOPS Predictions vs Regression Predictions. . .	90
D-I	SEP1 Observation Analysis Statistics.	187
D-II	SEP2 Observation Analysis Statistics.	188
D-III	SEP3 Observation Analysis Statistics.	189
D-IV	SEP4 Observation Analysis Statistics.	190
D-V	SEP5 Observation Analysis Statistics.	191
D-VI	SEP6 Observation Analysis Statistics.	192
D-VII	SEP7 Observation Analysis Statistics.	193
D-VIII	SEP8 Observation Analysis Statistics.	194
D-IX	SEP9 Observation Analysis Statistics.	195
D-X	SEP10 Observation Analysis Statistics	196
D-XI	SEP11 Observation Analysis Statistics	197
D-XII	SEP12 Observation Analysis Statistics	198
E-I	SEP1 # of Observations vs Prediction Errors . . .	206
E-II	SEP2 # of Observations vs Prediction Errors . . .	206
E-III	SEP3 # of Observations vs Prediction Errors . . .	207
E-IV	SEP4 # of Observations vs Prediction Errors . . .	207
E-V	SEP5 # of Observations vs Prediction Errors . . .	208
E-VI	SEP6 # of Observations vs Prediction Errors . . .	208
E-VII	SEP7 # of Observations vs Prediction Errors . . .	209
E-VIII	SEP8 # of Observations vs Prediction Errors . . .	210
E-IX	SEP9 # of Observations vs Prediction Errors . . .	211

ABSTRACT

This thesis develops statistical techniques for determining Air Force officer separations and retirements. The primary source of historical loss information is the Fiscal Year Computerized Officer Projection System report. The analysis techniques used were linear regression and Box and Jenkins' time series.

The regression models developed for both separation and retirement predictions were very accurate. The FY81 separation prediction was in error by only 1.8% and the FY82 separation and retirement predictions were in error by 16.9% and 2.1% respectfully. Moreover, a modified update procedure was in error by only 9.6% for the FY82 separation prediction. This compares to errors in loss predictions of 1.7% to 79.9% for the currently used models. The independent variables used were separation and retirement applications approved and in-system. The R^2 ranged from .75 to .99 for all data bases used in this study.

Although time domain time series models were developed which adequately fit both separation and retirement patterns, both failed to accurately predict either short or long term trends. The inadequacies of these time series models might be remedied by the development of an index of leading indicators or the removal of long term trends by a frequency domain analysis.

STATISTICAL TECHNIQUES FOR DETERMINING OFFICER SEPARATION AND RETIREMENT TRENDS IN THE UNITED STATES AIR FORCE

I. Introduction

The ability to accurately predict both separation and retirement trends is a necessity inherent in all aspects of Air Force Personnel Management. This thesis effort examines the trends associated with Air Force Officer separations and retirements and then attempts to predict these trends for both the short and long term needs of personnel management. As will be discussed later, currently used methodologies have failed to accurately predict losses so that their estimates have precipitated the adoption of numerous personnel actions which were required to bring strength levels in line with Congressional limits. Therefore, this research effort focused its attention on an alternative methodology which would have significantly improved loss projections.

As noted above, the requirement for accurate loss projecting is vital to Air Force Personnel Management. Each branch of the DOD is restricted by public law to be at or below an authorized strength level at 2400 hours on 30 September of each fiscal year. However, just as the Air Force is constrained to a maximum strength level, it also

attempts to come as close as possible to its authorized ceiling in order to meet mission requirements. Therefore, management must continually strive to obtain accurate loss projections with as much lead time as possible so that an adequate time span is available for both the recruiting and training of needed replacements.

Background

Since the end of the Vietnam conflict, large fluctuations in both our authorized strength level and loss rates have caused Air Force management to enact numerous policies, many of which were very unpopular to Air Force personnel. One of the most odious management acts ever adopted was the Reduction in Force (RIF) action which occurred in the mid-1970's. However, this was only the beginning of what was to be a very turbulent period for strength management.

Over the last half decade, two primary models have been developed for projecting Air Force Officer retirements and separations. The primary model in use today is the Air Force Computerized Officer Projecting System (AFCOPS). This model is used for projecting the next two fiscal years of losses (Ref 1). Another model, which is called the Defense Officer Personnel Management System (DOPMS), is a dynamic computerized model which was designed to project losses throughout the Five Year Defense Plan (FYDP) (Ref

1). A complete discussion of each of these models follows.

The AFCOPS model, as mentioned above, is a computerized model for projecting Air Force Officer losses. Using either one or two year loss statistics, this model divides losses into categories where the personal attributes of everyone in a given category or cell are identical. Such a category may be comprised of all pilots that are married, have one dependent, have completed a masters degree program, are ROTC graduates, and have seven years of total active commissioned service. Once the historical loss data has been categorized accordingly, loss rates are calculated by dividing the number lost in each cell by the beginning active duty population in that cell. If, for example, at the beginning of FY79 there were 1000 individuals in a particular cell and 250 of those individuals separated from the service during the next fiscal year, then a loss rate of 25% would be used to project losses for the next fiscal year. Thus, if 500 individuals were in this same loss category at the beginning of FY80, then 125 losses would be projected to occur.

The DOPMS model is similar to the AFCOPS model, except that it ages the force each year by adding estimated gains and then subtracting the estimated losses from the beginning population. The model then uses this number as the beginning population for the next fiscal year.

However, the DOPMS model does not calculate the loss rates which it uses for predicting, but instead uses the loss rates which are calculated by the AFCOPS model.

Actions Available to Meet End Strength. In an effort to meet end strength, recruiting goals and objectives must be set years in advance. To produce an officer from the Air Force Academy, a minimum lead time of four years is required; to produce an officer from ROTC, a minimum lead time of two years is required; and, to produce an officer out of OTS, a lead time of about six months is necessary. Therefore, when large fluctuations in loss rates occur, it becomes increasingly difficult to reduce or increase our strength levels by varying our accessions. For these reasons, if management is to offset changing retention patterns by adjusting recruitment goals, significant lead time is required. However, other personnel actions are possible and have occurred. The following is a list of personnel actions which have either been adopted or discussed for possible implementation during the past three fiscal years (Ref 1):

* designates actions which have been implemented within the last three fiscal years

1. Separate flight and tech training eliminees*
2. Increase Palace Chase quotas*
3. Relax miscellaneous reason separations*

4. Ease waiver restrictions for DOS six month notice*
5. Voluntary retirement rollback*
6. Ease DOS withdrawal restrictions
7. Suspend retirement continuations
8. Eliminate retirement date withdrawals*
9. Permit voluntary separation of one-time failures to temporary captain
10. Limit continuation of non-critical two-time failures to temporary major*
11. Delay accessing Airmen Education and Commissioning Program graduates until the next fiscal year*
12. Delay ROTC engineer accessions until the next fiscal year*
13. Delay reserve recall pilots until the next fiscal year*
14. Suspend all OTS technical and non-technical accessions*
15. Implement an early release program
16. Ask Congress for an end strength supplemental*
17. Separate one-time failures to temporary major*
18. Involuntary DOS rollback
19. RIF
20. Cancel the ASCRO program
(Reserve Officers with more than twenty years of active commissioned service)

As would be expected, not all of the above mentioned policies have been implemented, partly due to the adverse

publicity which they would cause and partly due to Congressional approval which would be required for any action such as a RIF or early release program. However, that is not to say that many of the policies listed above could not or would not be implemented should our loss rates continue to fluctuate to the degree which they have over the last few years.

In addition to the adverse publicity associated with many of these actions, whenever ROTC or OTS accessions are utilized as strength balancing tools (accession dates are delayed until the next fiscal year), a bow-wave of ROTC or OTS accessions develop. Over the past several years, this number has grown drastically. Currently, there are well in excess of 1000 ROTC graduates who normally would have been accessed in the current fiscal year (Ref 1), but, because of strength restrictions and changing loss trends, are being delayed until next fiscal year. This in turn results in those individuals who will be graduating next year having to wait until the following fiscal year before they can enter active service. One can easily imagine the personal financial hardships which often beset those individuals who must wait to enter active duty, especially considering the difficulty associated with finding interim employment in today's economic environment.

Therefore, it was in the area of loss trend analysis which I focused my attention. I hoped that by using

regression analysis to project short term (current fiscal year) losses and time series analysis to project both short and long term trends, that the personnel actions which have been explored and/or implemented during the past decade could either be eliminated or reduced to a minimum.

Thesis Overview

This thesis is divided into five primary sections. The first section deals with a regression analysis of voluntary separations, while section two analyzes similar line officer voluntary separation rates by means of a time series analysis. Section three models Air Force officer retirement trends by means of regression analysis, with section four analyzing the line officer retirement rates as a simple time series. Also, conclusions and recommendations dealing with the findings of each section are noted at the end of that section. Finally, the last section summarizes all of the conclusions and recommendations which were considered significant.

II. Regression Analysis of Separation Application Patterns

Methodology

A simple stepwise multiple linear regression program, or more specifically the Statistical Package for the Social Sciences (SPSS) regression package (Ref 8), was used to model separation application trends for Air Force officer personnel. Date of Separations (DOS) with a Separation Designator (SPD) and DOSs without an SPD were used as the independent variables. Accomplished losses by month were used as the dependent variable. Normally, DOSs with an SPD are defined as officer career separations (officers who separate more than one year after the end of their initial obligations), while DOSs without an SPD are officers which are eligible to separation immediately following or within one year after completion of initial obligation. Initial obligation ranges from four years for non-rated officers to seven years for rated officers (pilots and navigators).

The primary source of loss information used in each data base is the Fiscal Year Computerized Officer Projection System (FYCOPS) Report. This report, which is produced at the end of each month at the Air Force Manpower and Personnel Center (AFMPC), was originally designed to facilitate the tracking and control of normal separations and retirements as well as management-controlled loss

programs such as 7-Day Option, Early Release, and Palace Chase. Examples of pages from this report used for this thesis are contained in Appendix A.

Data Base Configuration

The data base for projecting current FY losses is comprised of twelve subfiles, each containing historical data pertaining to separation application patterns for a given number of months prior to the month in which the losses actually occurred. A listing of these files, labeled SEP1 through SEP12, can be found in Appendix B. As can be seen in the appendix, each file is comprised of three columns. The number in the first column is the dependent variable accomplished losses, with the numbers in the two following columns corresponding to the independent variables DOS without an SPD and DOS with an SPD.

In order to more fully explain the composition of these files, an example is presented. Individuals are required by Air Force policy to submit an application for separation at least 180 days prior to their desired separation date, barring unforeseen hardship, medical or other special circumstance. This advance notification requirement is therefore the foundation to the data bases' design. An examination of SEP3's first entry, "274 146 234" signifies that in July 1979, 274 separations occurred, and that three months prior to July 1979, there were 234

approved career separations in-system and 146 other officers who were scheduled to complete their initial obligations in the month of July, but had not yet notified AFMPC as to their separation intentions.

As noted, an Air Force officer is required to submit an application for DOS at least 180 days prior to a requested separation date. However, prior to March 1979, only 90 days notification was required. Therefore, due to the impact which this policy change had on application trends, each data base's observations have been restricted to only those separation actions which have occurred since May 1979.

Regression Results

All preliminary analyses were accomplished on AFIT's Cyber computer using the SPSS Regression package. A copy of each data base's SPSS listing is in Appendix C. The initial results were impressive. Using data as of May 1982, the R^2 statistic ranged from .99 for one month out (SEP1) to .75 for twelve months out (SEP12). The R^2 statistic measures the proportionate reduction of total variation in the dependent variable associated with the use of the set of independent variables. An R^2 of one exists when all observations fall directly on the fitted response surface. Also, because an R^2 value of one will always be obtained whenever the number of independent variables

equals the number of observations, an adjusted R^2 is sometimes used. In essence, the adjusted R^2 recognizes the number of independent variables in the model and adjusts the R^2 statistic accordingly. In fact, the adjusted R^2 may actually become smaller when another independent variable is introduced into the model because the decrease in the Error Sum of Squares (SSE) may be more than offset by the loss of a degree of freedom in the denominator. A summary listing of both R^2 s and other major statistics are in Tables I and II.

In examining the change in the adjusted R^2 across the data bases, a significant decrease after SEP6 was observed; however, this was not unexpected. As mentioned earlier, an individual is required to submit a DOS application 180 days prior to a requested separation date. Therefore, more variability in the data in files SEP7 through SEP12 would be expected.

In further analysis of the regression results, the F statistic was also found to show similar results. This statistic, which indicates whether the sample of observations being analyzed has been drawn from a population in which the multiple correlation is equal to zero, ranged from 1848 for SEP1 to 41.4 for SEP12. Comparing these values to an F distribution table indicated that each of the twelve data bases F statistic was statistically significant at the 95% confidence level.

TABLE I

Regression Summary Statistics (Part A)				
FILE	OVERALL F	R SQUARE	ADJ R SQUARE	DURBIN-WATSON
SEP1	1847.991	.99088	.99035	2.5129
SEP2	1081.490	.98406	.98309	2.3699
SEP3	649.053	.97594	.97444	2.2131
SEP4	375.835	.96309	.95784	2.1274
SEP5	264.352	.94630	.94272	2.8244
SEP6	247.965	.94296	.93916	2.0599
SEP7	109.962	.88350	.87546	1.6546
SEP8	80.462	.85179	.84121	1.9467
SEP9	133.680	.89311	.88642	1.7726
SEP10	107.084	.87356	.86540	1.5905
SEP11	72.849	.82925	.81787	1.7120
SEP12	41.393	.74726	.72921	1.6680

TABLE II

Regression Summary Statistics (Part B)			
FILE	NO. OF OBS.	VARIABLE F STATISTICS	
		DOS WITH SPD	DOS W/O SPD
SEP1	37	3554.36	57.33
SEP2	36	1844.89	49.59
SEP3	35	971.86	46.95
SEP4	34	673.45	32.67
SEP5	33	515.78	15.98
SEP6	33	486.89	20.04
SEP7	32	215.13	17.60
SEP8	31	159.29	24.07
SEP9	35	253.37	32.32
SEP10	34	210.57	29.19
SEP11	33	145.37	24.59
SEP12	31	82.43	25.01

Similarly, the F statistic associated with each coefficient was also statistically significant at alpha equal to .05.

Finally, each residual plot was examined for normality, constant variance and positive autocorrelation. Again, just as with the other statistical areas, no significant problems were encountered; that is, the Durbin-Watson statistic was above the upper bound for positive autocorrelation in all twelve residual plots, and a subjective assessment of the constant variance and normality assumptions failed to detect any significant problems.

Model Testing

As with any model, the testing and evaluation phase is as important as any other phase of model development. In order to accomplish this phase, data which was recorded subsequent to 30 September 1980 was deleted from the files. Following this, all twelve regressions were reaccomplished with the final output being a month-by-month projection of expected officer separations for Fiscal Year 1981. Figure 1 compares the FY81 predicted losses with the actual FY81 loss data. After the FY81 projections were completed, the data bases were updated with information through 30 September 1981 and the twelve regressions were performed again so as to obtain an FY82 loss prediction. Figure 2 compares the prediction for FY82 to the actual observed

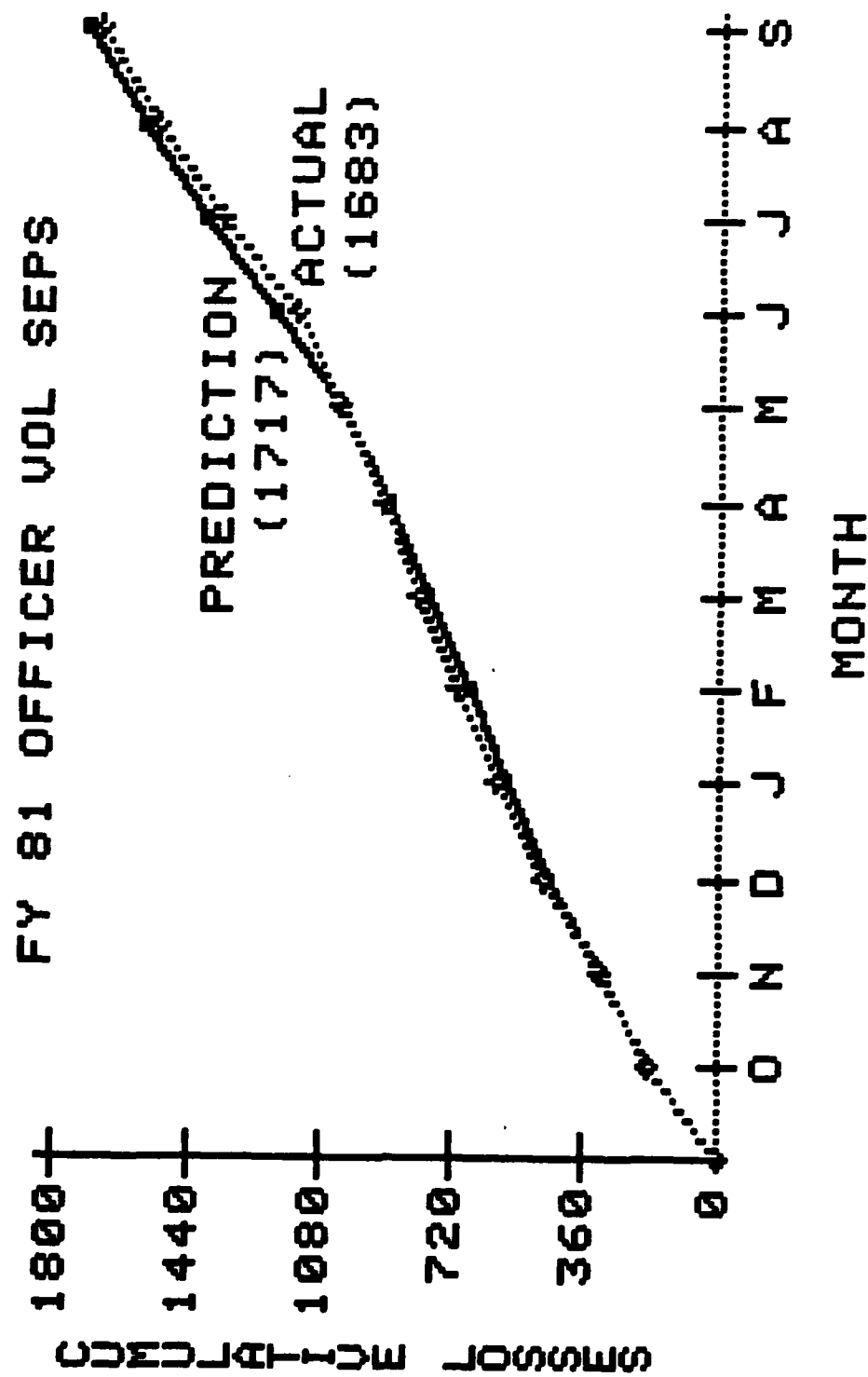
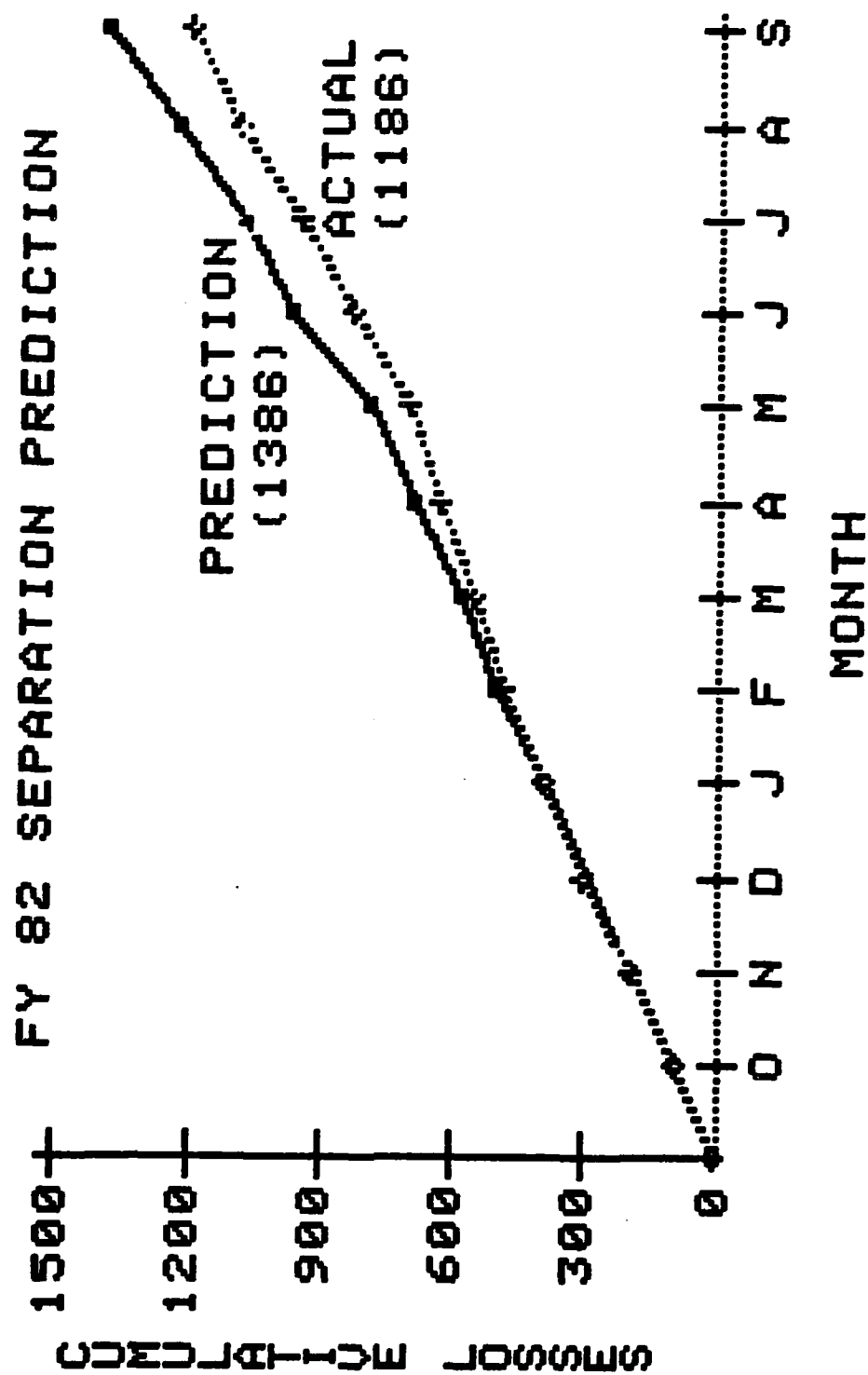


FIGURE 1. FY81 Officer Actual Vol Seps vs Prediction



losses. Although the FY81 estimate was within 2% of the actual 1683 separations, the FY82 prediction was in error by approximately 16.9%. Therefore, additional analysis was made in an attempt to offset the trend which accounted for this significant overestimate.

Initially, the additional analysis entailed an examination of the FY82 loss prediction. This analysis, revealed that the overprediction was not due to any particular month's prediction, but that it was due to a consistent overprediction for each month. The following table details these errors:

Table III

FY82 Prediction Errors			
Month	Pred.	Actual	Error
Oct	98	94	+ 4.2%
Nov	97	99	- 2.1%
Dec	102	101	+ 1.0%
Jan	100	91	+ 9.9%
Feb	103	84	+22.6%
Mar	83	73	+13.7%
Apr	106	76	+39.5%
May	105	74	+41.9%
Jun	176	131	+34.4%
Jul	105	117	-10.3%
Aug	154	141	+ 9.2%
Sep	156	105	+48.6%

Since no single month's error appeared to be the cause of the overprediction, it was believed that a change in the application submission pattern may have occurred. Therefore, the next phase of model development was to attempt to identify the cause, and then develop a

modification to the originally proposed model, one which would capture the changing application trends.

Model Investigation

Initially, the data bases contained data which had been compiled since the DOS application lead time was changed from 90 days to 180 days, with the number of observations in each data base varying from 37 in SEP1 to 31 in SEP12. Even though all the statistics were within a 95% confidence test, it was felt that data base size (number of observations recorded) may be responsible in part for the model's inability to capture changing application patterns. If too many observations are recorded, then the regression analysis technique will be slow in detecting a change in application trends. On the other hand, if too few observations are contained in the data bases, an outlier may have a significant undesirable impact on the calculated regression equations. In other words, because of the inherent nature of linear regression models, equations derived from large data bases will be slow in capturing changing application patterns. In addition, even though this methodology assumes that consecutive fiscal year patterns are similar, one can not assume that the application patterns of years which are several years apart are similar in nature,. As economic and management policies change, so can application

submittal patterns. Therefore, this phase of model development was to determine if a limited number of observations would improve the model's prediction ability.

Methodology. The determination of an optimal number of observations was divided into two subprojects. The first was to determine at what number of observations the adjusted R^2 and the square root of the MSE (SPSS's standard deviation) would be optimized. The second subproject was to ascertain if the number of observations in the data bases would affect the prediction error which is associated with each data base.

Adjusted R^2 and Standard Deviation. Using data as of May 1982, each data base had consecutive regression runs compiled with each run using one less data point. The observation removed was in all instances the oldest observation in the data base; that is, initially SEP1 contained all thirty-seven data points, the oldest data point was then removed and the regression statistics recomputed. This was repeated until only the most recent twelve observations were remaining in SEP1. This same methodology was then repeated for the remaining eleven data bases. A summary of each data base's regression statistics as well as a graphical display of each data base's adjusted R^2 and standard deviation can be found in Appendix D.

As mentioned before, this phase of model investigation was designed to determine an optimal number of observations

which should be recorded in each data base. To accomplish this, an independent analysis of each data base's adjusted R^2 and standard deviation was made. The following table summarizes the results of these analyses:

Table IV

Optimal Data Base Sizes	
Data Base	Optimal # of observations*
SEP1	23 to 37
SEP2	18 to 22
SEP3	18 to 20
SEP4	23 to 24
SEP5	23 to 24
SEP6	23 to 24
SEP7	22 to 23
SEP8	22 to 23
SEP9	22 to 23
SEP10	22 to 24
SEP11	24
SEP12	24

* - Determined by observing where the adjusted R^2 was maximized and where the standard deviation was minimized.

Since an analysis of each individual data base indicated a range where this best number would exist, and since maintaining a different number of observations in each data base would complicate the operational use of the proposed methodology, an average of the adjusted R^2 s and an average of the standard deviations were computed. It was hoped that these average statistics would provide insight into an overall best number of observations which could be used. Graphical displays of these averages are shown in Figures 3 and 4.

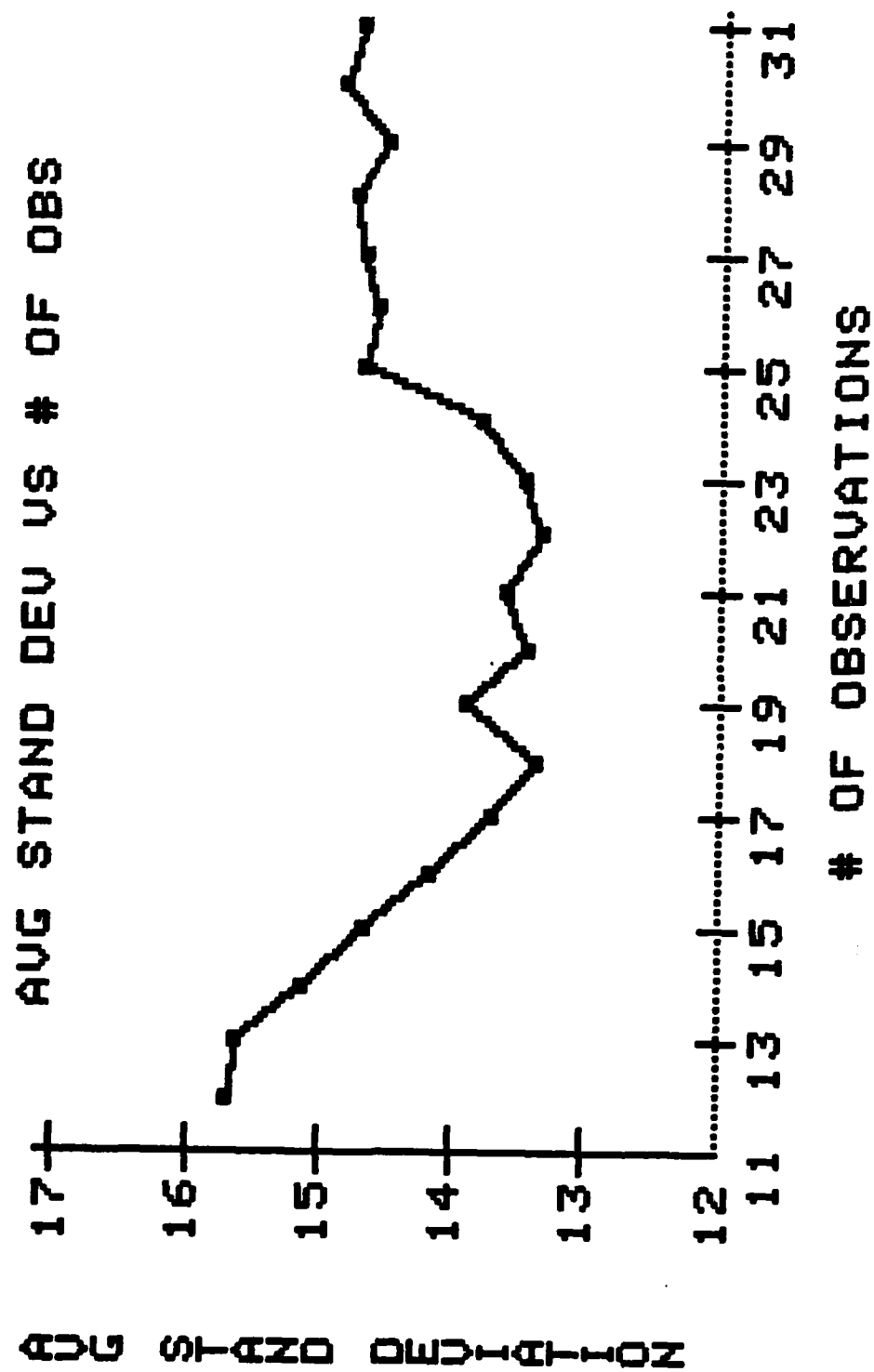


FIGURE 3. Avg Standard Deviation vs # of Observations

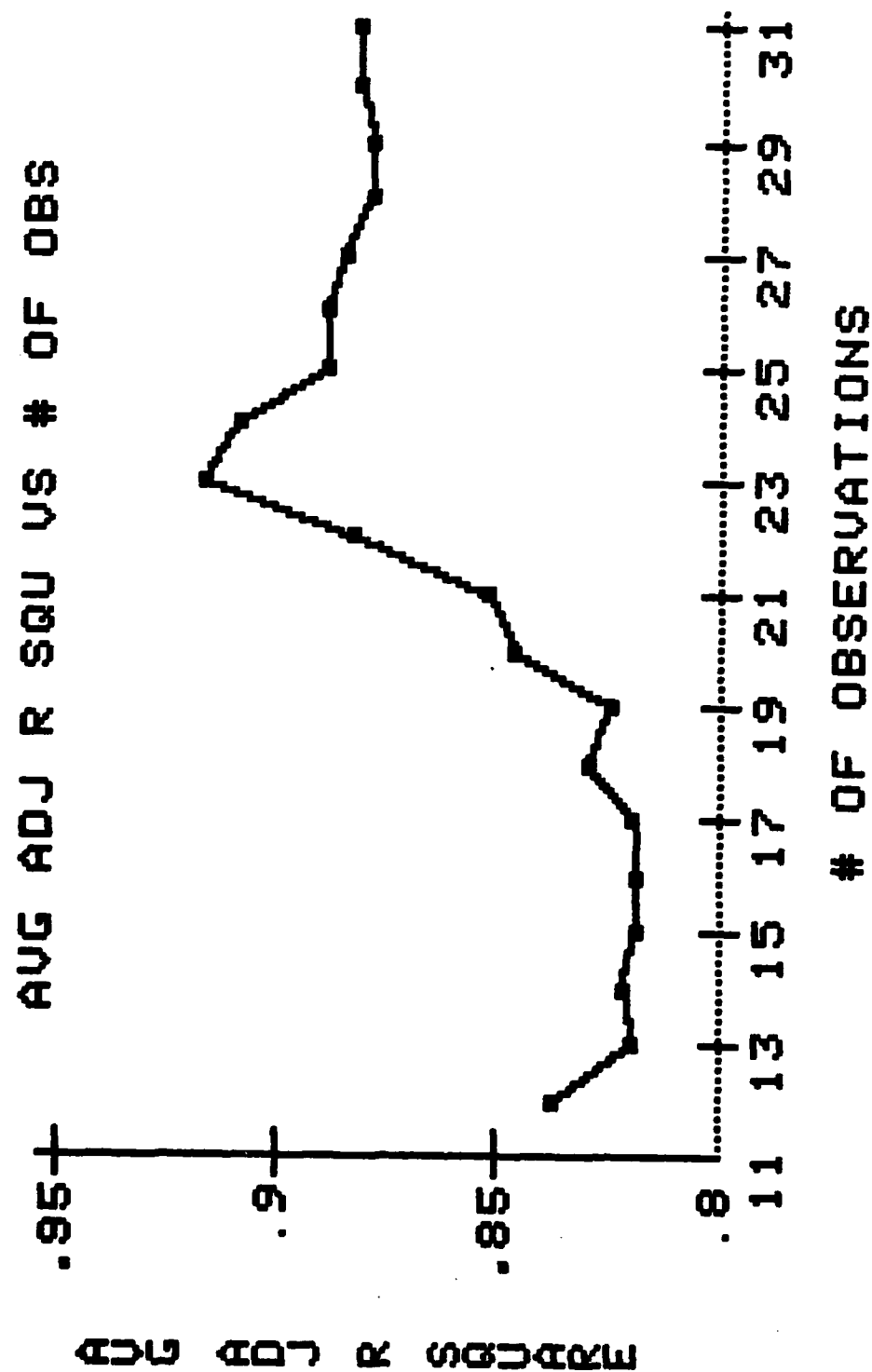


FIGURE 4. Avg Adjusted R^2 vs # of Observations

The analysis of these graphs indicated that the optimal number of observations which should be maintained in the data bases would be twenty-three. However, since there is not a statistically significant difference between twenty-three or twenty-four, and since twenty-four (two years of) historical observations might be more palatable to managers, two years of observations is recommended.

Prediction Error Minimization. Although determining an optimal number of observations by maximizing R and minimizing standard deviation is desirable, the primary purpose of this phase was to try to decrease the prediction error. Therefore, changes in the prediction error for SEP1 through SEP9 were calculated for different data base sizes. Data bases SEP10 through SEP12 were not analyzed because of small data base sizes. That is, in order to project losses for a given month from a data base such as SEP12, all entries subsequent to twelve months prior to that month would have had to have been removed. Since SEP12 had only thirty-one observations at the time of this analysis, removing twelve would have left only nineteen for projecting the most current observation.

In order to accomplish the prediction error minimization phase, the data bases were altered so that they would appear just as they would have if actual predictions had been made. In other words, to predict a month's losses with SEP5, all data recorded subsequent to

five months prior would be removed from that data base. Then, using this modified data base, different sizes of data bases would be used to predict the observed month's losses. In most cases, the number of observations used ranged from twenty to twenty-five since this was the area which the first phase of model investigation had identified as optimal. However, just as with the small number problem associated with SEP10 through SEP12, data base size also reduced the number of predictions which could be made with the remaining nine data bases. Also, even though it would have been better if a large number of predictions within each data base could have been estimated, a maximum of ten predictions for each data base was all that was realistically possible. A comprehensive list of the prediction errors for SEP1 through SEP9 is in Appendix E.

When this analysis was made, two findings of significance surfaced. First, the standard deviation of the prediction errors failed to display a significant increasing or decreasing pattern for the different data base sizes. Second, and perhaps the most important, was that as the number of observations in the data bases decreased, so did the mean of the errors. In other words, the overprediction which existed when the number of observations was maximized tended to decrease as the number of observations in the data base decreased. However, based upon the hypothesis of changing application patterns, this

was not unexpected. The fewer the observations, the easier it is for regression analysis to capture changing trends, but on the other hand, it must also be remembered that the smaller data base sizes would result in larger prediction intervals as calculated by regression packages because the mean square error tended to increase as the data base size decreased. In essence, if small data base sizes were to be adopted, then the possibility of larger errors would exist, while if large data base sizes were adopted, then the mean of the loss predictions may be further from the actual loss numbers, but the expected error interval would be smaller.

Although this exercise failed to provide additional information which would be helpful in identifying an optimal number of observations for predicting, it did provide further insight into the hypothesized cause for the overpredictions, that being changing application submission patterns.

Conclusions

The hypothesis that current fiscal year separations can be predicted by regression analysis appears to be valid; however, problems still exist in the methodology. One such problem is the inability to capture changing application patterns. Even with twenty-four observations maintained in the data base, the proposed model appears to be slow in apprehending varying application patterns. In

fact, had twenty-four observations been used in each data base when projecting FY82 losses, an additional cumulative error of +11 would have occurred in the prediction. A comparison of the original predictions for FY82 and the predictions using the most recent twenty-four observations for FY82 can be found below in Table V:

Table V

Comparison of FY82's Predictions Maximum Number of Observations vs The Most Recent Twenty-Four Observations													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Max # of Obs 24	98	97	102	103	103	83	106	105	176	105	154	156	1386
Obs	101	100	103	101	105	85	106	105	176	104	155	156	1397
Actual	94	99	101	91	84	73	76	74	131	117	141	105	1186

Recommendations

The recommendation for this chapter is simple, additional research must be accomplished regarding modifications which would improve the model's ability to capture changing patterns. This research could probably take on three paths. One would be to analyze the pattern of prediction errors by means of a time series analysis model. A second path would be to weight the observations according to a subjective assessment of their importance. Finally, the third path would be to further analyze the regression model methodology itself. Since some

preliminary work has been completed in this area, it is explained in more detail.

As noted before, a modification to the methodology must be developed which would aid in identifying changing application patterns. An examination of the proposed methodology indicates one possible flaw. When predicting the twelfth month of a twelve month prediction, data which is at best twelve months old is used. In essence, there is at least a twenty-four month difference between the data and the prediction. Although this example is the extreme of the proposed methodology, it does indicate a reason for the model's inability to capture changing patterns. Therefore, if this time span could be decreased, the result may be a decrease in the prediction error.

Within this area, one possibility which was explored was the updating of data bases with projections from other data bases. In other words, after the projection for one month out had been made, that prediction was used as the dependent variable for updating SEP2. Following this, SEP2's two month out prediction, along with SEP1's prediction was then used to update the data base SEP3, with the result being a new projection for three months out. This process was continued until all twelve data bases had been updated and projections for all twelve months recomputed.

This modified data base update procedure was tested

with FY82 data since the previous methodology's prediction error for this fiscal year was significantly high. The results of this exercise are contained below in Table VI:

Table VI

Modified Model's Prediction Errors (FY82)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Modified Proposal	101	100	103	98	102	86	99	98	161	96	123	133	
Original Proposal	98	97	102	100	103	83	106	105	176	105	154	156	
Actual	94	99	101	91	84	73	76	74	131	117	141	105	

In the aggregate, the prediction error was decreased from approximately 16.9% to 9.6%, or in other words, a 43.2% improvement was realized. However, it must be remembered that this is but one sample dealing with this modification. Time precluded additional analysis from being completed.

In summary, although the overall results are impressive, more analysis should be completed before full scale operational use is begun. Not only is it apparent that this methodology has merit, it is also apparent that with additional research, improved accuracy of predictions can in all probability be accomplished.

III. Time Series Analysis of Separation Data

Methodology and Data Base

An autoregressive integrated moving average process (ARIMA) model was fitted to the separation data by means of Box and Jenkins' techniques (Ref 2). The data used in this analysis was a ratio of losses to population expressed in percents. The population itself was made up of rated officers between their sixth and nineteenth year of service and of non-rated officers between their fourth and nineteenth year of service. The loss data used in this analysis was the same as that used in the current fiscal year regression analysis except for the removal of nonlinear loss data. This removal was necessary because of incomplete historical listings pertaining to nonlinear population sizes.

Also, because of strength reduction programs which occurred in the mid-1970's, the data base had to be restricted to losses which had occurred subsequent to December 1976. This data base restriction was necessary since many losses which normally would have occurred in 1975 and 1976 were accelerated to 1973, 1974, and 1975 because of post-Vietnam Reduction in Force (RIF) programs.

Model Identification

The ratio data was analyzed as a simple time series using a program written for the CYBER computer. This program was designed to utilize catalogued subroutines from the IMSL Library. A copy of this program, named TS, can be found in Appendix P. Initially, the simple and partial autocorrelations were examined for significant lags and/or damped exponential or sinusoidal patterns. The computer generated plots of both autocorrelations can be found in Figures 5 and 6. As can be seen, the simple autocorrelation plot has a distinctive sinusoidal pattern, while the partial autocorrelation plot appears to have only one significant partial autocorrelation at lag 1. This in itself, would tend to imply an autoregressive process of order 1. However, additional tools for model identification were examined before a specific model was selected for residual analysis.

Following the autocorrelation analysis, the computer generated periodogram table was examined for indications of significant frequencies inherent in the data. This analysis indicated that a seasonal wave of length twelve may be present. However, this was not unexpected since losses are known to increase during the summer months and then decrease during the winter months. Therefore, in order to test the significance of these and other periodogram values, an average periodogram value was

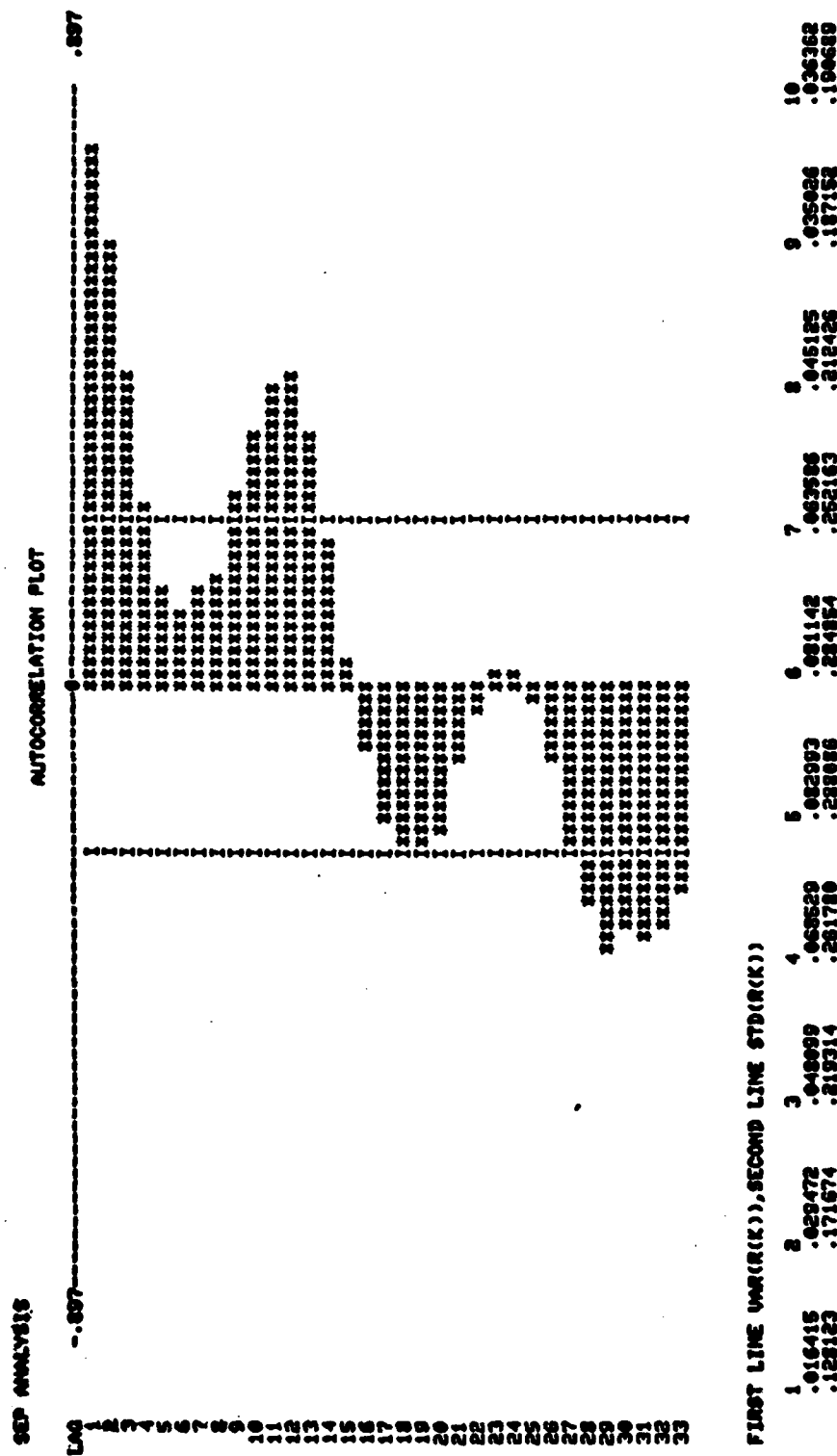


FIGURE 5. Autocorrelation Plot for Separation Data

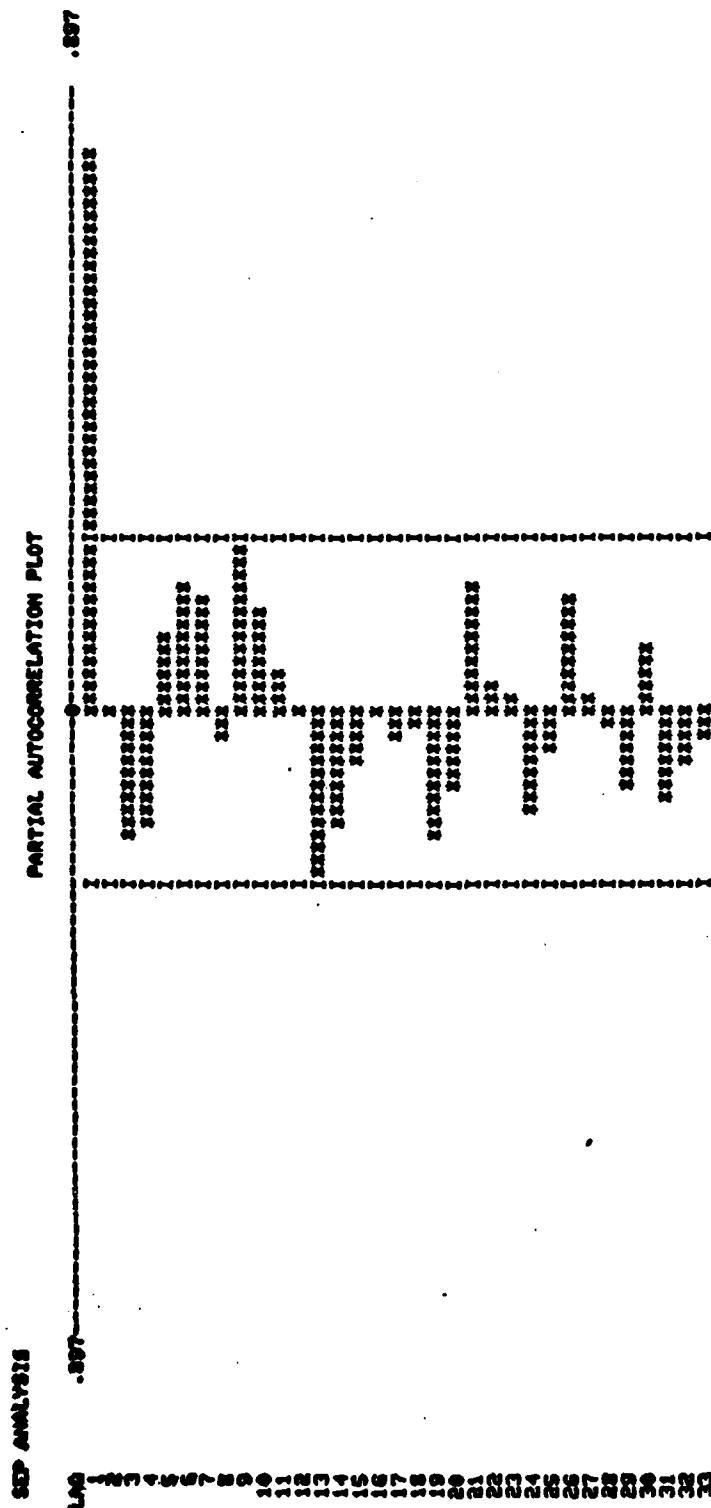


FIGURE 6. Partial Autocorrelation Plot for Separation Data

calculated and then multiplied by a value obtained from a distribution table which can be found in Fuller, 1972 (Ref 3:350-353). Essentially, any periodogram value which is calculated to be above this product can be considered statistically significant (throughout the remainder of this thesis, the required value from this distribution table will be referred to as the periodogram multiple). Since the calculated average was computed to be .0334 and since the periodogram multiple for thirty-three periodogram values is approximately 6.04, we could assume that any value above .2 is significant at the 95% confidence level. This by itself would indicate that only the .015 frequency was significant. However, even though this frequency is highly significant, it may be the result of several other waves being superimposed on each other, or it may simply be pseudo in nature. If one discounts the impact which its high value has on the average, the twelve month wave would probably become significant. Therefore, since attempting to remove a wave of length thirty-three from the data would significantly affect the number of data points left for modeling, attempts were made to remove the twelve month wave from the data with hopes that the resulting equation would account for the thirty-three month wave.

Another tool for identifying ARIMA models, is R and S array analysis. This methodology, which was developed by H. L. Gray, G. Kelly, and D. McIntire (Ref 3), uses

relationships between autocorrelations to identify ARMA models which could be used for further testing. A copy of both the high and low frequency R and S arrays are in Appendix F. Although the seasonality of twelve had not been removed from the data at this point, the R and S arrays indicated that possible nonseasonal differencing of the data may also be necessary. The R and S arrays suggested nonstationarity because the values in the first column of the low frequency S array tended to -2. Corollary 3 in Gray, McIntire, and Kelly (Ref 3:30) states that:

If $S_1(m) = -2$ when $f_m = p_n$ or $S_1(m) = 0$ when $f_m = (-1)^n p_n$, then the process is nonstationary and the characteristic equation has at least one root of -1.

In other words, the R and S arrays indicated that at least one root of the equation may be on or near the unit circle. A complete listing of the computer generated output for this phase of model identification can be found in Appendix F.

Nonseasonal Differencing of the Data. Even though the initial periodogram indicated that seasonal differencing of twelve may be required, this phase of model identification did not incorporate seasonal differencing, that is, only nonseasonal differencing of order 1 has been accomplished on the data at this point.

Following nonseasonal differencing of the data, the

previously identified steps of analysis were reaccomplished. Just as before, the simple and partial autocorrelations were computed and their respective plots analyzed. The autocorrelation plots are displayed in Figures 7 and 8. Except for a sinusoidal wave pattern of length twelve in the simple autocorrelation plot, nothing of significance was apparent, i.e. no significant lags except those associated with the sinusoidal pattern (lags 8, 12, and 24) appeared to be observable. However, even though there appeared to be a significant sinusoidal pattern in the autocorrelations, the periodogram failed to detect any periodicity as significant.

Following the analyses of the autocorrelations, the R and S arrays were examined. This analysis suggested that an ARIMA(4,1,1) model may provide an adequate fit to the data. This possibility was then further tested by use of the D statistic (Ref 5:22-24). This statistic measures agreement with the proper pattern for the stationary ARMA(p,q) process. As expected, based on the R and S array analysis, this statistic also indicated that the proposed ARIMA(4,1,1) model may be adequate.

Finally, the maximum likelihood estimators were calculated for the proposed model, with the resulting equation being:

$$Z_t = .5327Z_{t-1} + .1572Z_{t-2} + .0129Z_{t-3} - .3516Z_{t-4} + A_t - .7660A_{t-1}$$

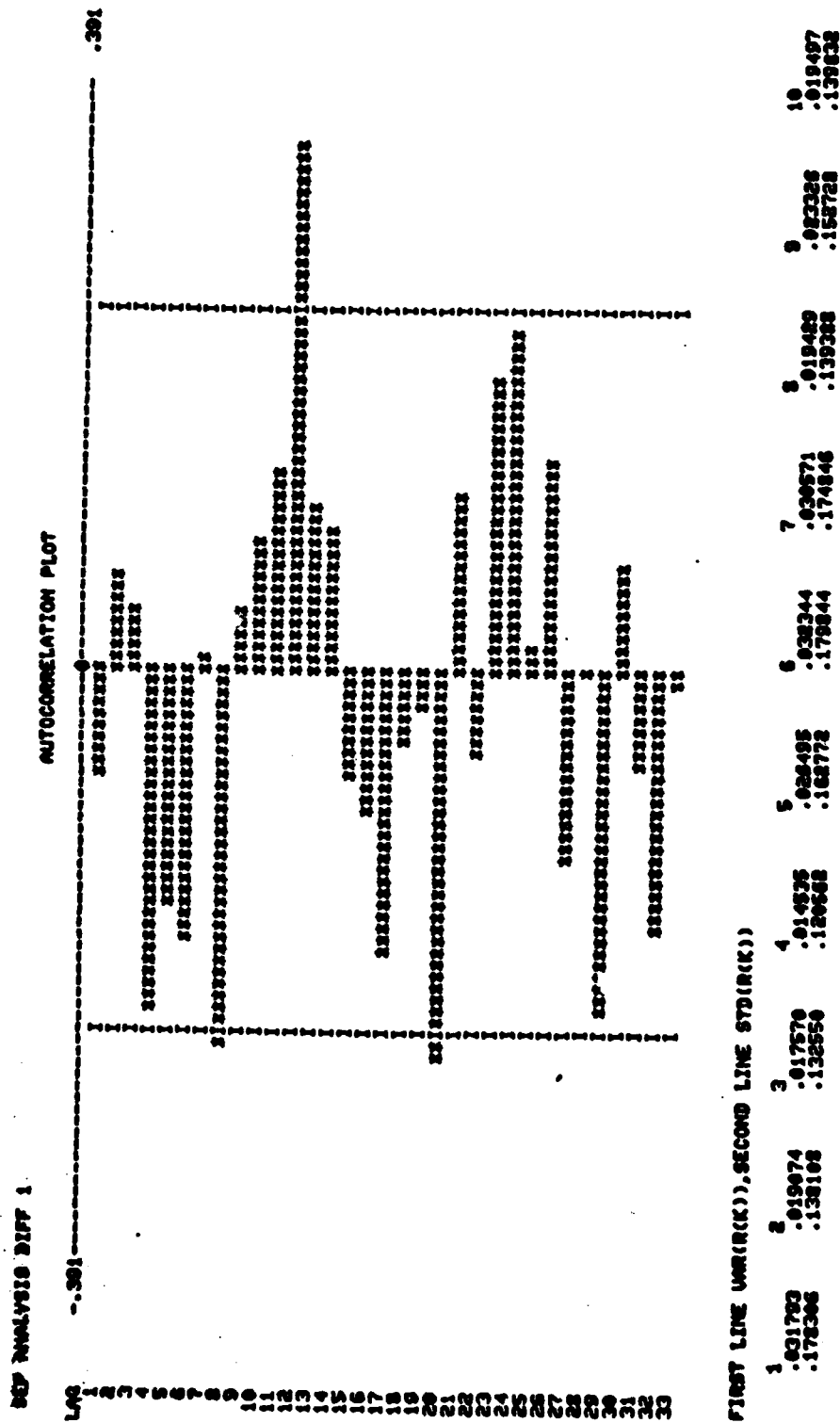


FIGURE 7. Autocorrelation Plot for Nonseasonally Differenced Separation Data

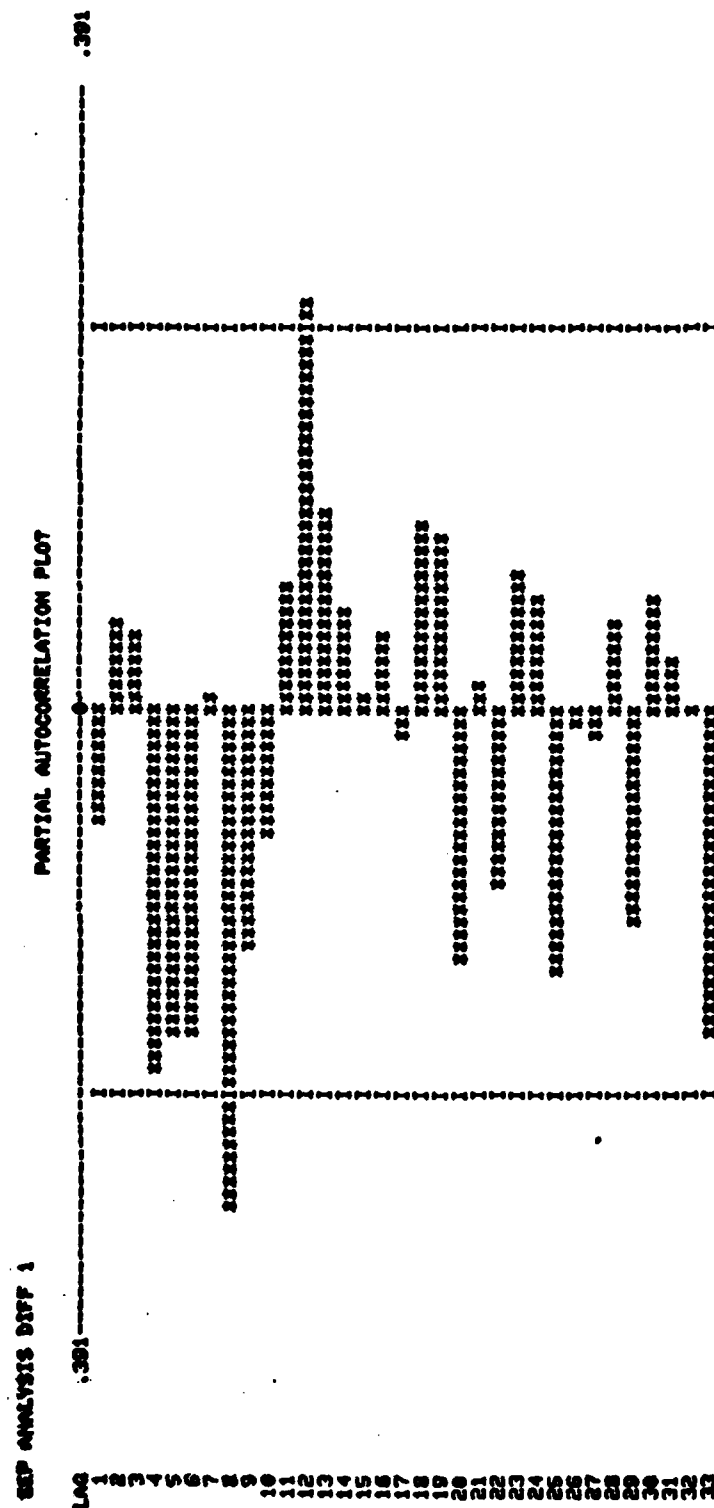


FIGURE 8. Partial Autocorrelation Plot for Nonseasonally Differenced Separation Data

$$Z_t = X_t - X_{t-1} - .0003$$

where X_t is the undifferenced data, .0003 is the mean of the differenced data, and A_t is the random shock of the moving average process. The mean .0003 must be removed from the data since the maximum likelihood estimators of the coefficients are calculated with the mean removed. Finally, since Z_t is differenced data, the equation of undifferenced data is:

$$(1-B)(1-.5327B-.1572B^2-.0129B^3+.3516B^4)Y_t = A_t - .7660A_{t-1}$$

$$(1-1.5327B+.3755B^2+.1443B^3+.3645B^4-.3516B^5)Y_t = A_t - .7660A_{t-1}$$

$$Y_t = X_t - .0003$$

where X_t is the undifferenced data and .0003 is the mean of the difference data.

After the calculations were completed, a residual analysis of the model was performed. A complete list of the computer generated output for this phase of model identification can be found in Appendix G.

Residual Analysis of ARIMA(4,1,1). As with any forecasting model, the adequacy of fit must be tested. In time series analysis, this entails a thorough examination of the residuals for signs of significant autocorrelations

SEP ANALYSIS

ARIMA(4, 1, 1)

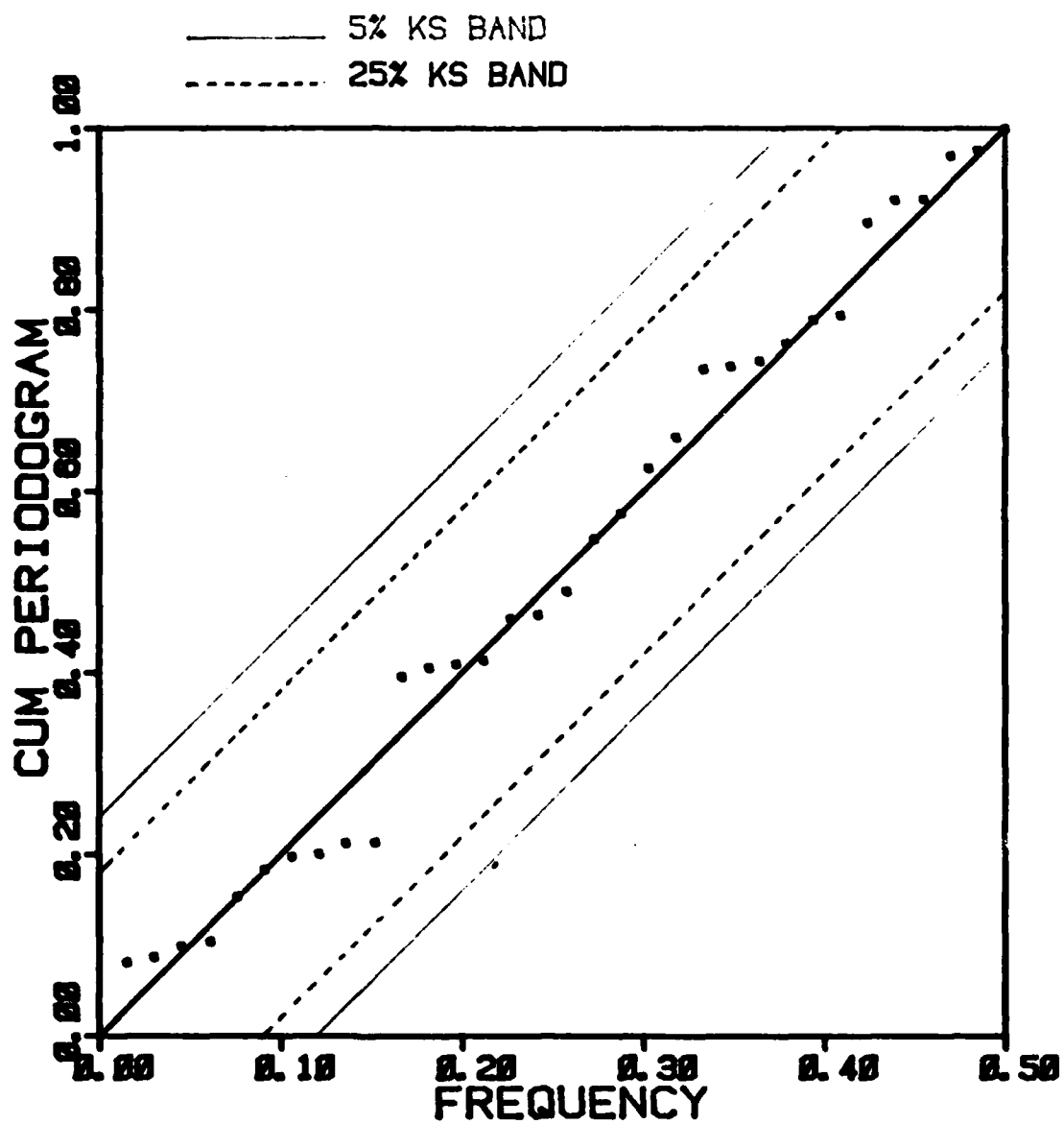


FIGURE 9. Cumulative Periodogram for ARIMA(4,1,1)

or frequencies.

Just as with the first phase of model identification, residual analysis's first phase is to compute the autocorrelations of the estimated residuals. This was accomplished by using the same IMSL subroutine that calculated the autocorrelations of the raw data. In this analysis, an assessment of the autocorrelations suggested that there may be an unaccounted-for wave of length twelve still in the data. Therefore, even if the remaining tests prove negative, attempts should be made to remove this frequency.

The next phase, was to examine the Portmanteau Lack of Fit Test value for indications of inadequacy. This value, takes the estimated autocorrelations as a whole to test for indications of model inadequacy (Ref 2:289-291). Once the value has been calculated, it is then compared against the Chi-Square Distribution with $K-p-q$ degrees of freedom, where p and q are the orders of the ARMA process and K is the number of autocorrelations used in the calculation of the Portmanteau value, which has been labeled Q . In this residual analysis, the value of Q was calculated to be 32.35, with the associated Chi-Square statistic for twenty-eight degrees of freedom being approximately 41.34 at the 95% confidence level. Therefore, this test did not indicate model inadequacy.

The last phase of model inadequacy testing involves

the graphing of a cumulative periodogram. Figure 9 displays this graph. Except for jumps between points, there does not appear to be any sign of the model not accounting for significant periodic characteristics in the series.

In summary, even though the cumulative periodogram and the Portmanteau Lack of Fit test did not indicate model inadequacy, additional analysis was accomplished on the data so that the periodicity of twelve could be removed from the data. Appendix H contains the computer generated autocorrelation table and other test statistics for this residual analysis.

Seasonal Differencing of Twelve. After completing the residual analysis of the ARIMA(4,1,1) model, the original data was seasonally differenced by order one and of length twelve. This data was then used for additional model identification. A complete list of the computer output for this phase is in Appendix I.

Again, the autocorrelations were first examined for signs of differencing and/or possible model identification. As can be seen from their plots, Figures 10 and 11, the autocorrelations have indications of nonstationarity. This hypothesis was later reinforced when examination of the R and S arrays also indicated the need for nonseasonal differencing.

Nonseasonal Differencing. After nonseasonal

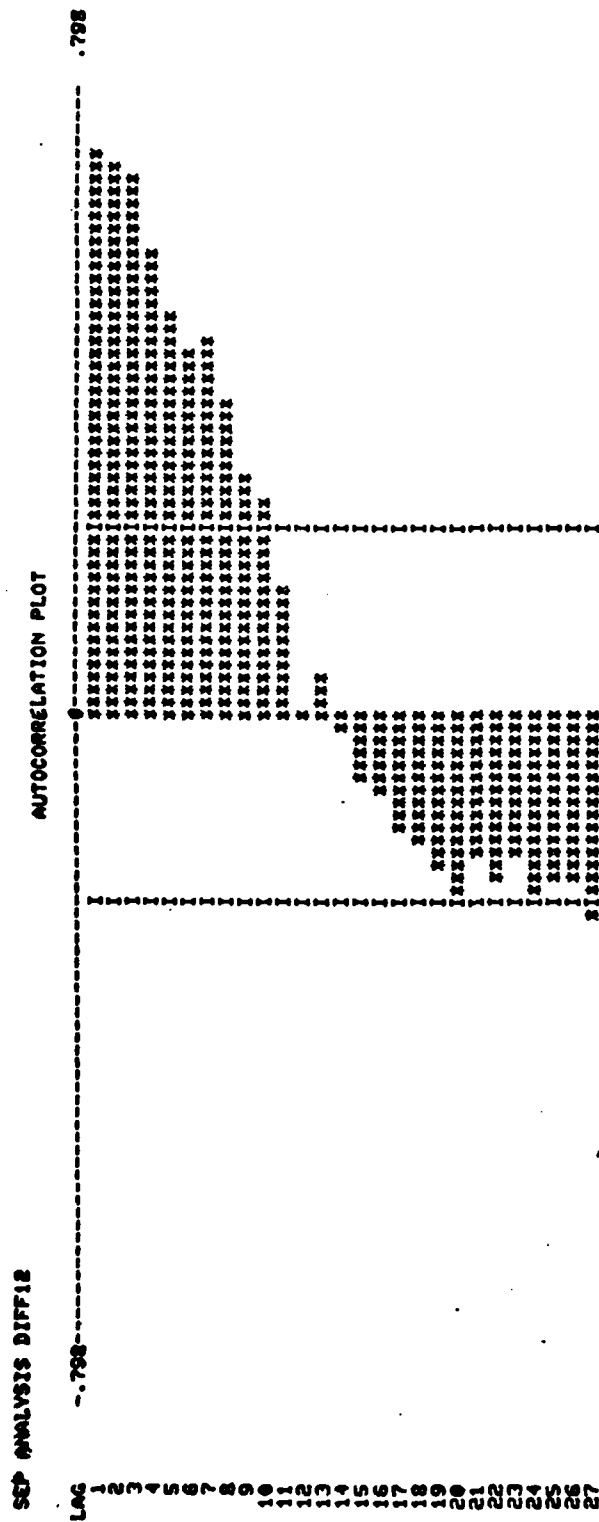


FIGURE 10. Autocorrelation Plot of Seasonally Differenced Separation Data

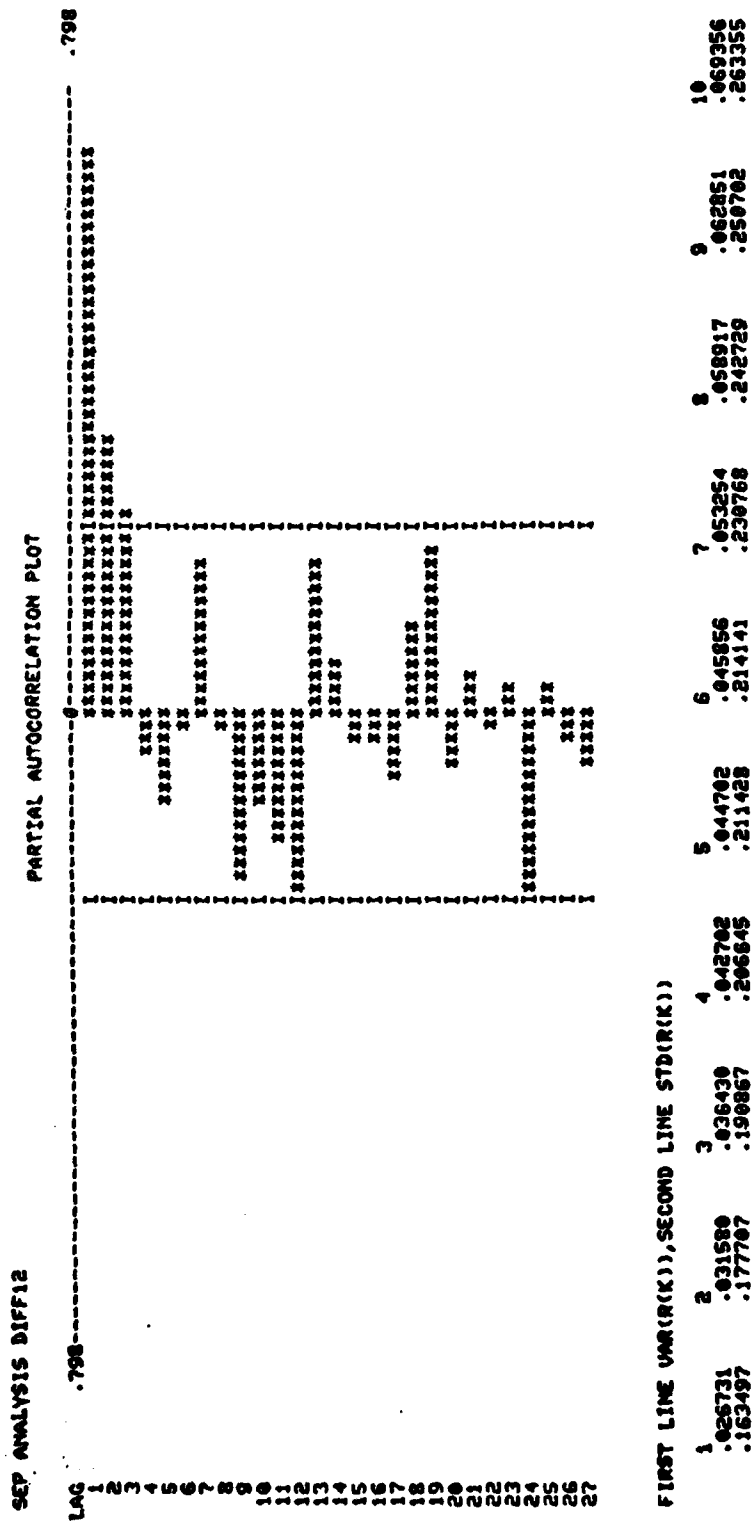


FIGURE 11. Partial Autocorrelation Plot of Seasonally Differenced Separation Data

differencing of the seasonally differenced data was completed, the autocorrelations, periodogram, and R and S arrays were computed. As expected, based upon the previous analysis, no additional differencing was indicated. Also, examination of the autocorrelations indicated that an autoregressive process of order 2 may be adequate. Moreover, both the low and high frequency R and S arrays had strong indications of an AR(2) process having an adequate fit. Finally, the calculation of the D statistic also substantiated a possible AR(2) process. Therefore, the parameters for this model were calculated and the model was examined for inadequacies.

Parameter Estimation. Using the IMSL catalogued program FTMXL, the maximum likelihood estimates of the coefficients were computed, with the resulting equation being:

$$Z_t = -.6008 * Z_{t-1} - .3555 * Z_{t-2} + A_t$$

However, it must be remembered that Z_t has been both seasonally differenced by twelve and nonseasonally differenced by an order of 1. Taking this into consideration, the equation of nondifferenced data becomes:

$$(1-B^{12})(1-B)(1+.6008B+.3555B^2)Y_t = A_t$$

Multiplying out the terms results in:

$$(1-B-B^{12}+B^{13})(1+.6008B+.3555B^2)Y_t=A_t$$

$$(1-.3992B-.2453B^2-.3555B^3-B^{12}+.3992B^{13}+.2453B^{14}+.3555B^{15})Y_t=A_t$$

$$Y_t=X_t+.0032$$

where X_t is the undifferenced data and .0032 is the mean of the differenced data. Again, as mentioned before, the mean of the differenced data must be removed from the data since the program for calculating the maximum likelihood coefficients removes the mean from the data prior to performing its computations. Therefore, when using the estimated equation for predicting, the mean must first be removed from the data and then added back into the predictions following all computations.

Residual Analysis of ARIMA(2,1,0)*(0,1,0)₁₂. As before, the initial step for residual analysis is to compute the autocorrelations for the estimated residuals. The residuals are estimated by subtracting the predicted from the actual. Just as with the previously examined ARIMA(4,1,1) model, the autocorrelation plots had a significant autocorrelation at lag 12. Therefore, this was noted so that additional attempts could be made to remove the significant autocorrelation following the completion of this residual analysis.

The next step in the analysis was to examine the Portmanteau Lack of Fit value. For this model, Q was calculated to be 16.66, with the associated Chi Square statistic for twenty-five degrees of freedom being 37.65 at the 95% confidence level. Therefore, this test failed to identify inadequacy in the proposed model.

Finally, the cumulative periodogram values were computed and graphed. This graph is shown in Figure 12. As can be seen, there are no signs of model inadequacy. In fact, this model's cumulative periodogram appears to have a better fit than does the one associated with the ARIMA(4,1,1). However, this would not be unexpected since this model can be viewed as an overfit when compared with the previous model. A complete list of this residual analysis's computer output can be found in Appendix J.

ARIMA(2,1,0)*(1,1,0)₁₂ Model. Since the autocorrelation plots of the ARIMA(2,1,0)*(0,1,0)₁₂ model indicated a significant value at lag 12, a twelfth order autoregressive coefficient was added to the model. This change resulted in the following equation:

$$(1-B^{12})(1-B)(1+.5294B+.2621B^2)(1+.3742B^{12})Y_t = A_t$$

Multiplying terms yields:

SEP ANALYSIS

ARIMA(2, 1, 0) * (0, 1, 0)₁₂

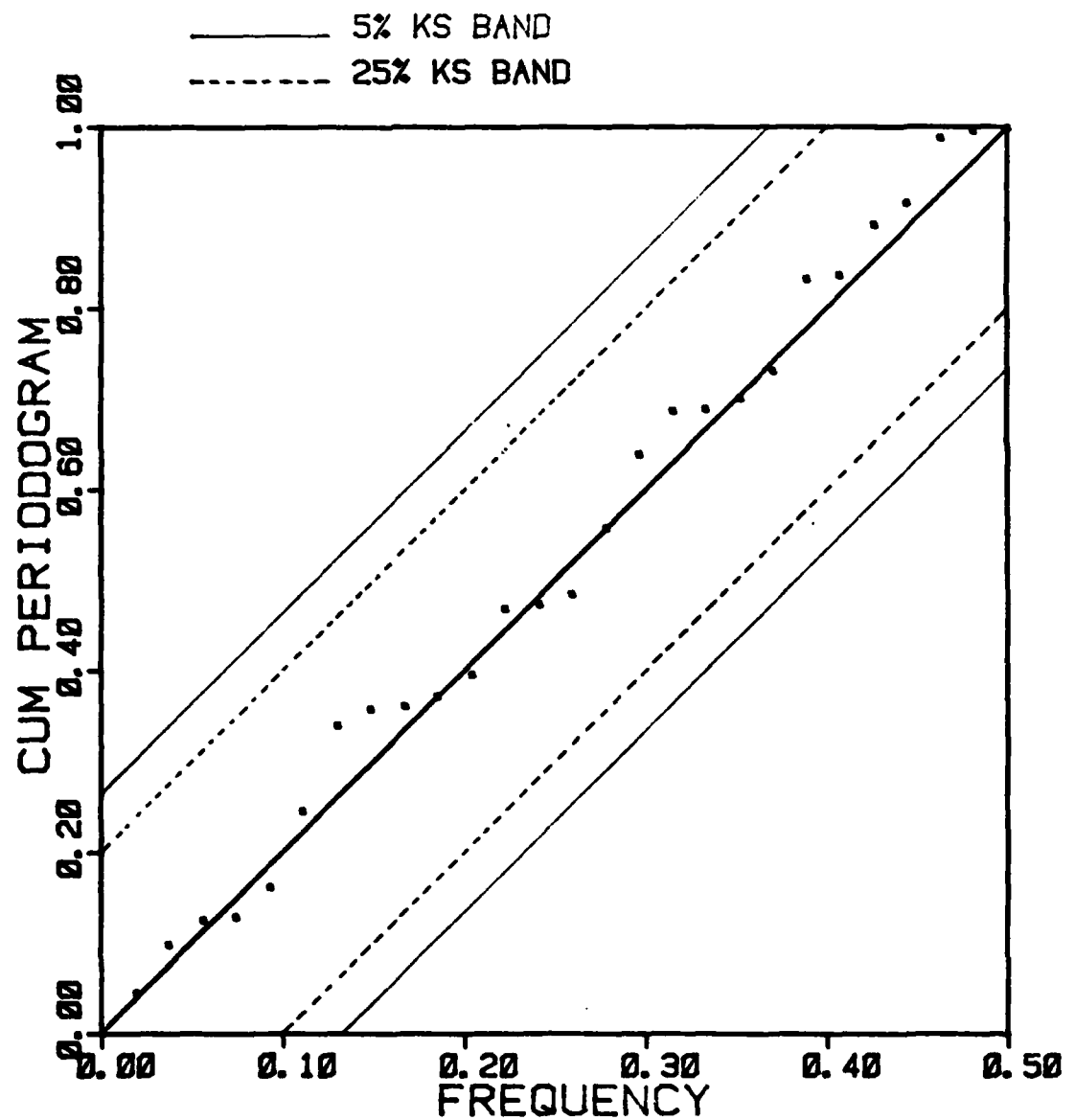


FIGURE 12. Cumulative Periodogram for ARIMA(2,1,0)*(0,1,0)₁₂

$$(1 - .4706B - .2673B^2 - .2621B^3 - .6258B^{12} + .0324B^{13} + .1673B^{14} + .1640B^{15} - .3742B^{24} + .3001B^{26} - .0240B^{28} - .0981B^{30})Y_t = A_t$$

$$Y_t = X_t + .0032$$

where X_t is the undifferenced data and .0032 is the mean of the differenced data.

Residual Analysis of ARIMA(2,1,0)*(1,1,0)₁₂. An examination of the autocorrelation plots, Figures 13 and 14, indicated that for the first time the autocorrelations failed to exceed an estimated 2 standard error band. Therefore, it appeared that the estimated residuals were white noise.

Further, examination of the Portmanteau Lack of Fit value also indicated that there were no signs of inadequacy, i.e., the value of Q was calculated as 19.43 with the associated Chi-Square statistic with alpha equal to .05 and twenty-five degrees of freedom being 37.65.

Finally, the cumulative periodogram, Figure 15, was analyzed for signs of unmodeled frequencies. As with the other models, all points fell well within both the 5% and 25% error bands. Therefore, based upon the cumulative periodogram, the Portmanteau Lack of Fit test, and a subjective assessment of the autocorrelations, there do not appear to be any significant signs of model inadequacies.

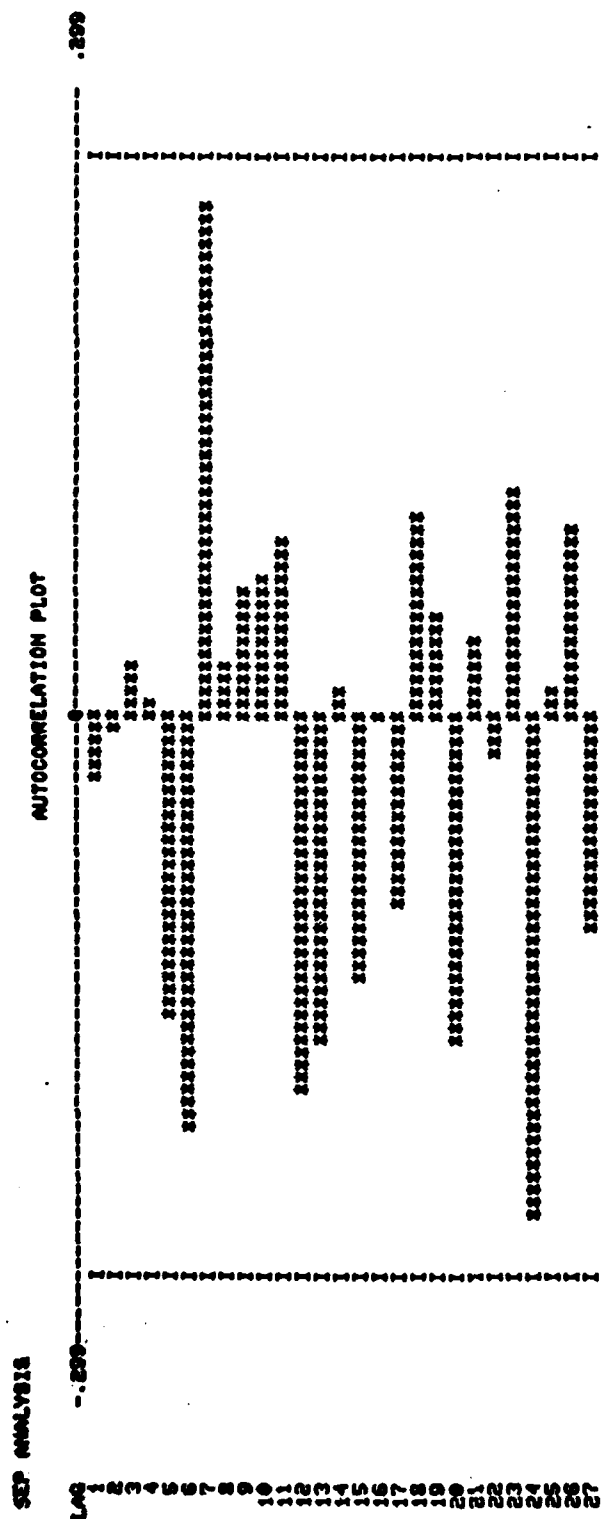


FIGURE 13. Autocorrelation Plot of the Residuals
from the $ARIMA(2,1,0) \times (1,1,0)_{12}$

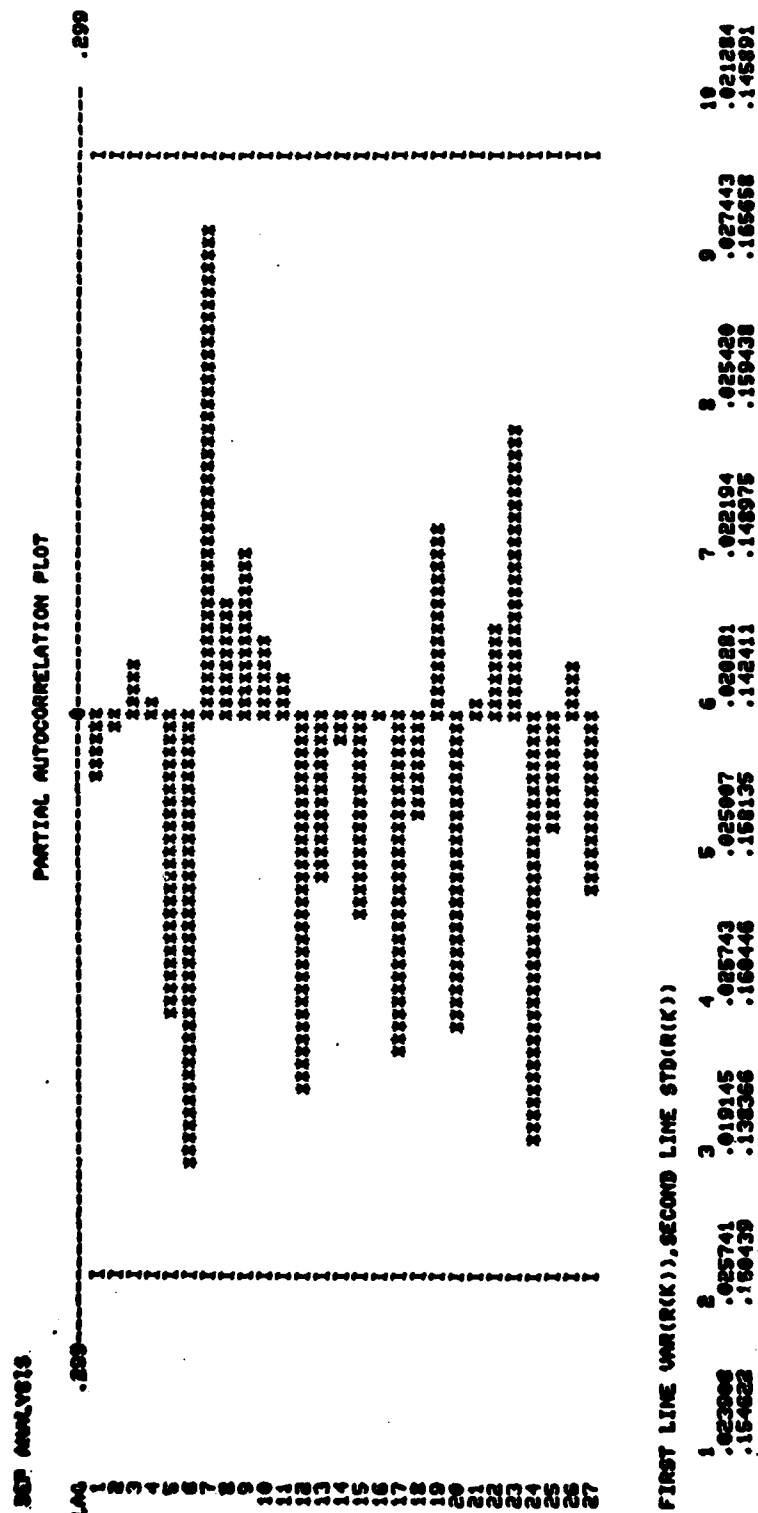


FIGURE 14. Partial Autocorrelation Plot of the Residuals from the $ARIMA(2,1,0)*(1,1,0)_{12}$

SEP ANALYSIS

ARIMA(2, 1, 0) * (1, 1, 0)₁₂

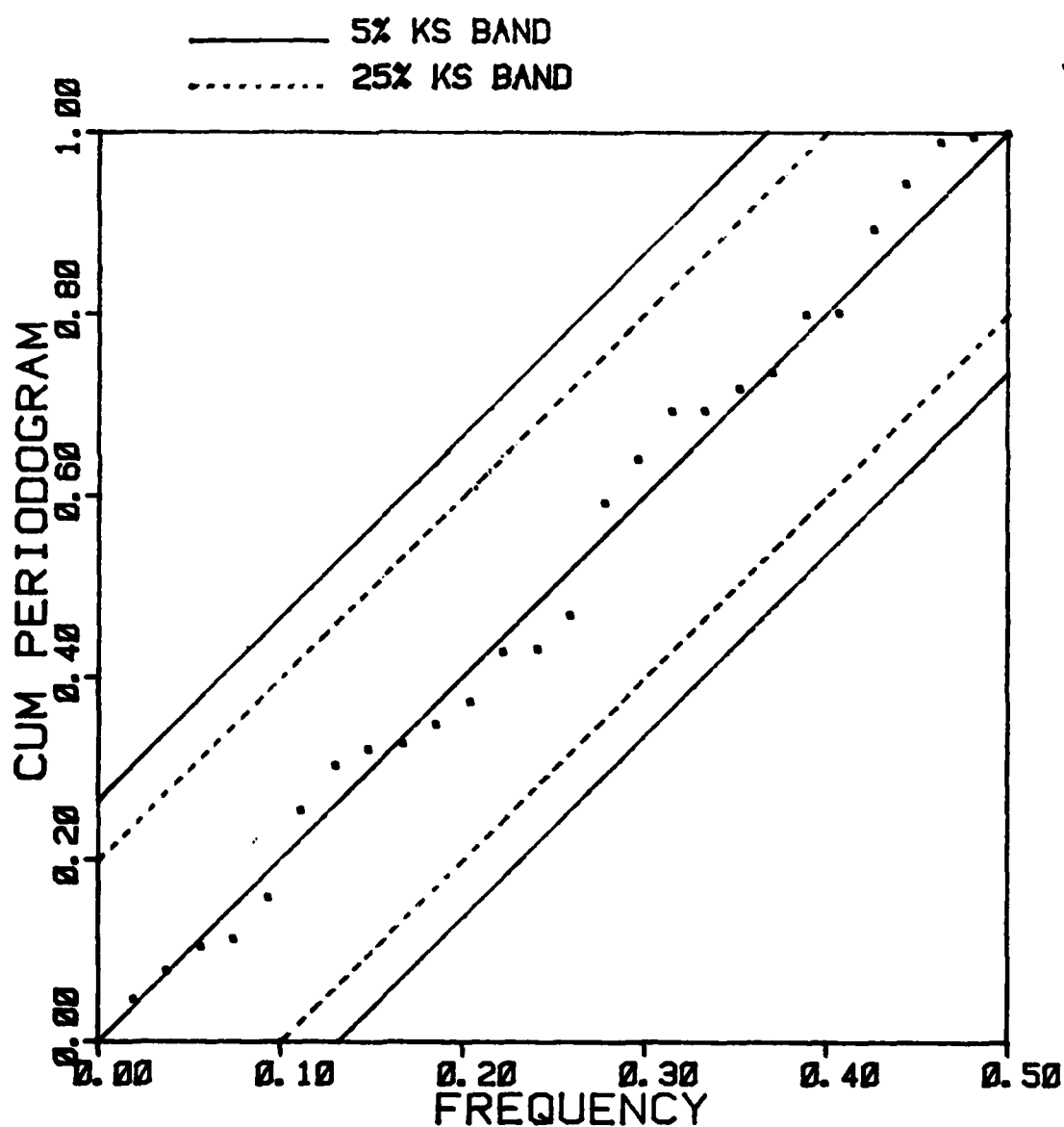


FIGURE 15. Cumulative Periodogram for ARIMA(2,1,0)*(1,1,0)₁₂

Conclusions

Although the $ARIMA(2,1,0) \times (1,1,0)_m$ adequately fits the data, there still appears to be numerous unaccounted for frequencies. These periodicities, which are not statistically significant, have an observable stairstep pattern. See Figure 15. Therefore, attempts to forecast will in all probability result in short term errors of a magnitude which may be unacceptable. However, when the loss projections are taken as a whole, the magnitude of the overall error may be reduced to the point where the resulting prediction error may be acceptable. Keeping this in mind, the following table, which compares the FY82 actual values with the FY82 time series prediction, was prepared:

Table VII Time Series FY82 Prediction Error (Data as of 30 Sep 81)				
Month	Actual	FY82 Pred	% Error	FY83 Pred
Oct	.193	.274	+42.0	.203
Nov	.193	.136	-29.5	.058
Dec	.197	.207	+ 5.1	.120
Jan	.165	.149	- 9.7	.067
Feb	.159	.116	-27.0	.031
Mar	.137	.131	- 4.4	.048
Apr	.145	.120	-17.2	.032
May	.141	.133	- 5.7	.053
Jun	.231	.160	-30.7	.081
Jul	.219	.291	+32.9	.201
Aug	.285	.257	- 9.8	.177
Sep	.221	.186	-15.8	.107
Total	2.286	2.160	- 5.5	1.178
Number	1137	1074	-63	587

The total prediction error of 63 (1137-1074) equates to a 5.5% inaccuracy. However, when the FY83 estimate (predicting two years out) was examined, the downward trend in losses continued to the point where the model could not be considered reliable. In other words, since there were already more than 400 approved career separations in-system for FY83 as of 30 September 1982, it would seem unrealistic to assume that only 175 additional career separations would be submitted throughout FY83. In addition, these in-system numbers do not include the end of obligation losses which would also be included in this category.

As a final note, when the prediction was extended into FY84, several months had negative separation rates. In other words, the downward trend which the $ARIMA(2,1,0)*(1,1,0)_2$ had modeled was not being reversed, i.e., the true long term trend was not being captured. Therefore, the time series data requires additional analysis before long term trend predictions should be attempted. However, this is not to say that current fiscal year loss rates could not be calculated for use as a comparison tool with other prediction techniques such as regression analysis.

Recommendations

The time series analysis of separation data indicated

an area of research which I feel deserves additional attention. As observed in the initial periodogram, there appears to be a long term wave for which differencing could not account. Therefore, a simple Fourier Analysis of the data was accomplished. This analysis indicated that a wave of length 64 or 65 may be present in the data. This hypothesis is also strengthened when one subjectively assesses the plot of the separation data (Figure 16). As can be seen, the rates had been increasing through mid-1979, at which point they began decreasing. Since it is both unrealistic and infeasible to assume that the rates will continue to decrease as the FY83 and FY84 time series predictions suggest, one would expect that they would have to bottom out and then begin to either stabilize or climb. To express this in another way, during FY78 and FY79, when the economy was significantly better than today, those individuals who were not quite satisfied with the service were able to easily obtain employment outside the Air Force. Essentially, those individuals who were sitting on the fence tended to jump to the private sector. However, when economic conditions rapidly changed during the years following 1979, jobs became harder to obtain and the retention rates improved. This change, therefore tended to restrict one's propensity to separate from the service. Therefore, it could reasonably be expected that when economic conditions improve, separation rates will

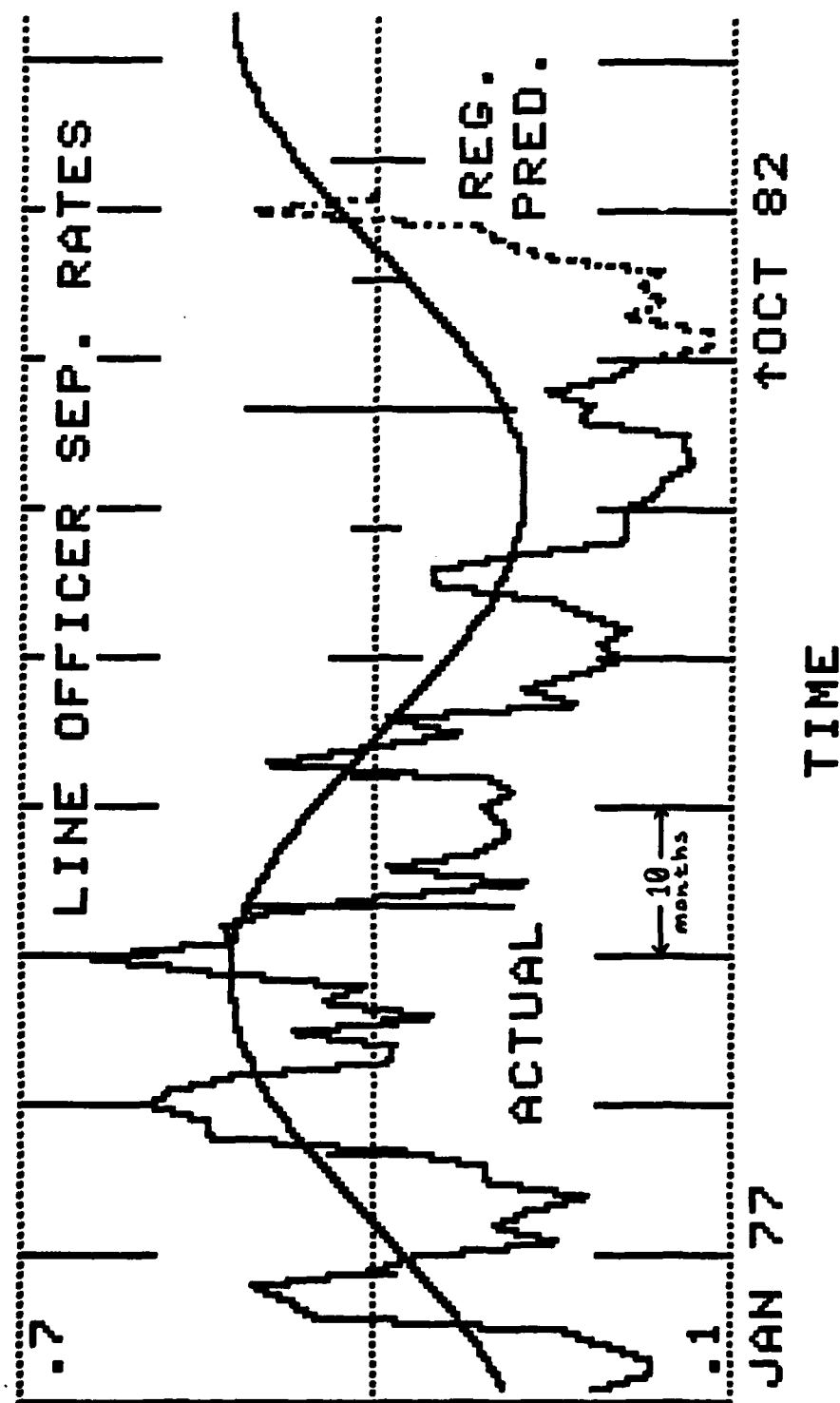


FIGURE 16. Long Term Trend Analysis of Separation Data

significantly increase.

As everyone knows, to accurately predict such a change is difficult if not impossible. However, there are indications that hint at when the influence of economic conditions change the separation patterns of Air Force officers. One easily obtained indicator is the number of DOSs in system. In essence, DOSs in system tends to be a type of economic barometer which measures the impact which the economy is having on one's propensity to separate. Therefore, since the FY83 number in system is greater than last year's (as measured at equivalent points in time), it could be assumed that the economic conditions which influence one's propensity to separate may be improving. This hypothesis can be graphically supported, Figure 16, by adding the regression analysis prediction to the end of the separation trend chart. In addition, if one extends the estimated 64 month wave beyond the most recent observation, it can be seen that this wave and the regression analysis's prediction trend patterns tend to coincide. Therefore, my recommendation is to reaccomplish the time series analysis but begin with a Fourier Analysis which would identify and calculate long term waves within the data. These calculated waves could then be removed from the data so that a conventional time domain analysis could be employed. Once this analysis is completed, the long term wave could be projected into the future and then simply added to the

predictions provided by the time series model.

IV. Regression Analysis of Retirement Application Patterns

Methodology

The same SPSS regression package that was used to model separation trends was also used to model retirement application patterns. Basically, it was hoped that the same regression methodology could be used to predict retirement loss patterns. Also, just as with the separation data, the primary source of retirement application information was the FYCOPS report (Appendix A).

Data Base Configuration

In the previous discussion of officer separations, it was noted that individuals are required by Air Force policy to submit an application for separation at least 180 days prior to the date on which they request to be separated. For those officers who are retirement eligible, a similar type of policy is applicable. This policy states that all retirement eligible officers must submit their retirement applications at least 90 days prior to a requested retirement date. This 90-days notice is required so that all necessary paperwork and mandatory physicals can be completed prior to the month in which the retirement is to become effective. Therefore, just as with DOSs in system for separations, the number of approved and in-system

retirements was used as the primary independent variable in the retirement analysis.

In addition to voluntary retirements, a large number of the losses which occur within a given fiscal year are in a category commonly referred to as mandatory retirements. This type of retirement is comprised of three subcategories: disability, promotion failure, and high year tenure retirements. Even though mandatory loss patterns are different from voluntary retirement patterns, the system still records the anticipated retirement date several months prior to the month in which the retirement is scheduled to occur. The high year tenure retirement is normally recorded in the system twelve months prior to the required retirement date, while the promotion failure retirement is usually entered into the system immediately following the promotion board results. Promotion failure retirements are required by Air Force policy to occur within 180 days following the release of promotion board results. The disability retirement advance notification is, as one would expect, very little. However, since the number of disability retirements which occur within any given month are usually less than ten, their impact is negligible. Moreover, since the number of mandatory retirements which occur within any individual category is small (normally less than ten), the sum of all three categories was used as the second independent variable

instead of using each subcategory as a separate variable.

The data base structure designed for this analysis is essentially the same as that which was used for the separation data bases, i.e., there are twelve data bases each comprised of information about the number of applications approved and in-system a given number of months out. As with the separation files, the first column of information in each data base is the dependent variable accomplished retirements. The second column of information in the retirement files is the independent variable voluntary retirements in-system. The third column in each data base is the previously discussed sum of all mandatory retirements. The fourth column in every file is a variable which time orders the observations. This additional variable was required since many of the data bases' residuals were positively autocorrelated. Also, some of the data bases required the addition of an indicator variable which was labeled policy. This variable always appears as the fifth column in those data bases which required the variable. In essence, this indicator variable pertains to those months in which promotion failure losses had a significant effect on retirements. More will be discussed about this variable in the regression results section.

The names used for the retirement files are RET1 through RET12. The number used in each name has the same

connotation as that associated with the separation files, i.e., RET1 contains data for one month out, RET2 contains data for two months out, etc. Since a listing of each data base is contained in the SPSS output (Appendix K), a separate appendix containing only data base information is not included.

Finally, the amount of historical information used in the analyses was restricted by the amount of historical data available. Initially, the data bases included data which had been recorded subsequent to September 1978. However, after the initial regression analyses were completed, the data bases were restricted to that loss information which had been recorded after 30 September 1979. In summary, the preliminary analyses indicated that several promotions/policy changes which occurred prior to FY80 had significantly affected the pattern of retirement applications.

Regression Results

Using the maximum number of observations, with the most recent being May 1982, the R^2 statistic ranged from .99 for one month out (RET1) to .42 for twelve months out (RET12). The adjusted R^2 ranged from .99 for RET1 to .38 for RET12. A summary listing of these and other major statistics can be found in Tables VIII and IX.

Like the separation analyses which identified a

TABLE VIII

Regression Summary Statistics (Part A) Monthly Observations through May 82				
FILE	OVERALL F	R SQUARE	ADJ R SQUARE	DURBIN-WATSON
RET1	33644.362	.99960	.99957	2.0107
RET2	7514.959	.99827	.99814	1.6157
RET3	3431.567	.99632	.99603	1.7880
RET4	849.546	.98569	.98453	1.4611
RET5	441.352	.97353	.97132	1.2711
RET6	192.030	.94273	.93782	2.3546
RET7	48.038	.81830	.80827	1.6124
RET8	23.951	.70546	.67600	1.5596
RET9	21.961	.59416	.56711	1.5595
RET10	20.513	.58587	.55731	1.3553
RET11	20.342	.58384	.55514	1.2970
RET12	9.788	.42031	.37736	1.4614

TABLE IX

Regression Summary Statistics (Part B) Monthly Observations through May 82				
FILE	# OF OBS	VARIABLE F STATISTICS		
		VOL RETS	MAND RETS	TIME
RET1	44	42808.75	6177.21	15.61
RET2	43	9288.48	1391.88	29.73
RET3	42	4207.24	766.77	40.43
RET4	41	1051.30	164.27	35.14
RET5	40	553.09	182.46	36.83
RET6	39	231.78	26.59	13.28
RET7	36	113.00	9.23	8.75
RET8	34	42.16	10.18	4.60
RET9	33	31.36	7.36	N/A
RET10	32	29.33	8.39	N/A
RET11	32	29.76	8.55	N/A
RET12	30	17.57	4.97	N/A

significant drop in the R^2 statistic after SEP6, the retirement's R^2 statistic also decreased significantly. It was determined that this decrease was a result of two things. First, it was felt that this decrease reflected the methodology's inability to account for the variability in the dependent variable as the time span between the application submittal month and the month of retirement increased. Second, and probably most significant, it was felt that a large portion of the decrease was a result of the data bases not containing a variable which reflected a change in policy or the release of promotion board results (policy variable was not used in the initial analysis). Therefore, these two possible explanations were noted for future analysis. This second hypothesis resulted in the addition of the fifth variable policy which was previously noted.

In addition to the R^2 analysis of the regression results, the F statistics were found to be significant at the 95% level for all twelve data bases. Further, examination of the F statistics for both the voluntary and mandatory retirement variables indicated that they too were significant at the 95% confidence level for all data bases. However, the time variable, which was used in the initial analyses, was not found to be significant for the data bases RET9 through RET12.

Finally, the Durbin-Watson values were checked for

signs of autocorrelation. This analysis indicated that several data bases had indications of positive autocorrelation. In essence, if the error terms in the regression model are positively autocorrelated, then the use of the regular least squares procedure has four important consequences. These are summarized below (Ref 7:352):

1. The regular least squares regression coefficients are still unbiased, but no longer have the minimum variance property and may be quite inefficient.
2. MSE may seriously underestimate the variance of the error terms.
3. $s(b_k)$ calculated according to the regular least squares procedure may seriously underestimate the true standard deviation of the estimated regression coefficient with that procedure.
4. The confidence intervals and test using the t and F distributions are no longer strictly applicable.

Therefore, attempts should always be made to remove signs of autocorrelation.

Initially, it was believed that the positive autocorrelation was being caused by the residuals which were associated with the FY79 data. A subjective assessment of these error terms indicated that in most data bases, the FY79 error terms were usually positive and significantly larger than those following fiscal year 1979. This difference was believed to be due to both the promotion boards which were held in FY79 and the condition

of the private sector economy. Therefore, since a comparison of the FY79 data points with subsequent residuals indicated that they were outliers, they were removed from the files, i.e., only data recorded following 30 September 1979 were used in future analyses. Also, in addition to the FY79 observation restriction, all data bases had the indicator variable policy added so that those months which had promotion failure losses or a retirement policy change could be identified.

Following the removal of the FY79 observations and the addition of the policy variable, all regression analyses were reaccomplished. These regression results were significantly different from those which were originally obtained. The adjusted R^2 statistics ranged from .99 to .82 instead of .99 to .38. Moreover, the remaining statistics (Tables X and XI) also had considerably different results. The F statistic for mandatory retirements in data bases RET8 and RET9 failed to pass a 95% confidence level test, and the F statistic for time was below the 95% confidence level test in files RET1, and RET6 through RET12. In addition, the just added policy variable was statistically significant in the data bases RET6 through RET12. The policy F statistics indicate that in those data bases which predict retirements more than five months in advance, policy changes/promotion board results have a significant impact on the number of retirements

TABLE X

Regression Summary Statistics (Part A) Monthly Observations, Oct 79 through May 82				
FILE	OVERALL F	R SQUARE	ADJ R SQUARE	DURBIN-WATSON
RET1	19533.046	.99952	.99947	1.9993
RET2	5248.449	.99822	.99803	1.7528
RET3	1749.056	.99469	.99412	1.6386
RET4	794.176	.98838	.98714	1.4496
RET5	415.041	.97801	.97565	1.9528
RET6	165.125	.94650	.94077	1.8236
RET7	70.470	.88675	.87417	2.1492
RET8	61.500	.87648	.86223	2.0095
RET9	45.535	.84010	.82165	1.5548
RET10	71.942	.89248	.88008	1.6763
RET11	68.372	.88750	.87452	1.5227
RET12	84.348	.91009	.89330	1.8164

TABLE XI

Regression Summary Statistics (Part B) Monthly Observations, Oct 79 through May 82					
FILE	# OF OBS	ASSOCIATED VARIABLE F STATISTICS			
		VOL RETS	MAND RETS	POLICY VAR	TIME
RET1	32	34135.45	3099.75	N/A	2.54
RET2	32	9095.94	772.60	N/A	4.88
RET3	32	2998.19	299.75	N/A	8.57
RET4	32	1455.80	119.25	N/A	12.01
RET5	32	633.04	65.26	N/A	4.11
RET6	32	253.83	22.99	5.34	N/A
RET7	31	168.68	5.27	7.23	N/A
RET8	30	46.04	1.48	25.54	N/A
RET9	30	33.93	2.58	25.18	N/A
RET10	30	49.84	5.29	69.19	N/A
RET11	30	47.33	6.45	69.58	N/A
RET12	28	55.44	18.07	132.54	N/A

which will ultimately occur. Also, the decreasing F value for the time variable indicated that the decreasing retirement pattern which was prevalent when the FY79 observations were in the data bases is not as significant as before.

When the Durbin-Watson values were checked, it was found that those files whose residuals indicated autocorrelation had changed somewhat. Instead of nine files having indications of autocorrelation, only four data bases' Durbin-Watson value were either in the inconclusive or the positive autocorrelation region. However, this decrease in positively autocorrelated data bases was expected following the removal of the FY79 observations' positive residuals. However, since no obvious reason for the remaining positive autocorrelation was apparent, additional analysis was needed in hopes of removing the remaining signs of positive autocorrelation. The steps involved in this analysis are discussed below.

Autocorrelation Analysis. Since each data base's composition is basically the same, it was felt that by thoroughly analyzing just one data base, a hypothesis for the autocorrelation might be discovered. Therefore, since ET4's Durbin-Watson statistic had the lowest value of all twelve data bases, this file was chosen for the extensive autocorrelation research. A complete discussion of this analysis can be found in Appendix L.

In summary, it was felt that positive autocorrelation was being caused by retirement application patterns which occur within fiscal years. It was found through a residual plot analysis, that except for FY81 the residuals tended to change from negative to positive as the fiscal year progressed. Further, it was felt that the FY81 residual pattern was a result of the large pay increase which was given in October 1981. Although this hypothesis could be modeled, a degree of uncertainty would still exist because the size of RET4 precluded positive identification of the cause. Therefore, retirement predictions produced with this methodology should include a list of caveats associated with positive autocorrelation.

After the completion of RET4's residual analysis, two additional months of observations were made available. Therefore, all regression results were reaccomplished following the addition of June and July's observations to the data bases. A list of the summary statistics for these regressions are in Tables XII and XIII. As shown, there were few changes in the R^2 statistics; however, the F values tended to take on a different meaning. Although RET2's time variable was significant in Table XI, it was not statistically significant after the two additional observations were added. This in itself may not seem important, but if one considers the underlying patterns associated with retirement applications, one could possibly

TABLE XII

Regression Summary Statistics (Part A) Monthly Observations, Oct 79 through Jul 82				
FILE	OVERALL F	R SQUARE	ADJ R SQUARE	DURBIN-WATSON
RET1	30074.480	.99948	.99945	1.8566
RET2	7377.640	.99790	.99777	1.5314
RET3	1708.593	.99418	.99360	1.5707
RET4	825.885	.98804	.98684	1.4790
RET5	447.647	.97815	.97956	1.9473
RET6	164.855	.94281	.93709	1.6447
RET7	76.978	.88843	.87689	2.1080
RET8	67.587	.87866	.86566	2.0579
RET9	88.720	.90481	.89462	1.7150
RET10	79.378	.89749	.88352	1.7106
RET11	74.789	.88905	.87716	1.5583
RET12	82.277	.83528	.82351	1.7753

TABLE XIII

Regression Summary Statistics (Part B) Monthly Observations, Oct 79 through Jul 82					
FILE	# OF OBS	VARIABLE F STATISTICS			
		VOL RETS	MAND RETS	POLICY VAR	TIME
RET1	34	37853.78	3210.83	N/A	N/A
RET2	34	9339.63	720.97	N/A	N/A
RET3	34	3067.55	289.46	N/A	6.08
RET4	34	1588.46	126.27	N/A	13.78
RET5	34	874.81	102.05	N/A	14.52
RET6	34	261.40	24.11	6.80	N/A
RET7	33	187.30	5.62	8.11	N/A
RET8	32	59.17	1.50	27.65	N/A
RET9	32	73.54	2.78	61.96	N/A
RET10	32	76.11	5.87	64.09	N/A
RET11	32	74.53	7.03	61.49	N/A
RET12	31	64.05	18.11	123.41	N/A

hypothesize that the previous downward trend in retirements may be reversing or at least stabilizing. In essence, these results strengthen the previously proposed hypothesis that the downward trend in retirement application patterns may be reversing.

Model Testing

Although an analysis similar to the one used to determine an optimal number of observations for the separation analysis would have also been desirable in the retirement analysis, two things prevented its accomplishment. First, time precluded the full scale prediction error minimization which was conducted in the separation analysis. This was due to the hundreds of regression runs which would have been necessary in order to accomplish a similar analysis. Second, and most important, it was felt that due to the nature of the autocorrelation, trying to reduce the number of observations would only exacerbate the positive autocorrelation problem. Since the residual analysis of RET4 identified a pattern associated with fiscal years, a reduction of observations may result in significant undesirable equations which would reflect a particular year's application pattern and not an average trend. Therefore, the model testing phase was reduced to an analysis of prediction error magnitude, and not prediction error minimization.

In addition to the positive autocorrelation problem, small data base sizes precluded the calculations on a large scale of the prediction errors. In other words, in order to project the twelfth month of FY82, RET12 would have had only twenty observations in its data base. Therefore, the prediction error phase did not include predictions associated with observations recorded prior to October 1981. This self imposed restriction resulted in a maximum calculation of twelve prediction errors for RET1, eleven for RET2, ten for RET3, etc., until only one prediction error was calculated for RET12. Although this restriction severely limited the ability of this analysis to accurately determine the prediction errors associated with this methodology, it was felt that additional error computations would be meaningless due to data base restrictions and autocorrelation problems.

For this phase of model testing, each prediction was computed just as it would have been under operational conditions. The results of this exercise are contained in Table XIV. As shown, every data base's average prediction error was negative except RET6. Using these results, the average error for a twelve month period would be approximately 168.4. However, it should also be noted that the averages for RET7 through RET12 were heavily weighted by the large negative error associated with September 1982. Since the September errors tended to be significantly

Table XIV

Retirement Regression Prediction Errors ERROR=PREDICTION-ACTUAL												
ACTUAL RETS	OCT 81	NOV 81	DEC 81	JAN 82	FEB 82	MAR 82	APR 82	MAY 82	JUN 82	JUL 82	AUG 82	SEP 82
	361	345	207	206	250	185	139	149	207	308	289	295
DATA BASE	Error											
RET1	-7	0	-3	0	-2	-2	-1	-6	-3	-2	2	2
RET2		2	1	2	6	-3	-1	-3	-8	-6	-21	-9
RET3			2	4	-1	-12	-13	-9	-18	-7	-31	-2
RET4				-16	-16	-29	-22	-15	-21	1	-15	-29
RET5					5	-18	-17	-14	-2	4	-6	-4
RET6						15	10	8	2	41	36	0
RET7							2	-10	-9	20	41	-51
RET8								14	2	-24	-8	-47
RET9									-16	-8	-22	-52
RET10										-7	-2	-71
RET11											1	-58
RET12												-57

larger than those associated with other months, the average expected error may be overstated. Therefore, in hopes of obtaining a better estimate of the model's prediction ability, an FY82 prediction was compared with actual retirements. Figure 13 displays these results.

As can be seen, the predicted retirements follow the actual retirement pattern extremely well. If it were not for the large September error, the twelve month prediction would be off only fractionally. For this exercise, the total twelve month error was computed to be sixty-three, with 90.5% of the total error occurring in the last prediction. In essence, the twelve month error of sixty-three equated to a 2.14% inaccuracy. In contrast, had the initial regressions been used to predict FY82's retirements, a 5.88% error in the prediction would have occurred. Therefore, the modifications to the data bases resulted in 63.61% improvement in the prediction error.

Conclusions

As noted, time constraints precluded the completion of a thorough analysis of retirement data. However, the results of those areas which were completed were as impressive as those associated with the separation analysis except for the positive autocorrelation problem. Also, in an examination of the prediction errors, there appears to be the possibility of a significantly larger error

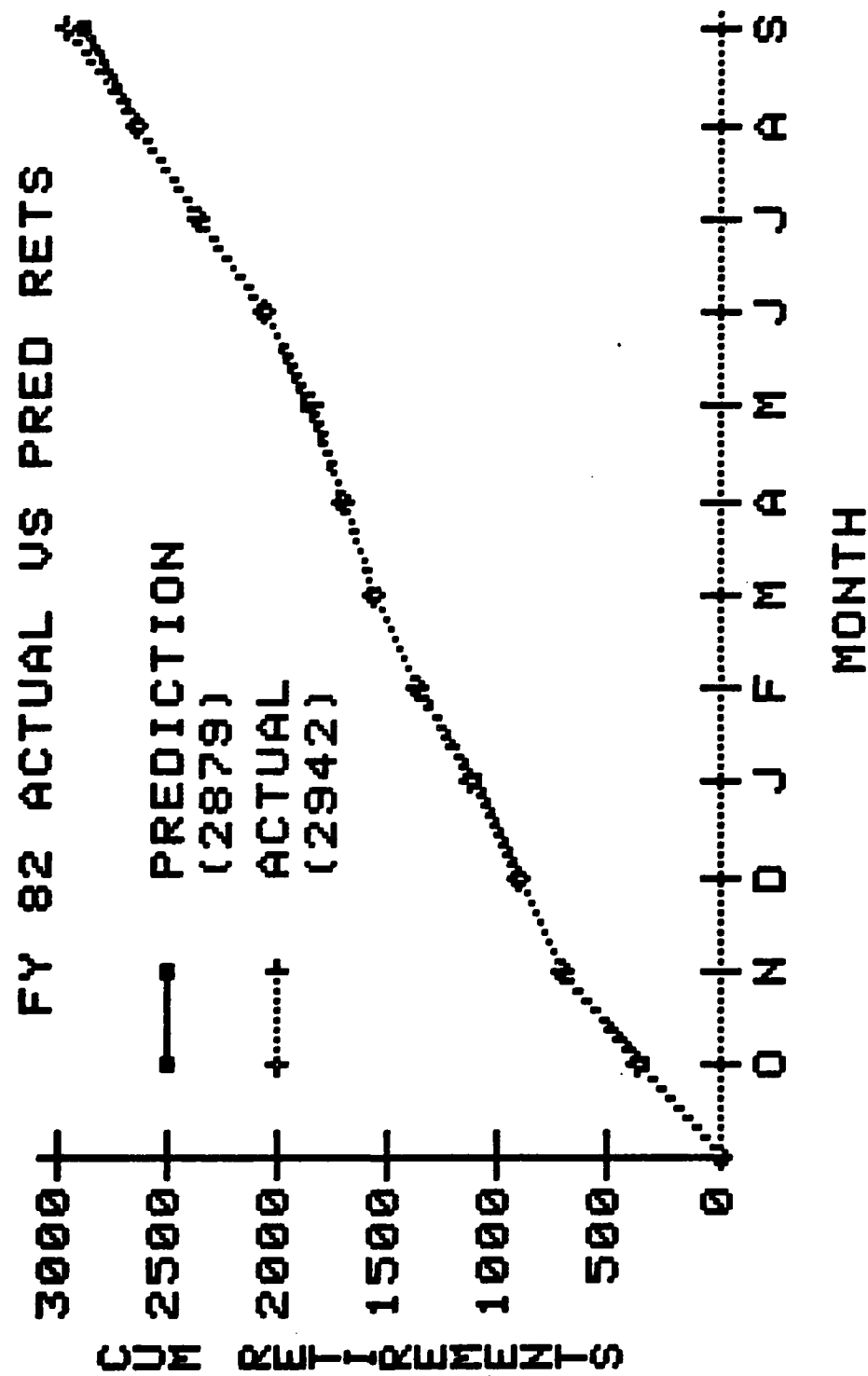


FIGURE 17. FY82 Officer Actual Rets vs Prediction

occurring than that which was computed for FY82. As can be found in Table XIV, several of the individual month's prediction errors had occurrences of large deviations from the mean. Should several of these occur within the same fiscal year's prediction, an error in the range of several hundred may not be improbable. In addition, when FY82's September prediction was made, the policy variable was not used. If there had been knowledge in October 1981 that a group of promotion failures would be required to retire on or before the month of September, an additional 197 officers would have been added to the September prediction. This addition would have changed the prediction from 2,879 to 3,076, or instead of a 2.14% error, it would have been reported as a 4.55% error. However, even this would probably be well within management tolerances for a twelve month prediction.

Recommendations

Unlike the separation prediction errors, the retirement errors do not appear to have a visible pattern. In essence, this may inhibit the ability to model the prediction errors with an ARIMA model. On the other hand, it may be that a twelve month cumulative error may be easier to model since it appears that overall, the prediction errors tend to the negative side. It may be that this tendency toward negative errors is the result of

the decreasing retirement trend which was previously noted.

In addition to modeling the errors by means of a time series model, it was felt that a modified update procedure similar to the one proposed in the separation analysis may reduce the negative error tendency. Therefore, a trial of this procedure was accomplished. The results are displayed below in Table XV:

Table XV

Modified Update Procedure's Prediction Error FY82			
Month	Actual	Original Pred	Modified Pred
Oct	361	354	354
Nov	345	347	358
Dec	207	209	201
Jan	206	190	194
Feb	250	255	257
Mar	185	200	196
Apr	139	141	144
May	149	163	168
Jun	207	191	193
Jul	308	301	297
Aug	289	290	294
Sep	295	238	238
Total	2942	2879	2874

As shown, there is an insignificant difference between the two predictions; however, this is not to say that this procedure would not reduce the magnitude of the errors in the long run, just that it failed to provide a superior prediction in this one sample.

Finally, it is recommended that future studies include another analysis of the positive autocorrelation condition

which existed in several of the data bases. Also, should positive identification and removal of the trends be accomplished, an analysis which would determine the optimal number of observations in each data base should be performed.

In summary, the methodology seems to have credence. However, its projections and associated prediction intervals should be appropriately caveated so as to ensure proper use.

V. Time Series Analysis of Retirement Data

Methodology and Data Base

Just as with the separation analysis, an ARIMA model was fitted to the retirement data by means of Box and Jenkins' techniques. The data used in this analysis was the ratio retirements divided by population, expressed as a percentage. The numerator of this ratio was made up of line officer retirements minus promotion failures. This was necessary since large numbers of promotion failure retirements occur approximately six months following the release of promotion board results. In other words, the temporary surge in retirements which result when promotion board results are released destroys the normal pattern of retirements which this analysis attempts to model. Also, even though non-line officer retirements were included in the regression analyses, their removal from this data base was necessary since complete historical population sizes were not available for non-line officers.

In addition to the non-line officer constraint, the number of observations for this data base was restricted to only those observations which had occurred subsequent to December 1976. This restriction was necessary for two reasons. First, population sizes for line officers were incomplete prior to January 1977. Second, even if

population sizes were available, use of the additional data would be questionable. As mentioned in the retirement regression analysis, policy changes which occurred in the mid-1970's significantly affected retirement trends. Some of these policy changes included waivers for time-on-station and time-in-grade, as well as look-back options which benefited those officers who retired immediately following a pay increase.

Model Identification

The retirement data was analyzed as a simple time series using the same programs which were used in the separation data model identification. Using the computer output dealing with the autocorrelation plots and the periodogram values, it was determined that a significant periodicity of length twelve was inherent in the data. In essence, the analysis of the simple autocorrelation plot suggested this periodicity because of a definite sinusoidal pattern with peaks at lags twelve and twenty-four. In addition, the periodogram analysis found that a frequency of .087 (period of 11.5) was statistically significant. Based upon an average value of 1.8 and a periodogram multiplier value of 6.079, one could assume that any frequency whose intensity value was above 10.9 would be statistically significant. For this exercise, only the previously mentioned frequency of .087 was determined to be

significant. This frequency had a calculated intensity value of 24.6.

Nonseasonal Differencing of the Data. Following the initial analysis, the data was nonseasonally differenced by order one and length twelve. This differencing was then followed by a reaccomplishment of the calculations for the autocorrelations, their respective plots, and the periodogram values. This time, the examination of the simple autocorrelation plot discovered a distinctive pattern which would be indicative of a long term wave (Figure 18). This was indicated by the gradual change from positive to negative autocorrelations as the lag increased from one to twenty-four. This hypothesis was later strengthened by the periodogram table which indicated that a statistically significant long term wave may still be in the data. For those values calculated, only the .018 frequency was statistically significant. This frequency equates to a wave of period fifty-seven. However, since the removal of such a wave by differencing would destroy the data base, the analysis continued without additional differencing. Finally, further analysis of the partial autocorrelation plot (Figure 19) indicated that the only statistically significant lag was at one. Therefore, without considering the long term wave, the plots would be indicative of an $ARIMA(1,0,0) \times (0,1,0)_{12}$.

R and S Array Analysis. As noted above, the

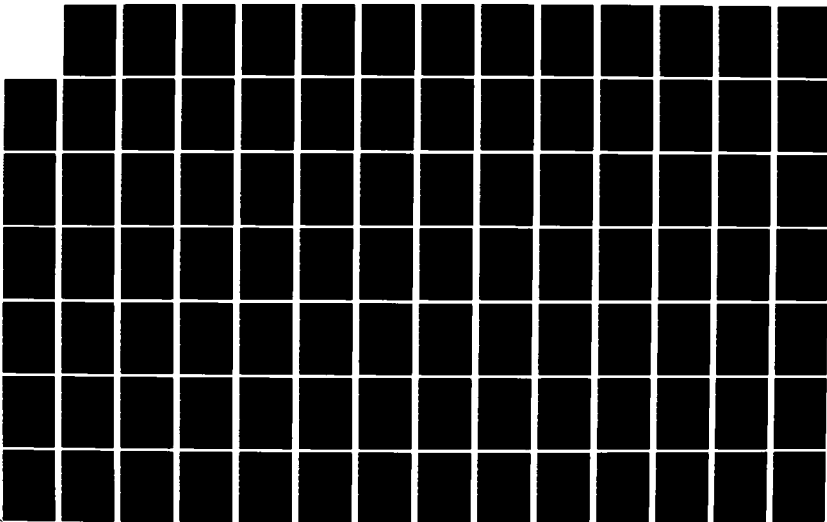
AD-A124 836

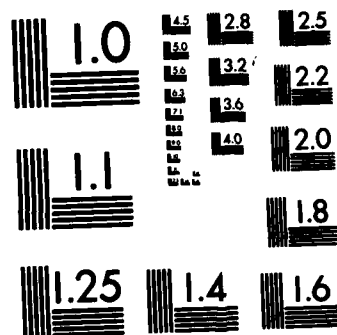
STATISTICAL TECHNIQUES FOR DETERMINING OFFICER
SEPARATION AND RETIREMENT. (U) AIR FORCE INST OF TECH
WRIGHT-PATTERSON AFB OH SCHOOL OF ENGI. A C DREMSTEDT
DEC 82 AFIT/GOR/OS/82D-2 E/G 12/1

2/4

UNCLASSIFIED

NL





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

significant. This frequency had a calculated intensity value of 24.6.

Nonseasonal Differencing of the Data. Following the initial analysis, the data was nonseasonally differenced by order one and length twelve. This differencing was then followed by a reaccomplishment of the calculations for the autocorrelations, their respective plots, and the periodogram values. This time, the examination of the simple autocorrelation plot discovered a distinctive pattern which would be indicative of a long term wave (Figure 18). This was indicated by the gradual change from positive to negative autocorrelations as the lag increased from one to twenty-four. This hypothesis was later strengthened by the periodogram table which indicated that a statistically significant long term wave may still be in the data. For those values calculated, only the .018 frequency was statistically significant. This frequency equates to a wave of period fifty-seven. However, since the removal of such a wave by differencing would destroy the data base, the analysis continued without additional differencing. Finally, further analysis of the partial autocorrelation plot (Figure 19) indicated that the only statistically significant lag was at one. Therefore, without considering the long term wave, the plots would be indicative of an $ARIMA(1,0,0) \times (0,1,0)_{12}$.

R and S Array Analysis. As noted above, the

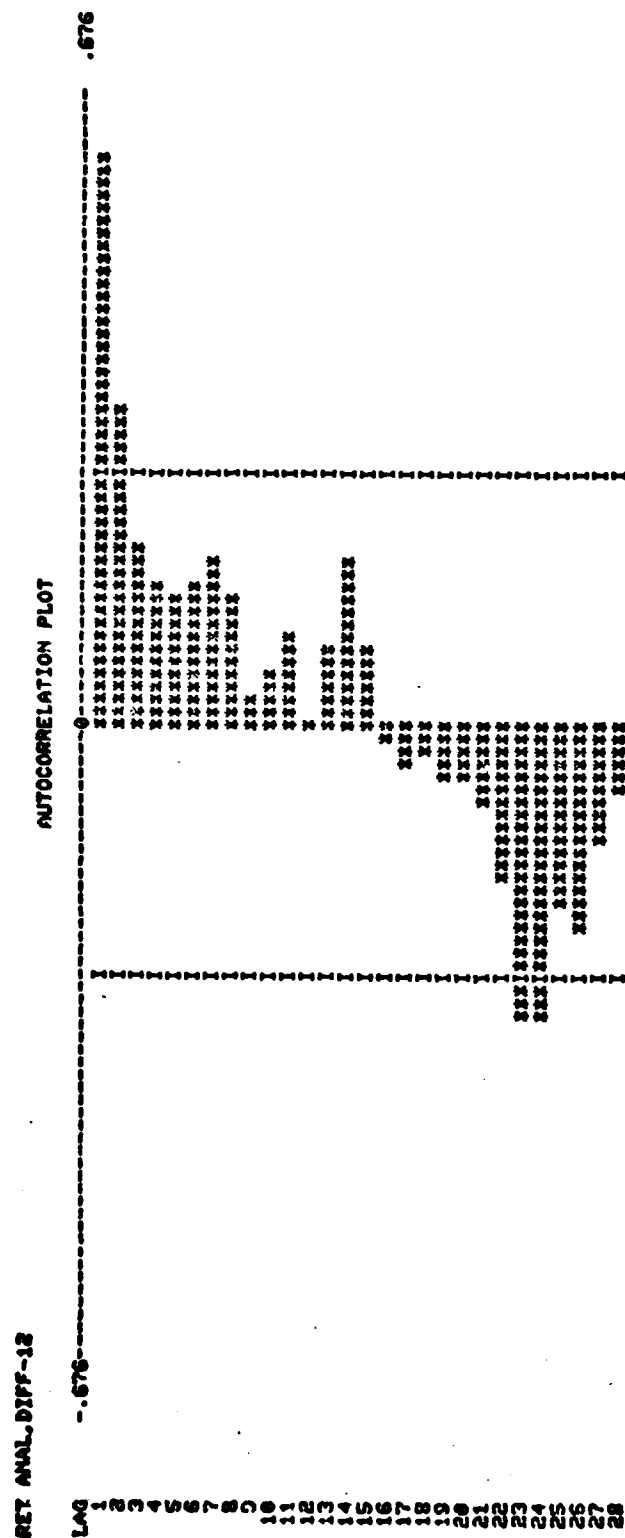


FIGURE 18. Autocorrelation Plot of Nonseasonally Differenced Retirement Data

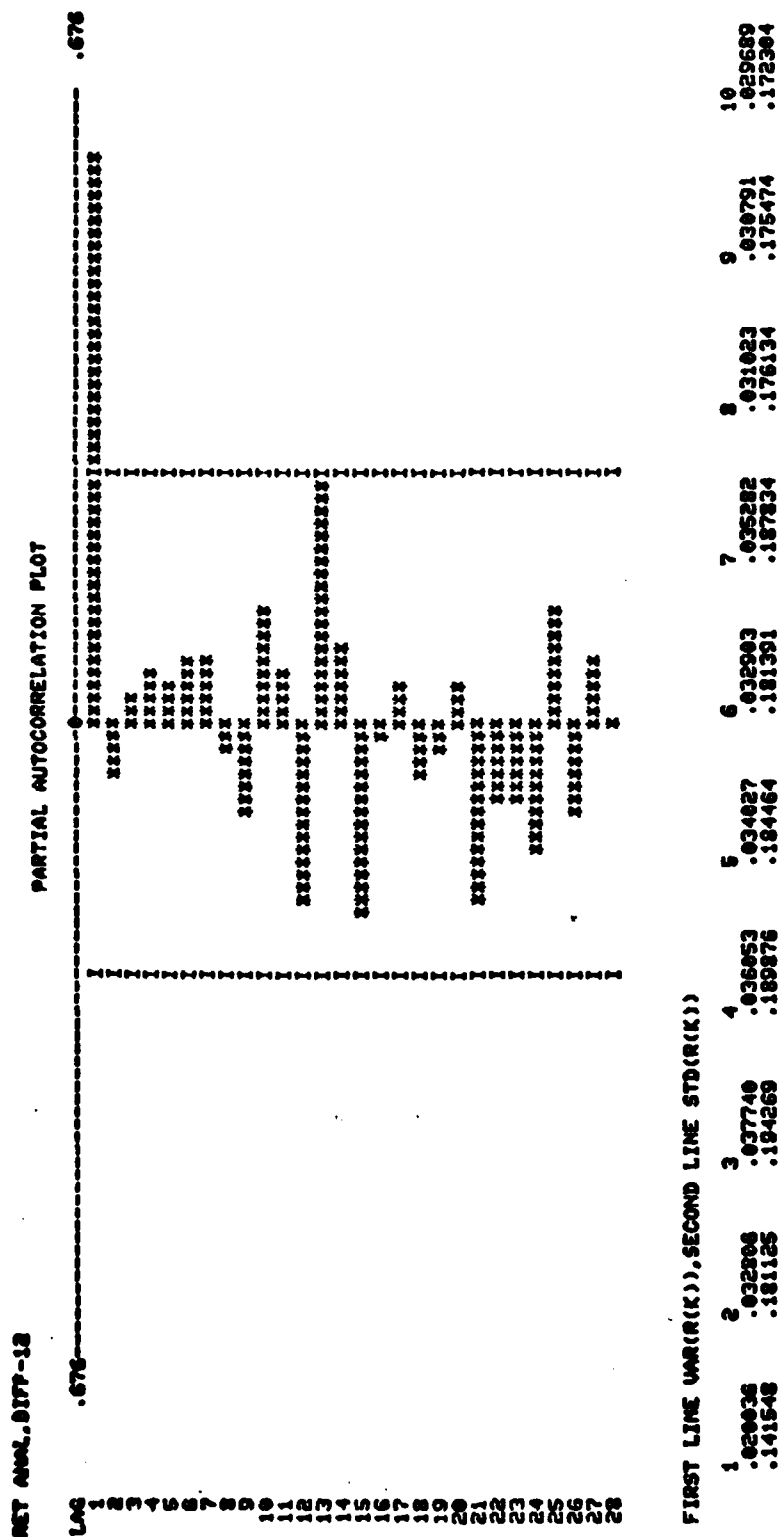


FIGURE 19. Partial Autocorrelation Plot of Nonseasonally Difference Retirement Data

autocorrelation plots indicated that an ARIMA(1,0,0)*(0,1,0)₁₂ may provide an adequate fit. This model was implied because of the partial autocorrelation's significant value at lag 1. Therefore, the R and S arrays were examined for symptomatic patterns associated with this model. As hoped, the low frequency R and S arrays did substantiate the proposed model. This can be seen by examining the annotated arrays in Appendix N. Consequently, based upon the autocorrelation plots and the R and S arrays, the proposed model's coefficients were calculated so that a residual analysis could be performed. The following equation contains the maximum likelihood estimates for these coefficients:

$$(1-B^{12})(1-.6149B)Z_t = A_t$$

Multiplying out terms yields:

$$(1-.6149B-B^{12}+.6149B^{13})Z_t = A_t$$

$$Z_t = X_t - .0460$$

where X_t is the undifferenced data and .0460 is the mean of the differenced data. A complete list of all the computer generated output for the model identification phase of this analysis can be found in Appendix N.

Residual Analysis of ARIMA(1,0,0)*(0,1,0)₁₂. As discussed in the separation analysis, in order to accomplish the

residual analysis, many of the same steps which are used to identify an initial model are repeated in this analysis; however, instead of using the raw data, the estimated residuals which are calculated from the proposed equation are used. For this residual analysis, the computed autocorrelations failed to detect a significant lag. In essence, the residuals appeared to be white noise.

The next phase in this residual analysis was to examine the calculated Portmanteau Lack of Fit value for indications of model inadequacies. The computer generated value for this model was 17.31. Therefore, since the Chi-Square statistic for twenty-seven degrees of freedom and an alpha value of .05 was 40.11, it could not be assumed that the calculated Q value indicated model inadequacy.

Finally, a cumulative periodogram was plotted for this model (Figure 20). As shown, there does not appear to be signs of a significant periodicity not being modeled by the proposed equation. Therefore, based upon the autocorrelations, the Portmanteau value, and the cumulative periodogram plot, the proposed model does not appear to have signs of inadequacy. A complete list of the computer output for this residual analysis can be found in Appendix O.

RET ANALYSIS

ARIMA(1,0,0)*(0,1,0)₁₂

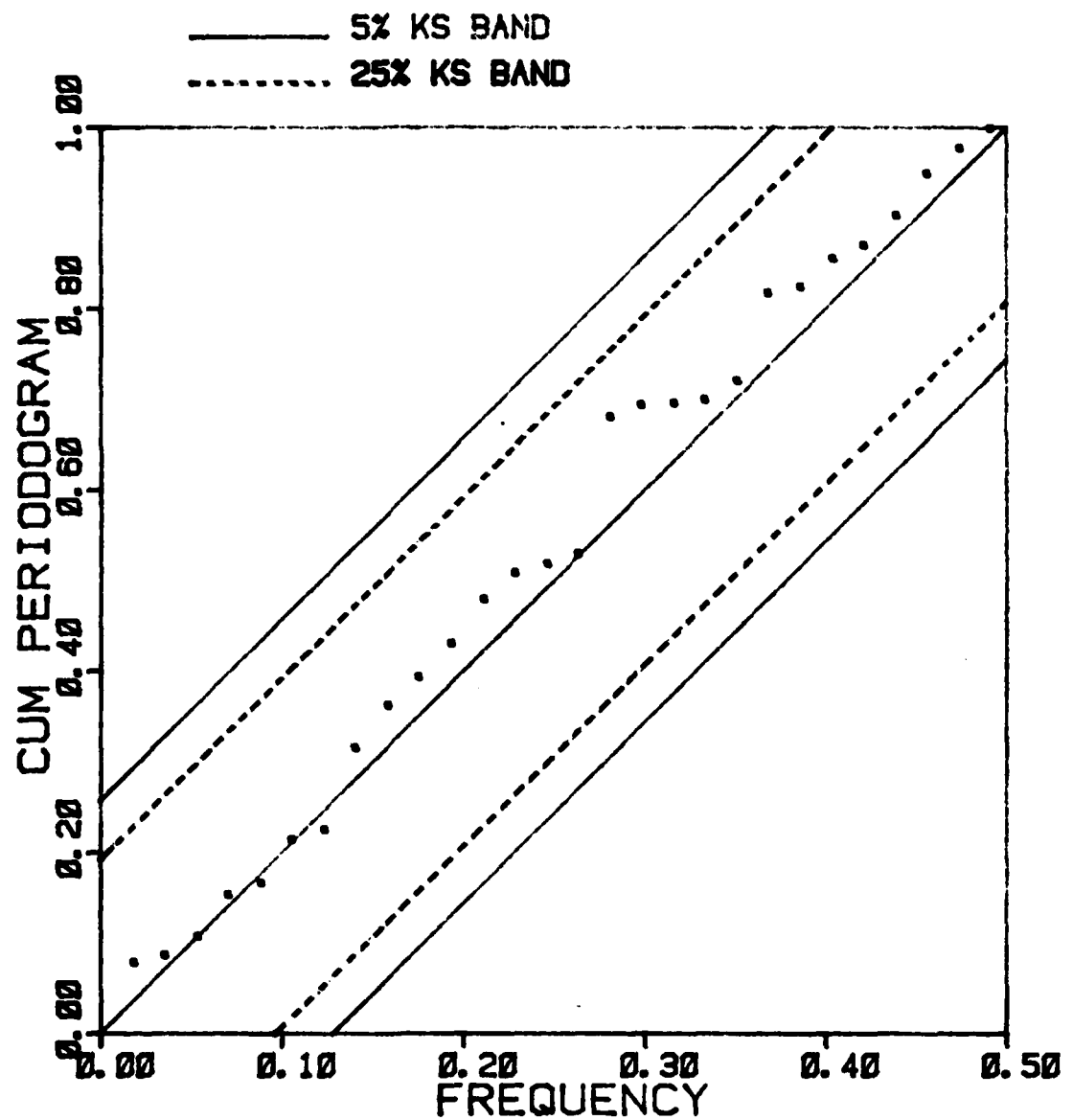


FIGURE 20. Cumulative Periodogram for ARIMA(1,0,0)*(0,1,0)₁₂

Model Prediction Capability

Using data as of 30 September 1981, a prediction for FY82 was made so that a comparison could be made with actual loss rates. The following table details those results:

Table XVI

Retirement Time Series FY82 Predictions vs Actual

Month	Actual	Pred.	% Error
Oct	3.31	0.94	-71.6
Nov	3.12	0.99	-68.3
Dec	1.85	1.00	-45.9
Jan	1.82	1.52	-16.5
Feb	1.56	1.50	- 3.8
Mar	1.62	1.15	-29.0
Apr	1.26	1.66	+31.7
May	1.31	1.47	+12.2
Jun	1.79	1.83	+ 2.2
Jul	2.68	2.76	+ 3.0
Aug	2.53	3.00	+18.6
Sep	2.01	1.89	- 6.0
Total	24.86	19.71	-20.7

The twelve month rate difference of 5.15 (24.86-19.71) equates to an underprediction of more than 550 retirements. Considering that 2,716 line officer retirements occurred in FY82, this prediction equates to an error of more than 20%. Therefore, since it would be unlikely that such an underestimate would be considered tolerable by management, additional analysis should be conducted in an attempt to reduce this error.

Conclusions

Although it appeared that an adequate model was identified, attempts to predict retirements with the proposed model proved discouraging. It would appear that the previously discussed policy, pay, and promotion board timing changes injected a degree of randomness into the data which the model was unable to capture. However, this would not be counterintuitive since management itself cannot accurately predict pay raises, policy changes, and dates for which promotion boards are to be held. Consequently, attempts to model retirement trends by use of a simple time series process will, in all probability, continue to fall short of the desired goals. In other words, it seems apparent that a process of higher complexity is needed before acceptable errors in the predictions are achieved. A brief discussion is presented below in the recommendations section.

Recommendations

Because of the detected long term periodicity in the data, future attempts to model retirement data should contain an analysis which would remove and project those trends from the data. This could possibly be conducted by the same procedure which was discussed in the separation analysis. However, even with an analysis of long term trends, short term changes in policies can destroy those

long term waves, e.g., a pay raise which is significantly larger than the observed increases in the consumer price index will drastically change retirement patterns. Historically, large numbers of individuals have delayed their retirement until sometime after large pay increases have become effective. This delay will in most cases result in larger retirement compensation for those individuals who chose to delay their retirement. Consequently, the focus of future analysis should be on the identification of a transfer function model, i.e., one which could be used to predict the degree of change which policy modifications inflict.

VI. Review, Conclusions, and Recommendations

This chapter will discuss the results of the four previous chapters and compare the predictive capabilities of the proposed models with the AFCOPS model.

Review of Accomplishments

During the course of this research, numerous models were examined as well as modifications to those models. Below is a list of the explored models along with a brief discussion of their nature:

- (1) A regression model of separation application patterns. This model used accomplished line, JAG, and chaplain separations as the dependent variable, and DOSs without an SPD and DOSs with an SPD as the independent variables. Because of the consistent overprediction of this model, attempts were made to identify and remedy this problem. This process included both a residual analysis and a modified update procedure of the methodology. A test of the modified update procedure resulted in a 43.2% improvement in the regression methodology's FY82 prediction.
- (2) A time series analysis of line officer separation rates. This model, which used Box and Jenkins' techniques, analyzed separation rates as a simple time series. Several ARIMA models were identified, with the final process chosen being an $ARIMA(2,1,0) \times (1,1,0)_w$.
- (3) A regression analysis of retirement application trends. Retirement application trends were analyzed by regressing accomplished line, JAG, and chaplain

retirements into approved and in-system voluntary and mandatory retirements. Because of positive autocorrelation problems in some of the files, one of the data bases was selected for a comprehensive residual analysis in an attempt to identify the cause for the autocorrelation.

- (4) A time series analysis of line officer retirement trends. A ratio of line officer retirements divided by the population and expressed as a percentage was analyzed as a simple time series. Several models were identified, with the final model chosen being an $ARIMA(1,0,0) \times (0,1,0)_{12}$.

Conclusions

This section will present those conclusions which are most significant. First, the conclusions associated with the time series methodology will be examined. This is then followed by the conclusions associated with the regression analyses. Following each subheading, a brief expanded discussion of the major conclusions is made.

Time Series Approach. Chapter III of this thesis dealt with a time series analysis of line officer separation trends. The following list summarizes the conclusions reached in that analysis:

- (1) An $ARIMA(2,1,0) \times (1,1,0)_{12}$ was determined to provide the best fit of the data. However, other models also provided an adequate fit.
- (2) Short term (monthly) projection accuracies were unacceptable. However, an FY82 (12 month) projection was within 63 (5.5%) of the actual separations for that year.
- (3) A long term periodicity, which is observable in the data, could not be captured in the

time series model. This resulted in negative loss rate predictions for FY84 when data as of September 1981 was used.

The other time series analysis which was accomplished in this thesis attempted to model line officer retirement trends (Chapter V). The following list summarizes the conclusions reached in that analysis:

- (1) An ARIMA(1,0,0)*(0,1,0)₁₂ model was determined to provide an adequate fit.
- (2) Monthly prediction errors were deemed unacceptable. Errors in excess of 50% were observed when monthly FY82 retirements were predicted.
- (3) Long term predictions were also found to be unacceptable. The FY82 prediction was in error by more than 500 (20.7%) retirements.
- (4) The model presented could not account for changes in retirements caused by promotion board results, pay increases, or policy changes.

Discussion. Although time series models would have the ability to project losses beyond twelve months, which is the maximum time frame attributable to the regression models in this thesis, there are obvious pitfalls inherent in their use. First of all, those models which were identified in this research failed to capture long term trends. This failure resulted in perceptible patterns which when extended into future fiscal years resulted in negative loss rate projections. Secondly, even though the separation model's FY82 prediction was within management's

tolerable limits, its failure to accurately predict monthly separation rates (see Table VII) made the model unusable except as a tool for the comparison of yearly loss projections. In other words, since the model's predictions for individual months would be expected to deviate significantly from the actual observed values, it would be extremely difficult to ascertain if (1) the model's short term estimates were in error but the long term trend was still valid, or if (2) the long term trend had changed and this change was the cause for the short term errors. Finally, since those models which were presented in these analyses do not use leading indicators, changes to predictions which would result from changes in promotion boards, pay benefits, and policy modifications could not be captured in the proposed model's estimates. Therefore, this drawback significantly limited the model's ability to predict retirements.

In summary, the time series approach as proposed in this research has obvious flaws which limit its use. However, this is not to say that variations in the models, the availability of additional data at some future date, or the introduction of leading indicators could not overcome many of the blemishes annotated within this research.

Regression Approach. Regression analyses of both separation (Chapter II) and retirement (Chapter IV) application trends were also made. The following list

details the results of those analyses:

- (1) Projections produced by this methodology were extremely accurate. An FY81 separation prediction was in error by only 1.8%, the FY82 separation prediction was in error by 16.9%, and the FY82 retirement estimate missed the actual retirement number by 2.1%.
- (2) For the separation analysis, using a data base comprised of the most recent twenty-four observations was found to provide a better model, as compared to models produced by using a larger number or smaller number of observations. Both the MSE and the R^2 were optimized for approximately twenty-four observations. This better fit would result in tighter prediction intervals produced by these models.
- (3) Although twenty-four observations in each data base was optimal, as the number of observations decreased, the mean of the prediction error tended to decrease, but the standard deviation remained nearly constant.
- (4) Updating data bases with projections produced by other data bases significantly improved the FY82 separation prediction, reducing the error to 9.6%.
- (5) Several of the retirement data bases were found to be autocorrelated. This was believed to be caused by retirement trends within fiscal years.

Discussion. Of the two approaches examined, regression analysis appears to be the most promising. In fact, in the aggregate, the predictions made were extremely accurate. When the regression predictions are compared to the previously used AFCOPS predictions (Ref 4), the improvements are obvious. Table XVII compares each methodology's estimates.

Table XVII

AFCOPS Predictions vs Regression Predictions						
Methodology	FY81		FY82			
	Seps	Error	Seps	Error	Rets	Error
AFCOPS*	2105	+24.9%	2123	+79.0%	3155	+ 7.2%
AFCOPS**	1961	+16.3%	1737	+46.5%	2891	- 1.7%
Regression	1717	+ 1.8%	1386	+16.9%	2879	- 2.1%
Actual	1686		1186		2942	

* Prediction based upon two years of historical loss information

** Prediction based upon one year of historical loss information

As noted above, two different AFCOPS estimates were prepared for each fiscal year's prediction. This was due to the changing loss patterns which were occurring during the preceeding few years. Therefore, by using only one year of loss information, it was hoped that a better estimate of losses could be obtained. However, as can be seen in the table, with the exception of the AFCOPS FY82 retirement estimate using only one year of historical loss information, the regression estimates were significantly better.

In summary, use of the regression methodology provides significant improvements in the predictions of voluntary separations and retirements when compared to the currently used AFCOPS model. Also, since the independent variables used in this methodology act as a barometer of future losses, these models have the ability to alter their

estimates as economic and policy conditions affect the propensity of Air Force officers to depart active duty. In addition, because of the simplistic nature of this methodology, monthly estimates can be produced so that long term trends in the predictive capability of the models can be analyzed. This ability, which is not economically feasible with the AFCOPS model because of the extensive computer and personnel costs involved with its maintenance and production, gives an added dimension to the regression models.

Recommendations

As elaborated on above, the regression models explored in this thesis are superior to the AFCOPS model in predicting officer voluntary separations and retirements. Therefore, it is recommended that the regression methodology be adopted for use as a predictive tool within the personnel management community.

Each chapter of this thesis details areas which this author considers needing additional research. In summary, it is felt that for time series models to be of significant benefit in predicting loss trends:

- (1) Additional data is required
- (2) An index of leading indicators must be identified which would link pay, promotions, and policy changes to losses.

- (3) A Fourier analysis of long term trends must be accomplished so that significant long term patterns can be removed from the time series prior to the accomplishment of a time series analysis.

Although the regression models provided significantly improved predictions when compared to the AFCOPS model, the following areas should be further explored:

- (1) A comprehensive analysis of the residual patterns in order to identify further improvements in the model. This could be accomplished by time series analysis, weighting the observations, or exploring alternative update procedures.
- (2) Additional analysis of the residual patterns associated with the retirement data. Several data bases either hinted at or had positive autocorrelation. Although this research identified a possible cause for the residual pattern, additional research needs to be accomplished which would identify and capture the pattern.
- (3) Accomplish a full scale analysis of the modified update procedure which was identified in the separation analysis (Chapter II).

Bibliography

1. Blum, Captain Gary R., Personnel Analyst, HQ AFMPC/MPCYAO, Randolph AFB, Tx. (Telephone Interviews). May 1982.
2. Box, George E., and Gwilym M. Jenkins. Time Series Analysis: Forecasting and Control. San Francisco: Holden-Day Incorporated, 1976.
3. Gray, H. L., G. Kelley, and D. McIntire. A New Approach to ARMA Modeling. Project NR 042-280, Southern Methodist University, Dallas, Texas. Research sponsored by the Office of Naval Research, December 1977. (AD A047748).
4. Gunnell, Lt Col Verner V., Chief Officer Programs, HQ AF/MPPP, Pentagon, Va. (Telephone Interview). October 1982.
5. Fuller, Wayne A. Introduction to Statistical Time Series. New York, New York: John Wiley and Sons, Incorporated, 1976.
6. Makridakis, Spyros and Michele Hibon. "Accuracy of Forecasting: An Empirical Investigation," Journal of the Royal Statistical Society (Series A) (U.K.) 142 Part 2: 97-145 (1979).
7. Neter, John, and William Wasserman. Applied Linear Statistical Models. Homewood, Illinois: Richard D. Irwin, Incorporated, 1974.
8. Nie, Norman H., et al. SPSS (Second Edition), New York: McGraw Hill Book Company, 1975.

APPENDIX A
FYCOPS Report

***** FOR OFFICIAL USE ONLY *****

PREPARED: 02 OCT 1902 SUMMARY OF FY02 ACCOMPLISHED ACTIONS FOR OCTOBER 1901 - SEPTEMBER 1902 EFFECTIVE: 30 SEP 1902

<< ADDITIONAL LOSS DETAIL - NORMAL LOSSES >>

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	YTD
NORMAL LOSS TOTALS	591	536	406	393	419	363	320	316	417	753	579	537	5630
LINE TOTALS	400	440	332	312	349	277	247	230	349	430	452	420	4331
ATTRITION	27	14	29	23	21	24	32	23	19	28	36	25	301
DEATH	7	7	6	10	4	6	18	7	4	6	6	10	93
VOLUNTARY	5	1	1	2	1	2	1	1	1	1	2	2	18
WAL UNIFORM	1	1	4	6	3	4	2	2	3	3	4	3	30
OTHER	14	5	16	5	12	12	11	13	12	10	24	10	152
SEPARATIONS	80	60	100	03	00	73	75	71	120	111	137	113	1166
END ORIGATION	48	40	42	41	33	16	35	24	64	51	59	39	494
ACQUITY	6	4	2	3	1	1	3	2	14	20	12	5	72
ROTC	30	23	23	36	10	11	19	16	41	29	31	26	312
OTS	1	1	1	1	1	1	1	1	2	1	1	1	8
ALCP	1	1	1	1	1	1	1	1	1	1	1	1	1
OTHER	3	12	16	2	14	6	11	6	7	2	16	7	102
CAREER SEPARATION	40	50	56	41	46	40	35	43	59	59	76	57	624
INVOLUNTARY SEPARATION	2	2	2	1	1	1	1	1	1	1	1	1	1
RETIRED	353	353	203	203	240	100	140	144	201	299	279	290	2004
DISABILITY	14	7	12	9	5	10	0	9	5	6	8	10	103
VOLUNTARY	326	321	180	180	157	100	124	124	180	274	249	193	2460
MANDATORY	14	9	9	11	10	0	7	11	12	15	21	16	143
PROBATION FAILURE	1	2	2	6	76	2	1	1	4	4	1	69	160
NON-LINE TOTALS	111	87	74	81	70	86	73	78	68	315	127	103	1279
NON-MEDICAL TOTALS	9	14	11	0	0	10	7	12	12	13	10	15	137
JAG TOTALS	6	9	9	7	6	9	5	9	0	5	10	10	93
ATTRITION	2	6	7	6	5	5	4	6	7	4	6	8	66
SEPARATIONS	2	6	5	5	2	2	1	4	4	3	5	4	43
END ORIGATION	1	2	2	1	3	3	3	2	3	1	1	4	23
CAREER	1	1	1	1	1	1	1	1	1	1	1	1	1
INVOLUNTARY	1	1	1	1	1	1	1	1	1	1	1	1	1
PROBATION FAILURE	1	1	1	1	1	1	1	1	1	1	1	1	1
RETIRED	4	3	2	1	4	1	1	3	1	1	4	2	25
CHAPLAIN TOTALS	3	5	2	1	2	1	2	3	4	0	0	5	44
ATTRITION	1	1	1	1	1	1	1	1	1	1	1	1	1
SEPARATIONS	1	1	1	1	1	1	1	2	1	1	2	1	9
END ORIGATION	1	1	1	1	1	1	1	1	1	1	1	1	1
CAREER	1	1	1	1	1	1	1	1	1	1	1	1	1
INVOLUNTARY	1	1	1	1	1	1	1	1	1	1	1	1	1
PROBATION FAILURE	1	1	1	1	1	1	1	1	1	1	1	1	1
RETIRED	3	3	2	1	1	1	2	1	4	7	6	3	33

PCN: RSH5052005

PAGE 2 OF 5

***** FOR OFFICIAL USE ONLY *****

END OF MONTH

***** FOR OFFICIAL USE ONLY *****
 PREPARED: 03 OCT 1982 SUMMARY OF FY82 ACCOMPLISHED ACTIONS FOR OCTOBER 1981 -- SEPTEMBER 1982 EFFECTIVE: 30 SEP 1982

< < FORCE REDUCTION PROGRAMS - EARLY RELEASE > >

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	YTD
LINE TOTALS	30	19	18	14	11	17	9	23	21	25	21	26	234
CARRYOVERS	14												14
RETIREMENT WAIVERS													
POLICY 1													
PILOT													
NAVIGATOR													
NON-RATED			2			4		1	1	2		5	13
PALACE CHARGE													
PALACE TURN OVER													
PILOT													
NAVIGATOR	10	17	18	14	11	13	7	21	19	22	16	20	195
7 DAY OPTION													
POLICY 2													
PILOT													
NAVIGATOR													
NON-RATED			1				2	1	1	1	3	1	10
OTHER													
MIN-LINE TOTALS	5	2	3	3	3	3	2	7	1	16	0	4	56
MEDICAL													
MEDICAL CORPS													
DENTAL CORPS													
NURSE													
VETERINARY													
MEDICAL SERVICES													
ARMED MEDICAL													
JAG													
CARRYOVERS	3	1											4
RETIREMENT WAIVERS													
7 DAY OPTION													
OTHER	2	1	3	3	3	3	2	7	1	13	0	4	52
EARLY RELEASE TOTAL	33	21	21	17	14	20	11	30	22	40	29	30	290

PCN: RSH5052003 PAGE 4 OF 5 END OF MONTH

***** FOR OFFICIAL USE ONLY *****

***** FOR OFFICIAL USE ONLY *****

PREPARED: 02 OCT 1902 SUMMARY OF FY02 ACCOMPLISHED ACTIONS FOR OCTOBER 1901 - SEPTEMBER 1902 EFFECTIVE: 30 SEP 1902

< < FORCE REDUCTION PROGRAMS - INVOLUNTARY RELEASE > >

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	YTD
LINE TOTALS	13	27	23	18	30	25	37	42	57	39	46	69	426
FLIGHT THO FLININES	10	17	15	10	20	15	25	33	30	36	42	60	327
TECH THO FLININES	3	7	8	7	9	10	11	9	15	2	3	9	88
ONE PASSENGER TEMP-04	.	3	.	1	1	.	1	.	3	1	1	2-18/77	11
DOS INLLDACK	.	.	.	.	.	.	.	.	.	.	.	.	.
PILOT 1 YR	.	.	.	.	.	.	.	.	.	.	.	.	.
NAVIGATOR 1 YR	.	.	.	.	.	.	.	.	.	.	.	.	.
SUPPORT 1 YR	.	.	.	.	.	.	.	.	.	.	.	.	.
PILOT 2 YR	.	.	.	.	.	.	.	.	.	.	.	.	.
NAVIGATOR 2 YR	.	.	.	.	.	.	.	.	.	.	.	.	.
SUPPORT 2 YR	.	.	.	.	.	.	.	.	.	.	.	.	.
RIF	.	.	.	.	.	.	.	.	.	.	.	.	.
NON-LINE TOTALS	.	.	.	.	.	.	.	.	.	.	.	.	.
ONE PASSENGER TEMP 04	.	.	.	.	.	.	.	.	.	.	.	.	.
RIF	.	.	.	.	.	.	.	.	.	.	.	.	.
OTHER	.	.	.	.	.	.	.	.	.	.	.	.	.
INVOLUNTARY RELEASE TOTAL	13	27	23	18	30	25	37	42	57	39	47	69	427
EARLY RELEASE TOTAL	35	21	21	17	14	20	11	30	22	40	29	30	290
SPECIAL PROGRAMS TOTAL	40	40	44	35	44	45	40	72	79	79	76	99	717

PCN: RSH5052003

PAGE 5 OF 5

END OF MONTH

***** FOR OFFICIAL USE ONLY *****

***** FOR OFFICIAL USE ONLY *****

PREPARED: 03 OCT 1962 SUMMARY OF FY62 PROJECTED ACTIONS FOR OCTOBER 1962 - SEPTEMBER 1963 EFFECTIVE: 30 SEP 1962
 << ADDITIONAL LOSS DETAIL - NORMAL LOSSES >>

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
NORMAL LOSS TOTALS	579	343	285	269	140	442	62	75	84	132	89	53	2573
LINE TOTALS	496	290	255	208	111	390	73	67	70	105	74	39	2190
ATTRITION	3	1	1										5
DEATH													
VOLUNTARY	1	1	1										1
WAF UNIQUE													
OTHER	2		1										2
SEPARATIONS	70	43	39	41	25	311	6	10	6	6	2	1	662
END ORILGATION	15	13	10	9	10	5	1	3	3				71
ACADEMY	4	3	2			2		1	4				16
NOTIC	7	4	6	6	7	3	1	1	1				30
OTS			1										1
AECF													
OTHER	4	4	1	3	3								10
CAREER SEPARATION	47	27	27	29	15	13	5	7	3	6	2	1	182
INVOLUNTARY SEPARATION													
PROMOTION FAILURE	0	3	2	3		(293)		57	67	99	72	38	309
RETIREMENTS	423	251	213	167	86	87							1632
DISABILITY	6												6
VOLUNTARY	377	220	194	154	73	72	54	35	54	72	42	15	1362
MANDATORY	33	21	16	11	13	15	13	22	13	27	30	23	237
PROMOTION FAILURE	7	13	5	2									27
NON-LINE TOTALS	63	45	30	61	29	44	9	0	0	27	15	14	374
NON-MEDICAL TOTALS	13	10	0	24	3	12	3	3	6	12	9	9	112
JAG TOTALS	11	6	6	21	1	10	3	3	6	11	8	9	93
ATTRITION	3	3	3	18	1	9	2	3	5	10	7	9	73
SEPARATIONS	3	3	3	10	1	5	2	2	3	9	7	6	63
END ORILGATION								1	2	1			6
CAREER													
INVOLUNTARY													
PROMOTION FAILURE						4							4
RETIREMENTS	0	0	3	3		1	1		1	1	1		22
COMPLAINT TOTALS	2	1	2	3	2	2							17
ATTRITION													
SEPARATIONS						1							1
END ORILGATION													
CAREER													
INVOLUNTARY													
PROMOTION FAILURE						1							1
RETIREMENTS	2	4	2	3	2	1			1	1	1		16

PCN: RSH3052005

PAGE 2 OF 5

***** FOR OFFICIAL USE ONLY *****

END OF MONTH

PREPARED: 02 OCT 1982 SUMMARY OF FIVE PROJECTED ACTIONS FOR OCTOBER 1982 - SEPTEMBER 1983 EFFECTIVE: 30 SEP 1982

***** FOR OFFICIAL USE ONLY *****

< < FORCE REDUCTION PROGRAMS - EARLY RELEASE > >

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
LINE TOTALS	9	10	14	4	11	3	5		4	3	1	2	72
FY81 CARRYOVERS													
RETIREMENT WAIVERS													
POLICY 1													
PILOT													
NAVIGATOR													
NON-RATED													
OTHER													
PALACE CHASE													
PALACE FURNISH													
PILOT													
NAVIGATOR													
7 DAY OPTION													
POLICY 2													
PILOT													
NAVIGATOR													
NON-RATED													
OTHER													
NON-LINE TOTALS	2	1	1	3	1								6
MEDICAL													
MEDICAL CORPS													
DENTAL CORPS													
NURSE													
VETERINARY													
MEDICAL SERVICES													
RT MEDICAL													
JAO													
CARRYOVERS													
RETIREMENT WAIVERS													
7 DAY OPTION													
OTHER	2	1	1	3	1								8
EARLY RELEASE TOTAL	11	17	15	7	12	3	5		4	3	1	2	60

PCN: R3H8052003

PAGE 4 OF 5

END OF MONTH

***** FOR OFFICIAL USE ONLY *****

PREPARED: 02 OCT 1982
 SUMMARY OF PLANT PROTECTED ACTIONS FOR OCTOBER 1982 - SEPTEMBER 1983
 EFFECTIVE: 30 SEP 1982
 < / INHIBIT REDUCTION PROGRAMS - INHIBITARY RELEASE > >

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
LINE TOTALS	1	2											3
FLIGHT TWO FLIGHTS													
TECH TWO FLIGHTS													
ONE PASSENGER TEMP-04	1	2											3
DOS INTRACK													
PILOT 1 YR													
NAVIGATOR 1 YR													
SUPPORT 1 YR													
PILOT 2 YR													
NAVIGATOR 2 YR													
SUPPORT 2 YR													
RIF													
NON-LINE TOTALS													
ONE PASSENGER TEMP-04													
RIF													
OTHER													
INVOLUNTARY RELEASE TOTAL	1	2											3
EARLY RELEASE TOTAL	11	17	15	7	12	3	5		4	3	1	2	60
SPECIAL PROGRAMS TOTAL	12	19	15	7	12	3	5		4	3	1	2	63

PREPARED: 02 OCT 1962
 PROJECTED FY63 D O S W/O S P D
 EFFECTIVE: 30 SEP 1962

***** FOR OFFICIAL USE ONLY *****

LINE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
JAG	71	56	47	101	198	165	155	309	345	363	638	811	3319
CHAPLAIN	4			7		1		3	6	2	3	6	33
MEDICAL	2	1		1	1		1	4		5	7	4	26
DENTAL	15	7	2	12	2	5	3	1	1	198	37	33	316
NURSE	1	1	2	2	1		2	4	11	56	33	24	142
VETERINARY	7	14	7	25	27	38	3	27	9	66	59	46	348
MEDICAL SERVICES													
DISTRICT	2	2	2	9	4	10	1	22	3	45	12	13	125
UNKNOWN													
TOTAL	102	91	60	225	236	220	166	379	376	795	793	943	4376

PCRT-RSR062005
 PAGE 1 OF 1
 ***** FOR OFFICIAL USE ONLY *****
 END-OF-MONTH

APPENDIX B

Listings of the Separation Data Bases

used in the Regression Analysis

SEP1

CASE-NO	ACCOMP	NOSPD	SPD
1	298.	15.	278.
2	340.	13.	334.
3	274.	98.	243.
4	278.	86.	238.
5	262.	57.	232.
6	238.	47.	194.
7	149.	13.	149.
8	206.	40.	178.
9	173.	41.	158.
10	152.	22.	139.
11	163.	19.	160.
12	164.	28.	143.
13	147.	11.	143.
14	156.	25.	143.
15	256.	77.	235.
16	212.	53.	191.
17	168.	49.	148.
18	186.	84.	152.
19	125.	36.	117.
20	148.	42.	125.
21	119.	42.	184.
22	188.	57.	86.
23	114.	47.	88.
24	93.	26.	86.
25	119.	25.	185.
26	128.	49.	181.
27	191.	74.	144.
28	178.	54.	159.
29	154.	49.	128.
30	94.	53.	74.
31	99.	43.	77.
32	101.	46.	77.
33	91.	58.	66.
34	84.	62.	66.
35	73.	29.	67.
36	76.	35.	46.
37	74.	35.	69.

SEP2

CASE-NO	ACCOMP	NOSPD	SPD
1	340.	14.	333.
2	274.	117.	258.
3	278.	134.	222.
4	262.	78.	231.
5	238.	53.	191.
6	149.	12.	154.
7	206.	58.	156.
8	178.	46.	163.
9	152.	28.	151.
10	160.	25.	166.
11	164.	33.	141.
12	147.	11.	153.
13	156.	25.	154.
14	256.	86.	251.
15	212.	52.	192.
16	168.	66.	155.
17	186.	95.	153.
18	125.	44.	119.
19	148.	46.	126.
20	119.	62.	182.
21	188.	77.	85.
22	114.	75.	92.
23	93.	26.	85.
24	119.	34.	183.
25	128.	54.	187.
26	191.	182.	142.
27	178.	72.	150.
28	154.	52.	129.
29	94.	78.	77.
30	99.	47.	81.
31	101.	49.	86.
32	91.	61.	72.
33	84.	68.	71.
34	73.	29.	78.
35	76.	46.	47.
36	74.	49.	63.

SEP3

CASE-NO	ACCOMP	NOSPD	SPD
1	274.	146.	234.
2	278.	141.	218.
3	262.	88.	226.
4	288.	67.	187.
5	149.	16.	153.
6	206.	54.	177.
7	173.	51.	158.
8	152.	28.	149.
9	160.	39.	156.
10	164.	47.	133.
11	147.	16.	143.
12	156.	31.	158.
13	256.	98.	238.
14	212.	63.	191.
15	168.	98.	154.
16	186.	123.	158.
17	125.	47.	189.
18	148.	59.	122.
19	119.	69.	93.
20	188.	78.	81.
21	114.	73.	89.
22	93.	32.	82.
23	119.	35.	181.
24	128.	76.	184.
25	191.	118.	138.
26	178.	97.	145.
27	154.	78.	186.
28	94.	98.	73.
29	99.	49.	79.
30	101.	49.	81.
31	91.	76.	78.
32	84.	88.	66.
33	73.	24.	69.
34	76.	85.	45.
35	74.	68.	68.

SEP4

CASE-NO	ACCOMP	NOSPD	SPD
1	278.	157.	195.
2	262.	97.	223.
3	288.	181.	188.
4	149.	22.	144.
5	206.	59.	167.
6	178.	53.	158.
7	152.	23.	146.
8	160.	45.	157.
9	164.	61.	128.
10	147.	28.	141.
11	156.	32.	147.
12	256.	113.	229.
13	212.	75.	187.
14	158.	111.	154.
15	166.	168.	148.
16	125.	61.	184.
17	148.	72.	111.
18	119.	84.	88.
19	188.	87.	79.
20	114.	83.	86.
21	93.	35.	79.
22	119.	64.	188.
23	128.	96.	181.
24	191.	134.	141.
25	178.	113.	145.
26	154.	185.	96.
27	94.	132.	73.
28	99.	72.	75.
29	181.	66.	79.
30	91.	23.	65.
31	84.	86.	69.
32	73.	38.	68.
33	76.	98.	39.
34	74.	98.	58.

SEP5

CASE-NO	ACCOMP	NOSPD	SPD
1	262.	108.	209.
2	208.	112.	165.
3	149.	37.	140.
4	206.	85.	153.
5	170.	59.	144.
6	152.	26.	134.
7	160.	51.	149.
8	164.	66.	122.
9	147.	23.	130.
10	156.	37.	139.
11	256.	134.	213.
12	212.	85.	167.
13	168.	127.	143.
14	186.	180.	132.
15	125.	82.	93.
16	148.	89.	104.
17	119.	97.	80.
18	108.	136.	74.
19	114.	97.	81.
20	93.	39.	74.
21	119.	73.	88.
22	128.	146.	94.
23	191.	152.	129.
24	178.	146.	136.
25	154.	115.	83.
26	94.	184.	69.
27	99.	112.	65.
28	101.	77.	73.
29	91.	105.	61.
30	84.	94.	67.
31	73.	37.	54.
32	76.	129.	37.
33	74.	113.	51.

SEP6

CASE-NO	ACCOMP	NOSPD	SPD
1	262.	122.	155.
2	208.	133.	125.
3	149.	42.	101.
4	206.	123.	105.
5	170.	70.	97.
6	152.	30.	93.
7	160.	52.	96.
8	164.	70.	88.
9	147.	34.	99.
10	156.	47.	102.
11	256.	155.	156.
12	212.	101.	121.
13	168.	152.	89.
14	186.	207.	111.
15	125.	89.	64.
16	148.	123.	68.
17	110.	123.	54.
18	108.	126.	49.
19	114.	109.	48.
20	93.	41.	53.
21	119.	80.	52.
22	128.	169.	67.
23	191.	183.	89.
24	178.	164.	79.
25	154.	139.	61.
26	94.	215.	35.
27	99.	166.	48.
28	101.	130.	30.
29	91.	112.	39.
30	84.	101.	40.
31	73.	46.	37.
32	76.	130.	27.
33	74.	128.	28.

SEP7

CASE-NO	ACCOMP	NOSPD	SPD
1	208.	158.	80.
2	149.	49.	51.
3	206.	132.	72.
4	170.	85.	68.
5	152.	39.	60.
6	160.	54.	63.
7	164.	75.	53.
8	147.	36.	62.
9	156.	55.	63.
10	256.	193.	83.
11	212.	119.	60.
12	168.	162.	46.
13	186.	229.	58.
14	125.	99.	43.
15	148.	145.	37.
16	119.	142.	28.
17	108.	139.	20.
18	114.	124.	23.
19	93.	46.	24.
20	119.	92.	34.
21	128.	191.	41.
22	191.	197.	48.
23	178.	179.	41.
24	154.	161.	35.
25	94.	251.	17.
26	99.	186.	22.
27	101.	153.	14.
28	91.	135.	19.
29	84.	109.	18.
30	73.	53.	11.
31	76.	145.	18.
32	74.	154.	17.

SEP8

CASE-NO	ACCOMP	NOSPD	SPD
1	149.	56.	41.
2	206.	148.	60.
3	170.	94.	55.
4	152.	62.	54.
5	160.	58.	45.
6	164.	77.	46.
7	147.	37.	50.
8	156.	60.	56.
9	256.	220.	61.
10	212.	145.	49.
11	168.	192.	40.
12	186.	235.	40.
13	125.	113.	29.
14	148.	172.	27.
15	119.	158.	19.
16	108.	174.	16.
17	114.	145.	17.
18	93.	54.	21.
19	119.	105.	25.
20	128.	209.	34.
21	191.	208.	32.
22	178.	150.	33.
23	154.	178.	26.
24	94.	283.	10.
25	99.	221.	17.
26	101.	173.	7.
27	91.	152.	14.
28	84.	131.	14.
29	73.	60.	9.
30	76.	159.	12.
31	74.	165.	11.

SEP9

CASE-NO	ACCOMP	NOSPD	SPD
1	274.	254.	56.
2	270.	223.	68.
3	262.	151.	54.
4	208.	175.	46.
5	149.	63.	38.
6	206.	163.	55.
7	170.	111.	44.
8	152.	65.	48.
9	160.	73.	38.
10	164.	85.	35.
11	147.	39.	43.
12	156.	61.	40.
13	256.	240.	51.
14	212.	152.	37.
15	168.	236.	24.
16	186.	255.	29.
17	125.	120.	23.
18	148.	187.	21.
19	119.	173.	18.
20	108.	194.	15.
21	114.	174.	13.
22	93.	59.	17.
23	119.	111.	21.
24	128.	225.	22.
25	191.	220.	29.
26	178.	207.	25.
27	154.	192.	17.
28	94.	311.	7.
29	99.	245.	13.
30	101.	196.	7.
31	91.	159.	10.
32	84.	153.	12.
33	73.	71.	7.
34	76.	164.	11.
35	74.	170.	9.

SEP10

CASE-NO	ACCOMP	NOSPD	SPD
1	270.	235.	61.
2	262.	153.	47.
3	208.	187.	34.
4	149.	67.	35.
5	206.	171.	48.
6	170.	124.	34.
7	152.	77.	35.
8	160.	81.	37.
9	164.	101.	30.
10	147.	51.	37.
11	156.	66.	30.
12	256.	256.	39.
13	212.	168.	36.
14	168.	255.	20.
15	185.	280.	23.
16	125.	124.	15.
17	148.	196.	17.
18	119.	188.	13.
19	108.	213.	11.
20	114.	196.	8.
21	93.	73.	13.
22	119.	118.	17.
23	128.	249.	15.
24	191.	233.	22.
25	178.	219.	19.
26	154.	201.	11.
27	94.	326.	5.
28	99.	267.	6.
29	101.	215.	5.
30	91.	176.	9.
31	84.	164.	8.
32	73.	81.	6.
33	76.	177.	7.
34	74.	183.	6.

SEP11

CASE-NO	ACCOMP	NOSPD	SPD
1	262.	167.	49.
2	208.	199.	29.
3	149.	75.	30.
4	206.	187.	37.
5	170.	128.	25.
6	152.	84.	30.
7	160.	80.	35.
8	164.	109.	23.
9	147.	69.	35.
10	156.	83.	23.
11	256.	267.	34.
12	212.	171.	29.
13	168.	275.	19.
14	186.	296.	22.
15	125.	154.	13.
16	148.	210.	13.
17	119.	192.	10.
18	108.	233.	8.
19	114.	210.	8.
20	93.	76.	10.
21	119.	145.	14.
22	128.	262.	8.
23	191.	243.	13.
24	178.	230.	16.
25	154.	204.	10.
26	94.	334.	4.
27	99.	270.	6.
28	101.	232.	3.
29	91.	194.	8.
30	84.	186.	4.
31	73.	36.	5.
32	76.	196.	6.
33	74.	205.	6.

SEP12

CASE-NO	ACCOMP	NOSPD	SPD
1	149.	80.	27.
2	206.	196.	31.
3	170.	134.	20.
4	152.	90.	27.
5	160.	98.	27.
6	164.	118.	20.
7	147.	75.	31.
8	156.	104.	21.
9	256.	294.	25.
10	212.	177.	26.
11	168.	278.	13.
12	186.	313.	17.
13	125.	169.	10.
14	148.	228.	8.
15	119.	200.	7.
16	108.	245.	5.
17	114.	222.	8.
18	93.	88.	8.
19	119.	154.	13.
20	128.	279.	4.
21	191.	256.	9.
22	178.	240.	12.
23	154.	209.	5.
24	94.	340.	2.
25	99.	282.	4.
26	101.	248.	8.
27	91.	214.	6.
28	84.	200.	1.
29	73.	99.	4.
30	76.	211.	4.
31	74.	224.	3.

APPENDIX C

Separation's SPSS Regression Output Listings

VOGELBACK COMPUTING CENTER
NORTHWESTERN UNIVERSITY

S P S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES
VERSION 8.0 -- JUNE 18, 1979

RUN NAME SEPARATION PROJECTIONS. 1ST MONTH
VARIABLE LIST ACCOMP,NOSPD,SPD
INPUT MEDIUM DISK
N OF CASES 37
INPUT FORMAT FREEFIELD
VAR LABELS ACCOMP,NOSPD,SPD
LIST CASES CASES:000//VARIABLES=ACCOMP,NOSPD,SPD
REGRESSION METHOD=STEPWISE/VARIABLES=ACCOMP,NOSPD,SPD/
REGRESSION=ACCOMP WITH NOSPD,SPD/RESIDUALS/
STATISTICS ALL

88854488 CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

87/15/82 15.28.15.

SEPARATION PROJECTIONS, 1ST MONTH
FILE NAME (CREATION DATE - 87/15/82)

CASE-NO	ACCOMP	NOSPD	SPD
1	298.	15.	278.
2	348.	13.	334.
3	271.	98.	243.
4	278.	86.	238.
5	262.	57.	232.
6	208.	47.	194.
7	149.	13.	149.
8	286.	48.	178.
9	178.	41.	158.
10	152.	22.	139.
11	168.	19.	164.
12	164.	28.	143.
13	147.	11.	143.
14	156.	25.	143.
15	256.	77.	235.
16	212.	53.	191.
17	168.	49.	148.
18	186.	84.	152.
19	125.	36.	117.
20	148.	42.	125.
21	119.	42.	184.
22	108.	57.	86.
23	114.	47.	88.
24	93.	26.	86.
25	119.	25.	185.
26	128.	49.	101.
27	191.	74.	144.
28	178.	54.	159.
29	154.	49.	128.
30	94.	53.	74.
31	99.	43.	77.
32	101.	46.	77.
33	91.	68.	66.
34	84.	62.	66.
35	73.	29.	67.
36	76.	35.	46.
37	74.	35.	59.

SEPARATION PROJECTIONS, 1ST MONTH

87/15/82 15.28.15. PAGE 3

SEPARATION PROJECTIONS, 1ST MONTH

87/15/82 15.28.15. PAGE 4

FILE MONAME (CREATION DATE = 87/15/82)

..... MULTIPLE REGRESSION

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	168.5135	67.2593	37
NOSPD	44.1881	28.7253	37
SPD	141.2162	66.3849	37

CORRELATION COEFFICIENTS.

A VALUE OF 99.9999 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

NOSPD	.19485
SPD	.58768
ACCOMP	.87289
NOSPD	
SPD	

SEPARATION PROJECTIONS, 1ST MONTH

87/15/82 15.29.15. PAGE 5

FILE NAME (CREATION DATE = 87/15/82)

DEPENDENT VARIABLE.. ACCOMP NOSPD.SPD

MULTIPLE REGRESSION

MEAN RESPONSE 168.51351 STD. DEV. 57.25929

VARIABLE(S) ENTERED ON STEP NUMBER 1.. SPD

MULTIPLE R	.98768	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.97551	REGRESSION	1.	158869.58926	158869.58926	1394.41277	
ADJUSTED R SQUARE	.97481	RESIDUAL	35.	3987.65399	113.93297		
STD DEVIATION	18.67394	COEFF OF VARIABILITY	6.6 PCT				

VARIABLES IN THE EQUATION

VARIABLES NOT IN THE EQUATION

VARIABLE	B	STD ERROR B	F	BETA	PARTIAL	TOLERANCE	F	SIGNIFICANCE
SPD	1.8886318	.26798118E-01	1394.4128	.9876813	.79229	.99488	57.338818	.888
(CONSTANT)	19.199722	4.1713884	21.185888	.88839				

VARIABLE(S) ENTERED ON STEP NUMBER 2.. NOSPD

MULTIPLE R	.99543	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.99888	REGRESSION	2.	161372.74718	80686.37355	1847.99181	.888
ADJUSTED R SQUARE	.99835	RESIDUAL	34.	1484.49614	43.66165		
STD DEVIATION	6.68778	COEFF OF VARIABILITY	4.1 PCT				

VARIABLES IN THE EQUATION

VARIABLES NOT IN THE EQUATION

VARIABLE	B	STD ERROR B	F	BETA	PARTIAL	TOLERANCE	F	SIGNIFICANCE
SPD	.99161232	.166322636E-01	3554.3622	.987287				
NOSPD	.48377773	.53327143E-01	57.338818	.87248				
(CONSTANT)	2.6719825	3.3812732	.62442559	.11896				

ALL VARIABLES ARE IN THE EQUATION.

SEPARATION PROJECTIONS, 1ST MONTH

FILE NAME (CREATION DATE = 87/15/82)
 DEPENDENT VARIABLE.. ACCOMP NOSPD,SPD

87/15/82 15.28.15. PAGE 6

MULTIPLE REGRESSION

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL
SPD	.99161232	.16632638E-01	59.618472	.95781873 ; 1.0254139
NOSPD	.48377773	.53327143E-01	7.5717112	.29548393 ; .51215152
CONSTANT	2.6719825	3.3812732	.79826685	-4.1996714 ; 9.5434764

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

NOSPD	.88284
SPD	-.88886 .88828
NOSPD	SPD

SEPARATION PROJECTIONS, 1ST MONTH

FILE NAME (CREATION DATE = 87/15/82)
 DEPENDENT VARIABLE.. ACCOMP NOSPD,SPD

87/15/82 15.28.15. PAGE 7

MULTIPLE REGRESSION

SUMMARY TABLE

STEP	VARIABLE ENTERED REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	SPD	1394.41277	.888	.98768	.97551	.97551	.98768	1394.41277	.888
2	NOSPD	57.33891	.888	.99543	.99888	.01537	.19485	1847.99181	.888

SEPARATION PROJECTIONS, 1ST MONTH

87/15/82 15.28.15. PAGE 8

FILE NAME (CREATION DATE - 87/15/82)

MULTIPLE REGRESSION

OBSERVATION Y VALUE Y ESTIMATE RESIDUAL

1.	298.8000	284.3968	5.653287	1
2.	348.8000	333.1195	8.884738	1
3.	274.8000	279.9737	-6.973691	1
4.	270.8000	265.4676	4.532388	1
5.	262.8000	245.7413	6.250789	1
6.	288.8000	214.8232	6.822445	1
7.	149.8000	185.6112	-6.671248	1
8.	206.8000	195.3308	10.670888	1
9.	178.8000	175.9815	-5.981535	1
10.	152.8000	149.3891	2.618875	1
11.	168.8000	169.8817	-9.881658	1
12.	164.8000	155.7782	8.221768	1
13.	147.8000	148.9140	-1.914019	1
14.	156.8000	134.5609	1.332933	1
15.	256.8000	266.7917	-10.79163	1
16.	212.8000	213.4781	-1.478875	1
17.	168.8000	169.2156	-1.215634	1
18.	186.8000	187.3143	-1.314384	1
19.	175.8000	173.2765	8.226442	1
20.	148.8000	143.5831	4.417893	1
21.	119.8000	122.7582	-3.758248	1
22.	188.8000	188.9659	-2.965892	1
23.	114.8000	108.9113	5.886668	1
24.	93.8000	98.44878	-5.448783	1
25.	119.8000	116.8856	2.114361	1
26.	128.8000	122.6299	5.398145	1
27.	191.8000	175.3436	15.65637	1
28.	178.8000	182.1423	-4.142258	1
29.	154.8000	149.3834	4.616612	1
30.	94.8000	97.45143	-3.451433	1
31.	99.8000	96.38849	2.611587	1
32.	181.8000	97.59983	3.488174	1
33.	91.8000	91.53742	-5.374235	1
34.	84.8000	97.15253	-9.152534	1
35.	73.8000	82.81928	-7.819182	1
36.	76.8000	62.41829	13.58171	1
37.	74.8000	75.38925	-1.389258	1

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED 37. OR 5.41 PERCENT OF THE TOTAL
 NUMBER OF 2 S.D. OUTLIERS 2. OR DUBIN-WATSON TEST 2.61286
 VON NEUMANN RATIO 2.58267
 NUMBER OF POSITIVE RESIDUALS 17.
 NUMBER OF NEGATIVE RESIDUALS 20.
 NUMBER OF RUNS OF SIGNS 24.
 EXPECTED NUMBER OF RUNS OF SIGNS 19.
 EXPECTED S.D. OF RUN DISTRIBUTION 2.97856
 UNIT NORMAL DEVIATE 1.71949
 Z ((EXPLICIT-OBSERVED)/S.D.) .84276
 PROBABILITY OF OBTAINING .GE. ABS(Z)

VOGELBACK COMPUTING CENTER
NORTHWESTERN UNIVERSITY

S P S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 8.0 -- JUNE 10, 1979

07/15/82 15.30.22. PAGE 1

RUN NAME SEPARATION PROJECTIONS, 2ND MONTH
VARIABLE LIST ACCOMP,NOSPD,SPD
INPUT MEDIUM DISK
N OF CASES 36
INPUT FORMAT FREEFIELD
VAR LABELS ACCOMP,NOSPD,SPD
LIST CASES CASES=36/VARIABLES=ACCOMP,NOSPD,SPD
REGRESSION METHOD=STEPWISE/VARIABLES=ACCOMP,NOSPD,SPD/
REGRESSION=ACCOMP WITH NOSPD,SPD/RESIDUALS/
STATISTICS ALL

00054400 CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

SEPARATION PROJECTIONS, 2ND MONTH
 FILE MONAME (CREATION DATE = 87/15/82)

87/15/82 15.38.22. PAGE 2

CASE-NO	ACCOMP	NOSPD	SPD
1	348.	14.	333.
2	274.	117.	258.
3	278.	134.	222.
4	262.	78.	231.
5	288.	53.	191.
6	149.	12.	154.
7	206.	58.	106.
8	178.	46.	163.
9	151.	30.	151.
10	160.	25.	160.
11	164.	33.	141.
12	147.	11.	153.
13	156.	25.	154.
14	256.	86.	251.
15	211.	52.	192.
16	168.	66.	155.
17	186.	95.	153.
18	125.	44.	119.
19	148.	46.	126.
20	119.	62.	182.
21	108.	77.	85.
22	114.	75.	92.
23	93.	26.	85.
24	119.	34.	185.
25	128.	54.	187.
26	191.	182.	142.
27	178.	72.	158.
28	154.	52.	129.
29	94.	78.	77.
30	99.	47.	81.
31	181.	48.	86.
32	91.	61.	72.
33	84.	68.	71.
34	73.	29.	78.
35	76.	46.	47.
36	74.	49.	63.

SEPARATION PROJECTIONS, 2ND MONTH

87/15/82 15.38.22. PAGE 3

SEPARATION PROJECTIONS, 2ND MONTH

87/15/82 15.38.22. PAGE 4

FILE _MNAME (CREATION DATE - 87/15/82)

..... MULTIPLE REGRESSION

VARIABLE	MEAN	STANDARD DEV	CASES
ACOMP	156.9167	64.5835	36
NOSPD	54.7588	28.4579	36
SPD	148.4167	62.9228	36

CORRELATION COEFFICIENTS.

A VALUE OF 99.99999 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

NOSPD	.38462
SPD	.97985
ACOMP	.15483
NOSPD	

SEPARATION PROJECTIONS, 2ND MONTH

87/15/82 16.38.22. PAGE 5

FILE MONAME (CREATION DATE = 87/15/82.)

DEPENDENT VARIABLE.. ACCOMP NOSPD.SPD

MULTIPLE REGRESSION

MEAN RESPONSE 156.91667 STD. DEV. 64.58354

VARIABLE(S) ENTERED ON STEP NUMBER 1.. SPD

MULTIPLE R	.97985	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.96818	REGRESSION	1.	139814.51855	139814.51855	818.15791	.000
ADJUSTED R SQUARE	.95893	RESIDUAL	34.	5818.23945	178.89948		
STD DEVIATION	13.07247	COEFF OF VARIABILITY	8.3 PCT				

----- VARIABLES NOT IN THE EQUATION -----

----- VARIABLES IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F	SIGNIFICANCE	BETA	ELASTICITY	VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
SPD	1.884633	.35116846E-01	818.15791		.9798476		NOSPD	.77488	.97683	49.589517	.000
(CONSTANT)	15.873279	5.3988887	8.6698954	.006	.89884						

VARIABLE(S) ENTERED ON STEP NUMBER 2.. NOSPD

MULTIPLE R	.99288	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.98486	REGRESSION	2.	143383.17326	71651.58663	1818.48986	.000
ADJUSTED R SQUARE	.98389	RESIDUAL	33.	2321.57674	78.35881		
STD DEVIATION	8.38754	COEFF OF VARIABILITY	5.3 PCT				

----- VARIABLES NOT IN THE EQUATION -----

----- VARIABLES IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F	SIGNIFICANCE	BETA	ELASTICITY	VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
SPD	.97959662	.22886655E-01	1844.8939		.9555983						
NOSPD	.35518948	.58427486E-01	49.589517	.000	.87659						
(CONSTANT)	-.77268983E-01	4.1345428	.34926469E-03	.985	.12398						

ALL VARIABLES ARE IN THE EQUATION.

SEPARATION PROJECTIONS, 2ND MONTH

FILE NAME (CREATION DATE - 87/15/82)
DEPENDENT VARIABLE.. ACCOMP NOSPD,SPD

87/15/82 15.38.22. PAGE 6

MULTIPLE REGRESSION

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL
SPD	.97959662	.2280655E-01	42.952228	.93319613
NOSPD	.35518948	.5047486E-01	7.0419825	.25251398
CONSTANT	-.7726893E-01	4.134542E-01	-.18688625E-01	-8.4898579
				8.3345281

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

NOSPD	.88254
SPD	-.88818 .88052
NOSPD	SPD

SEPARATION PROJECTIONS, 2ND MONTH

FILE NAME (CREATION DATE - 87/15/82)
DEPENDENT VARIABLE.. ACCOMP NOSPD,SPD

87/15/82 15.38.22. PAGE 7

MULTIPLE REGRESSION

SUMMARY TABLE

STEP	VARIABLE ENTERED	REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	SPD		818.15791		.97985	.96818	.96818	.97985	818.15791	.000
2	NOSPD		49.58952		.99288	.98486	.02396	.38462	1818.48986	.000

SEPARATION PROJECTIONS. 2ND MONTH

87/15/82 15.38.22. PAGE 8

FILE NAME (CREATION DATE - 87/15/92)

MULTIPLE REGRESSION

OBSERVATION	Y VALUE	Y ESTIMATE	RESIDUAL	-2SD	S.S	+2SD
1.	348.8000	331.8999	9.98862		1	
2.	274.8000	286.3697	-12.36969		1	
3.	274.8000	264.9779	5.822158		1	
4.	262.8000	251.8672	18.93279		1	
5.	208.8000	245.8465	2.153513		1	
6.	149.8000	155.8419	-6.041924		1	
7.	286.8000	199.8832	6.116324		1	
8.	170.8000	175.9330	-5.932316		1	
9.	152.8000	154.9440	-2.944018		1	
10.	160.8000	171.4135	-11.41351		1	
11.	164.8000	149.7645	14.23553		1	
12.	147.8000	153.7872	-6.787218		1	
13.	156.8000	159.6583	-3.658347		1	
14.	256.8000	276.3469	-20.34690		1	
15.	212.8000	206.4718	5.52926		1	
16.	168.8000	175.1974	-7.197432		1	
17.	186.8000	183.5364	-2.463586		1	
18.	125.8000	132.1195	-7.119545		1	
19.	148.8000	139.6869	8.313059		1	
20.	119.8000	121.8584	-2.858374		1	
21.	188.8000	118.5319	2.531873		1	
22.	114.8000	116.6780	-2.678031		1	
23.	93.80000	92.42129	5.787188		1	
24.	119.8000	114.8541	4.145982		1	
25.	128.8000	123.9155	4.884519		1	
26.	191.8000	175.2466	15.75338		1	
27.	178.8000	172.4381	5.560894		1	
28.	154.8000	144.7564	9.243612		1	
29.	94.80000	108.2893	-6.289334		1	
30.	99.80000	95.96808	3.831979		1	
31.	181.8000	141.2133	2.132951		1	
32.	91.80000	92.11537	-1.115366		1	
33.	84.80000	93.62154	-9.621535		1	
34.	73.80000	78.78267	-5.782669		1	
35.	76.88308	62.29881	13.78119		1	
36.	74.80000	79.83760	-5.837682		1	

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED

R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED	36.	1. OR	2.78 PERCENT OF THE TOTAL
NUMBER OF 2 S.D. OUTLIERS			
VON NEUMANN RATIO	2.43761	DURBIN-WATSON TEST	2.36989
NUMBER OF POSITIVE RESIDUALS	17.		
NUMBER OF NEGATIVE RESIDUALS	19.		
NUMBER OF RUNS OF SIGNS	28.		
EXPECTED NUMBER OF RUNS OF SIGNS	19.		
EXPECTED S.D. OF RUN DISTRIBUTION	2.94744		
UNIT NORMAL DEVIATE			
7-(EXPECTED-OBSERVED)/S.D.	-5.2777		
PROBABILITY OF OBTAINING .G.L. ABS(2)	.23003		

VOGELBACK COMPUTING CENTER
NORTHWESTERN UNIVERSITY

S P S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 8.0 -- JUNE 18, 1979

87/15/82

18.31.81.

PAGE 1

RUN NAME SEPARATION PROJECTIONS, 3RD MONTH
VARIABLE LIST ACCOMP.NOSPD,SPD
INPUT METHOD DISK
N OF CASES 35
INPUT FORMAT FREEFIELD
VAR LABELS ACCOMP.NOSPD,SPD
LIST CASES CASES=35/VARIABLES-ACCOMP.NOSPD,SPD
REGRESSION METHOD=STEPWISE/VARIABLES-ACCOMP.NOSPD,SPD/
REGRESSION-ACCOMP WITH NOSPD,SPD/RESIDUALS/
STATISTICS ALL

88054488 CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

SEPARATION PROJECTIONS, 3RD MONTH

87/15/82 15.31.51. PAGE 2

FILE MONAME (CREATION DATE = 87/15/82)

CASE-NO	ACCOMP	MOSPD	SPD
1	274.	146.	234.
2	278.	141.	218.
3	262.	88.	226.
4	288.	67.	187.
5	149.	16.	153.
6	286.	54.	177.
7	178.	51.	158.
8	152.	28.	149.
9	169.	39.	156.
10	164.	47.	133.
11	147.	16.	143.
12	156.	31.	158.
13	256.	98.	238.
14	212.	63.	191.
15	168.	98.	154.
16	186.	123.	158.
17	125.	47.	189.
18	148.	59.	122.
19	119.	69.	93.
20	180.	78.	81.
21	114.	73.	89.
22	93.	32.	82.
23	119.	35.	181.
24	128.	76.	184.
25	191.	118.	138.
26	178.	97.	145.
27	154.	78.	186.
28	94.	98.	73.
29	99.	49.	79.
30	181.	49.	81.
31	91.	76.	78.
32	84.	88.	66.
33	73.	24.	69.
34	76.	85.	45.
35	74.	68.	68.

SEPARATION PROJECTIONS, 3RD MONTH

87/15/82 15.31.51. PAGE 3

SEPARATION PROJECTIONS, 3RD MONTH

87/15/82 15.31.51. PAGE 4

FILE NAME (CREATION DATE - 87/15/82.)

..... MULTIPLE REGRESSION

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	151.6957	57.1756	36
NOSPD	67.3429	32.9404	36
SPD	129.2088	52.4661	35

CORRELATION COEFFICIENTS.

A VALUE OF 99.9999 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

NOSPD	.49526
SPD	.96987
ACCOMP	.32762
NOSPD	

SEPARATION PROJECTIONS, 3RD MONTH

87/15/82 15.31.51. PAGE 5

FILE MONAME (CREATION DATE = 87/15/82.)

DEPENDENT VARIABLE.. ACCOMP NOSPD,SPD

MULTIPLE REGRESSION

MEAN RESPONSE 151.68571 STD. DEV. 57.17557

VARIABLE(S) ENTERED ON STEP NUMBER 1.. SPD

MULTIPLE R	.96987	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.94864	REGRESSION	1.	184558.86783	184558.86783	522.95841	.000
ADJUSTED R SQUARE	.93884	RESIDUAL	32.	6597.47582	199.92349		
STD DEVIATION	14.13943	COEFF OF VARIABILITY	9.3 PCT				

VARIABLES IN THE EQUATION

VARIABLE	B	STD ERROR B	F	BETA	VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
SPD	1.8569239	.46218247E-01	522.95841	.9698671	NOSPD	.77116	.89267	46.952157	.000
(CONSTANT)	15.131145	6.4319273	5.5342826	.98825					

VARIABLE(S) ENTERED ON STEP NUMBER 2.. NOSPD

MULTIPLE R	.98798	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.97594	REGRESSION	2.	18473.52858	54236.76425	649.85278	.000
ADJUSTED R SQUARE	.97444	RESIDUAL	32.	2674.81436	83.56295		
STD DEVIATION	9.14128	COEFF OF VARIABILITY	6.8 PCT				

VARIABLES IN THE EQUATION

VARIABLE	B	STD ERROR B	F	BETA	VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
SPD	.9852692	.31625973E-01	971.85542	.9847188					
NOSPD	.34589788	.58363339E-01	46.952157	.83977					
(CONSTANT)	1.8648785	4.6374599	.52648618E-01	.15321					

ALL VARIABLES ARE IN THE EQUATION.

SEPARATION PROJECTIONS, 3RD MONTH

87/15/82 15.31.51. PAGE 6

FILE MONAME (CREATION DATE = 87/15/82)
 DEPENDENT VARIABLE.. ACCOMP NOSPD,SPD

MULTIPLE REGRESSION

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL
SPD	.98592592	.31625973E-01	31.174596	.92158693
NOSPD	.34549708	.58363339E-01	6.8521644	.24251111
CONSTANT	1.9648785	4.6374599	.22945207	-8.3821102

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

NOSPD .88254
 SPD -.88952 .88188

NOSPD SPD

SEPARATION PROJECTIONS, 3RD MONTH

87/15/82 15.31.51. PAGE 7

FILE MONAME (CREATION DATE = 87/15/82)
 DEPENDENT VARIABLE.. ACCOMP NOSPD,SPD

MULTIPLE REGRESSION

SUMMARY TABLE

STEP	VARIABLE ENTERED REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	SPD	522.95841	.888	.96987	.94864	.94864	.96987	522.95841	.888
2	NOSPD	46.95216	.888	.98798	.97694	.93538	.49626	649.85278	.888

SEPARATION PROJECTIONS, 3RD MONTH

87/15/82 15.31.51. PAGE 8

FILE NAME (CREATION DATE - 87/15/82)

MULTIPLE REGRESSION *****
OBSERVATION Y VALUE Y ESTIMATE RESIDUAL -2SD S.D. +2SD

1.	274.0000	282.1553	-8.155269	
2.	278.0000	256.7675	13.23247	
3.	262.0000	254.2522	7.747823	
4.	268.0000	260.5548	-5.539713	
5.	149.0000	157.4325	-8.432454	
6.	246.0000	194.2864	11.79157	
7.	178.0000	174.4485	-4.440524	
8.	152.0000	154.8691	-2.869148	
9.	160.0000	168.3275	-8.327496	
10.	164.0000	148.4128	15.58884	
11.	147.0000	147.5732	-5731948	
12.	156.0000	159.5512	-3.651151	
13.	256.0000	269.5343	-13.53428	
14.	212.0000	211.1173	.8827125	
15.	168.0000	186.7164	-18.71642	
16.	186.0000	191.4882	-5.488156	
17.	125.0000	124.7497	.252864	
18.	148.0000	141.7879	6.292862	
19.	119.0000	115.5678	2.432964	
20.	180.0000	187.8418	-15.82061	
21.	114.0000	114.8837	-.3719995E-02	
22.	93.0000	92.95322	.4678159E-01	
23.	119.0000	112.7211	6.278876	
24.	128.0000	129.8279	-1.827917	
25.	191.0000	175.8628	15.91724	
26.	178.0000	177.4988	.5028232	
27.	154.0000	129.7292	24.27882	
28.	94.0000	104.8956	-10.89555	
29.	99.0000	95.86214	3.137898	
30.	181.0000	97.83396	3.166845	
31.	91.0000	96.38648	-5.386482	
32.	84.0000	93.74389	-9.743886	
33.	73.0000	77.37539	-4.375385	
34.	76.0000	74.75411	1.235888	
35.	74.0000	80.92557	-6.925567	

NOTE - (1) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED	35.	2. OR	5.71 PERCENT OF THE TOTAL	
NUMBER OF 2 S.D. OUTLIERS				
VON NEUMANN RATIO	2.27823		DURBIN-WATSON TEST	2.21314
NUMBER OF POSITIVE RESIDUALS	17.			
NUMBER OF NEGATIVE RESIDUALS	18.			
NUMBER OF RUNS OF SIGNS	19.			
EXPECTED NUMBER OF RUNS OF SIGNS	18.			
EXPECTED S.D. OF RUN DISTRIBUTION	2.91176			
UNIT NORMAL DEViate				
2-(EXPECTED-OBSERVED)/S.D.	.34834			
PROBABILITY OF OBTAINING .GE. ABS(Z)	.36379			

VOGELBACK COMPUTING CENTER
NORTHWESTERN UNIVERSITY

S P S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 8.8 -- JUNE 18, 1979

87/16/82

15.33.33.

PAGE

1

RUN NAME SEPARATION PROJECTIONS, 4TH MONTH
VARIABLE LIST ACCOMP.NOSPD.SPD
INPUT MEDIUM DISK
N OF CASES 34
INPUT FORMAT FREEFIELD
VAR LABELS ACCOMP.NOSPD.SPD
LIST CASES CASES=34/VARIABLES=ACCOMP.NOSPD.SPD
REGRESSION METHOD=STEPWISE/VARIABLES=ACCOMP.NOSPD.SPD/
REGRESSION=ACCOMP WITH NOSPD.SPD/RESIDUALS/
STATISTICS ALL

88954488 CH NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

SEPARATION PROJECTIONS, 4TH MONTH
FILE NO NAME (CREATION DATE = 87/15/82)

87/15/82 15.33.33. PAGE 2

CASE-NO	ACCOMP	WOSPD	SPD
1	278.	157.	195.
2	262.	97.	223.
3	208.	181.	189.
4	149.	22.	144.
5	206.	59.	167.
6	178.	53.	158.
7	152.	23.	146.
8	160.	45.	157.
9	164.	61.	128.
10	147.	28.	141.
11	156.	32.	147.
12	256.	113.	229.
13	212.	75.	187.
14	168.	111.	154.
15	186.	168.	148.
16	125.	61.	184.
17	148.	72.	111.
18	119.	54.	88.
19	188.	87.	79.
20	114.	83.	85.
21	93.	25.	73.
22	119.	64.	188.
23	128.	96.	181.
24	191.	134.	141.
25	178.	113.	145.
26	154.	185.	96.
27	94.	132.	73.
28	99.	72.	75.
29	181.	66.	73.
30	91.	93.	65.
31	84.	86.	69.
32	73.	38.	68.
33	76.	98.	39.
34	74.	98.	58.

SEPARATION PROJECTIONS, 4TH MONTH

87/15/82 15.33.33. PAGE 3

SEPARATION PROJECTIONS, 4TH MONTH

87/15/82 15.33.33. PAGE 4

FILE NAME (CREATION DATE - 87/15/82)

..... MULTIPLE REGRESSION

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	148.8882	53.9648	34
NOSPD	88.5294	36.5724	34
SPD	121.6471	48.7653	34

CORRELATION COEFFICIENTS.

A VALUE OF 99.9999 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

NOSPD	.31613	
SPD	.95846	.11816
ACCOMP		NOSPD

SEPARATION PROJECTIONS, 4TH MONTH
 FILE MONAME (CREATION DATE 07/15/82)
 DEPENDENT VARIABLE.. ACCOMP NOSPD,SPD
 MEAN RESPONSE 148.88824 STD. DEV. 63.8648#
 VARIABLE(S) ENTERED ON STEP NUMBER 1... SPD
 MULTIPLE R .95846 ANALYSIS OF VARIANCE DF SUM OF SQUARES MEAN SQUARE F SIGNIFICANCE
 R SQUARE .91065 REGRESSION 1. 87957.6864# 87957.6864# 361.35535 #
 ADJUSTED R SQUARE .91611 RESIDUAL 32. 7789.12889 243.41828
 STD DEVIATION 15.68161 COEFF OF VARIABILITY 18.5 PCT

----- VARIABLES IN THE EQUATION -----
 VARIABLE B STD ERROR B F SIGNIFICANCE BETA ELASTICITY
 SPD 1.8587982 .55698815E-81 361.35535 .9584616
 (CONSTANT) 19.288547 7.2847677 7.8180882 .86975
 ----- VARIABLES NOT IN THE EQUATION -----
 VARIABLE PARTIAL TOLERANCE F SIGNIFICANCE
 NOSPD .71633 .98684 32.671329 .838

 VARIABLE(S) ENTERED ON STEP NUMBER 2... NOSPD
 MULTIPLE R .98888 ANALYSIS OF VARIANCE DF SUM OF SQUARES MEAN SQUARE F SIGNIFICANCE
 R SQUARE .96839 REGRESSION 2. 91954.48852 45977.28826 375.83528 .888
 ADJUSTED R SQUARE .95784 RESIDUAL 31. 3792.33477 122.33338
 STD DEVIATION 11.86844 COEFF OF VARIABILITY 7.5 PCT

----- VARIABLES IN THE EQUATION -----
 VARIABLE B STD ERROR B F SIGNIFICANCE BETA ELASTICITY
 SPD 1.831942# .39765889E-81 673.45197 .9341584
 NOSPD .38221284 .52872459E-81 32.671329 .84769
 (CONSTANT) -1.7014927 6.3458890 .78032174E-81 .16434
 .781

ALL VARIABLES ARE IN THE EQUATION.

SEPARATION PROJECTIONS, 4TH MONTH

87/15/82 15.33.33. PAGE 6

FILE NNAME (CREATION DATE = 87/15/82)

 DEPENDENT VARIABLE.. ACCOMP NOSPD,SPD

MULTIPLE REGRESSION

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CO- IDENCE INTERVAL
SPD	1.8319428	.39765099E-01	25.950953	.95084054 ; 1.1130434
NOSPD	.30221284	.52872459E-01	5.7158839	.19437875 ; .41884693
CONSTANT	-1.7614927	6.3450098	-.28077068	-14.722226 ; 11.169248

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

NOSPD	.88288
SPD	-.88025 .88158
NOSPD	SPD

SEPARATION PROJECTIONS, 4TH MONTH

87/15/82 15.33.33. PAGE 7

FILE NNAME (CREATION DATE = 87/15/82)

 DEPENDENT VARIABLE.. ACCOMP NOSPD,SPD

MULTIPLE REGRESSION

SUMMARY TABLE

STEP	VARIABLE ENTERED	REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	SPD		361.35535	.000	.95046	.31865	.91865	.95846	361.35535	.000
2	NOSPD		32.67133	.000	.98000	.96039	.04174	.31613	375.83528	.000

SEPARATION PROJECTIONS, 4TH MONTH

87/15/82 15.33.33. PAGE 8

FILE NAME (CREATION DATE - 87/15/82.)

OBSERVATION	Y VALUE	Y ESTIMATE	RESIDUAL	-2SD	8.8	+2SD
1.	278.8888	246.8946	23.18539			R
2.	262.0000	257.6562	4.343788			
3.	280.0000	214.4916	-6.491589			
4.	149.0000	153.4668	-4.466834			
5.	206.0000	189.3014	17.01663			
6.	178.0000	169.8271	.9729165			
7.	152.0000	155.8329	-3.832938			
8.	168.0000	173.8338	-13.8338			
9.	164.0000	148.7471	15.25294			
10.	147.0000	149.7666	-2.766582			
11.	156.0000	159.5848	-3.584788			
12.	256.0000	268.6833	-12.68327			
13.	212.0000	213.8576	-1.857619			
14.	168.0000	198.6832	-22.68328			
15.	186.0000	191.8444	-5.844438			
16.	125.0000	123.9755	1.024544			
17.	148.0000	134.5234	13.47661			
18.	119.0000	114.4153	4.584721			
19.	188.0000	186.8344	1.965568			
20.	114.0000	112.8492	1.95817			
21.	93.0000	90.31937	2.680628			
22.	119.0000	128.7543	-1.754326			
23.	128.0000	131.4571	-3.457079			
24.	151.0000	134.2180	6.781154			
25.	178.0000	182.8801	-4.088144			
26.	154.0000	129.8173	24.28272			
27.	94.0000	113.4424	-19.44237			
28.	99.0000	97.37348	1.626528			
29.	101.0000	99.68797	1.312829			
30.	91.0000	93.40053	-2.400530			
31.	84.0000	88.41281	-11.41281			
32.	73.0000	69.28141	3.796589			
33.	76.0000	68.83118	7.918897			
34.	74.8888	87.68888	-13.68888			

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED	34.	8.82 PERCENT OF THE TOTAL
NUMBER OF 2 S.D. OUTLIERS	3. OR	
VON NEUMANN RATIO	2.19184	DURBIN-WATSON TEST 2.12738
NUMBER OF POSITIVE RESIDUALS	17.	
NUMBER OF NEGATIVE RESIDUALS	17.	
NUMBER OF RUNS OF SIGNS	16.	
EXPECTED NUMBER OF RUNS OF SIGNS	18.	
EXPECTED S.D. OF RUN DISTRIBUTION	2.87896	
UNIT NORMAL DEVIATE		
Z-(EXPECTED-OBSERVED)/S.D.	-5.2247	
PROBABILITY OF OBTAINING .GE. ABS(Z)	.38867	

VOGELBACK COMPUTING CENTER
NORTHWESTERN UNIVERSITY

S P S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES
VERSION 8.0 -- JUNE 18, 1979

87/18/82 18.35.18. PAGE 1

RUN NAME SEPARATION PROJECTIONS, 5TH MONTH
VARIABLE LIST ACCOMP.NOSPD,SPD
INPUT MEDIUM DISK
N OF CASES 33
INPUT FORMAT FREEFIELD
VAR LABELS ACCOMP.NOSPD,SPD
LIST CASES CASES-33/VARIABLES-ACCOMP.NOSPD,SPD
REGRESSION METHOD-STEPWISE/VARIABLES-ACCOMP.NOSPD,SPD/
REGRESSION-ACCOMP WITH NOSPD,SPD/RESIDUALS/
STATISTICS ALL

***** CH NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

87/15/82 16.35.10. PAGE 2

SEPARATION PROJECTIONS, 6TH MONTH
FILE MONAME (CREATION DATE = 87/15/82)

CASE-NO	ACCOMP	NOSPD	SPD
1	262.	188.	289.
2	288.	112.	165.
3	149.	37.	148.
4	285.	85.	153.
5	178.	59.	144.
6	152.	26.	134.
7	168.	51.	149.
8	164.	66.	172.
9	147.	26.	130.
10	156.	37.	139.
11	206.	134.	213.
12	212.	85.	167.
13	168.	127.	143.
14	186.	180.	132.
15	125.	82.	93.
16	148.	89.	184.
17	119.	97.	80.
18	168.	106.	74.
19	114.	97.	81.
20	93.	39.	74.
21	113.	73.	88.
22	128.	146.	94.
23	191.	152.	129.
24	178.	146.	136.
25	154.	115.	83.
26	94.	184.	69.
27	99.	112.	65.
28	181.	77.	78.
29	51.	185.	61.
30	84.	94.	67.
31	73.	37.	54.
32	76.	189.	37.
33	74.	118.	51.

SEPARATION PROJECTIONS, 5TH MONTH

87/15/82 15.35.18. PAGE 3

SEPARATION PROJECTIONS, 5TH MONTH

87/15/82 15.35.18. PAGE 4

FILE MONAME (CREATION DATE 87/15/82)

***** MULTIPLE REGRESSION *****

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	144.3939	58.1354	33
NOSPD	94.7383	41.8124	33
SPD	118.6861	44.8253	33

CORRELATION COEFFICIENTS.

A VALUE OF 99.9999 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

NOSPD	.15286	
SPD	.95797	-.81777
ACCOMP		NOSPD

SEPARATION PROJECTIONS, 8TH MONTH

07/15/82 15.35.18. PAGE 5

FILE NAME (CREATION DATE = 07/15/82)

DEPENDENT VARIABLE.. ACCOMP NOSPD,SPD

MEAN RESPONSE 144.39394 STD. DEV. 58.13548

VARIABLE(S) ENTERED ON STEP NUMBER 1.. SPD

MULTIPLE R	.95797	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.91771	REGRESSION	1.	73814.63362	73814.63362	346.69787	
ADJUSTED R SQUARE	.91505	RESIDUAL	31.	6619.24517	213.52484		
STD DEVIATION	14.61246	COEFF OF VARIABILITY	18.1 PCT				

VARIABLES IN THE EQUATION

VARIABLES NOT IN THE EQUATION

VARIABLE	B	STD ERROR B	F	SIGNIFICANCE	BETA	ELASTICITY	PARTIAL	TOLERANCE	F	SIGNIFICANCE
SPD	1.0714526	.67626874E-01	345.69787		.9679696					
(CONSTANT)	25.884882	6.8627182	14.226518	.001	.82873				.99960	15.978806

VARIABLE(S) ENTERED ON STEP NUMBER 2.. NOSPD

MULTIPLE R	.97278	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.94638	REGRESSION	2.	76114.92228	38057.46114	264.35178	.000
ADJUSTED R SQUARE	.94272	RESIDUAL	30.	4318.98651	143.96522		
STD DEVIATION	11.99855	COEFF OF VARIABILITY	8.3 PCT				

VARIABLES IN THE EQUATION

VARIABLES NOT IN THE EQUATION

VARIABLE	B	STD ERROR B	F	SIGNIFICANCE	BETA	ELASTICITY	PARTIAL	TOLERANCE	F	SIGNIFICANCE
SPD	1.0748136	.47325915E-01	515.78443		.9689747					
NOSPD	.28289526	.58736878E-01	18.978886	.000	.82331					
(CONSTANT)	6.4432864	7.4437992	.74922937	.394	.13287					

ALL VARIABLES ARE IN THE EQUATION.

SEPARATION PROJECTIONS, 5TH MONTH

87/15/82 15.35.18. PAGE 6

FILE NAME (CREATION DATE = 87/15/82)
DEPENDENT VARIABLE.. ACCOMP NOSPD.SPD

MULTIPLE REGRESSION

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL
SPD	1.8748136	.4732915E-01	22.714888	.97816114
NOSPD	.28288526	.5871687E-01	3.9972599	.99188377E-01
CONSTANT	6.4432864	7.4437992	.86558937	.38642214
				-8.7599597
				21.645473

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

NOSPD	.88257
SPD	.88804
	.88224
NOSPD	SPD

SEPARATION PROJECTIONS, 5TH MONTH

87/15/82 15.35.18. PAGE 7

FILE NAME (CREATION DATE = 87/15/82)
DEPENDENT VARIABLE.. ACCOMP NOSPD.SPD

MULTIPLE REGRESSION

SUMMARY TABLE

STEP	VARIABLE ENTERED	VARIABLE REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	SPD		345.69787	.000	.95797	.91771	.91771	.95797	245.69787	.000
2	NOSPD		15.97889	.000	.97278	.94638	.02868	.95286	264.36178	.000

SEPARATION PROJECTIONS, 5TH MONTH

FILE NAME (CREATION DATE = 87/15/82)

87/15/82 15.35.18. PAGE 8

MULTIPLE REGRESSION

OBSERVATION Y VALUE Y ESTIMATE RESIDUAL

1.	262.8888	252.9822	9.917793
2.	288.8888	286.5816	1.498368
3.	149.8888	164.4289	-15.428987
4.	286.8888	188.1281	17.87187
5.	178.8888	173.1819	3.181869
6.	155.8888	155.7412	-3.741168
7.	169.8888	176.9335	-16.93349
8.	164.8888	158.9556	13.84439
9.	147.8888	151.4419	-4.441985
10.	156.8888	163.3461	-7.346385
11.	256.8888	262.5544	-6.554398
12.	212.8888	243.1755	-31.2867
13.	163.8888	185.8978	-22.9189
14.	186.8888	184.8235	1.176458
15.	125.8888	123.8389	1.969182
16.	148.8888	136.2735	11.72652
17.	119.8888	112.1884	6.899599
18.	183.8888	187.4760	-4.587172
19.	114.8888	113.1752	1.713136
20.	93.8888	93.08881	0.800019
21.	119.8888	115.8316	3.168417
22.	128.8888	137.8852	-9.885248
23.	191.8888	175.9286	15.87945
24.	178.8888	182.2274	-4.227417
25.	154.8888	118.9753	35.82466
26.	94.8888	117.9215	-23.92151
27.	99.8888	99.88828	0.000518
28.	181.8888	97.29616	84.59272
29.	91.8888	93.38139	-2.381385
30.	84.8888	97.51941	-13.51941
31.	73.8888	71.98693	1.813867
32.	76.8888	68.31788	8.571919
33.	74.8888	83.56728	-9.567276

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED	33.	1. OR	3.83 PERCENT OF THE TOTAL	
NUMBER OF 2 S.D. OUTLIERS				
VON NEUMANN RATIO	2.91268		DURBIN-WATSON TEST	2.82442
NUMBER OF POSITIVE RESIDUALS	17.			
NUMBER OF NEGATIVE RESIDUALS	16.			
NUMBER OF RUNS OF SIGNS	28.			
EXPECTED NUMBER OF RUNS OF SIGNS	17.			
EXPECTED S.D. OF RUN DISTRIBUTION	2.82437			
UNIT NORMAL DEVIATE				
Z-EXPECTED-OBSERVED/(S.D.)	1.86755			
PROBABILITY OF OBTAINING .GE. ABS(Z)	.14286			

87/16/82 18.36.38. PAGE 1

VOGELBACK COMPUTING CENTER
NORTHWESTERN UNIVERSITY

S P S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 8.0 -- JUNE 18, 1979

RUN NAME SEPARATION PROJECTIONS, 6TH MONTH
VARIABLE LIST ACCOMP.NOSPD.SPD
INPUT MEDIUM DISK
N OF CASES 33
INPUT FORMAT FREEFIELD
VAR LABELS ACCOMP.NOSPD.SPD
LIST CASES CASES-33/VARIABLES-ACCOMP.NOSPD.SPD
REGRESSION METHOD-STEPWISE/VARIABLES-ACCOMP.NOSPD.SPD/
REGRESSION-ACCOMP WITH NOSPD.SPD/RESIDUALS/
STATISTICS ALL

88854488 CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

87/15/82 15.36.35. PAGE 2

SEPARATION PROJECTIONS, 6TH MONTH
FILE NONAME (CREATION DATE = 87/15/82)

CASE-NO	ACCOMP	NOSPD	SPD
1	262.	122.	155.
2	288.	133.	125.
3	149.	42.	181.
4	206.	123.	185.
5	178.	178.	97.
6	152.	38.	93.
7	168.	52.	96.
8	184.	78.	88.
9	147.	34.	99.
10	156.	47.	102.
11	256.	155.	156.
12	212.	181.	121.
13	168.	152.	89.
14	186.	287.	111.
15	125.	83.	64.
16	148.	123.	68.
17	119.	123.	54.
18	188.	126.	49.
19	114.	189.	48.
20	93.	41.	53.
21	119.	88.	52.
22	128.	169.	67.
23	131.	188.	89.
24	178.	164.	79.
25	154.	139.	61.
26	94.	215.	35.
27	99.	166.	48.
28	181.	128.	38.
29	91.	112.	39.
30	84.	181.	48.
31	73.	136.	37.
32	76.	138.	27.
33	74.	128.	28.

SEPARATION PROJECTIONS, 6TH MONTH

87/15/82 15.36.35. PAGE 3

SEPARATION PROJECTIONS, 6TH MONTH

87/15/82 15.36.35. PAGE 4

FILE NAME (CREATION DATE - 87/15/82.)

***** MULTIPLE REGRESSION *****

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	144.3939	58.1354	33
NOSPD	112.3939	49.8642	33
SPD	75.6978	35.4352	33

CORRELATION COEFFICIENTS.

A VALUE OF 99.9999 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

NOSPD	.13113	
SPD	.95124	-.86689
ACCOMP		NOSPD

SEPARATION PROJECTIONS, 6TH MONTH

87/15/82 15.36.35. PAGE 6

FILE MNAME (CREATION DATE = 87/15/82)
DEPENDENT VARIABLE.. ACCOMP NOSPD.SPD

MULTIPLE REGRESSION

MEAN RESPONSE 144.39394 STD. DEV. 68.13648
VARIABLE(S) ENTERED ON STEP NUMBER 1.. SPD

MULTIPLE R	.95124	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.98486	REGRESSION	1.	72781.38795	72781.38795	294.83171	.000
ADJUSTED R SQUARE	.98179	RESIDUAL	31.	7662.57884	246.85712		
STD DEVIATION	15.71169	COEFF OF VARIABILITY	18.9 PCT				

VARIABLES IN THE EQUATION

VARIABLE	B	STD ERROR B	F	SIGNIFICANCE	BETA	ELASTICITY	PARTIAL	TOLERANCE	F	SIGNIFICANCE
SPD	1.3458595	.78381329E-01	294.83171	.000	.9512487	.78555	.63281	.99553	28.837528	.000
(CONSTANT)	42.516454	6.5332784	42.349837	.000						

VARIABLE(S) ENTERED ON STEP NUMBER 2.. NOSPD

MULTIPLE R	.97186	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.94296	REGRESSION	2.	75845.77919	37922.88959	247.96469	.000
ADJUSTED R SQUARE	.93916	RESIDUAL	30.	4588.89968	152.93665		
STD DEVIATION	12.36676	COEFF OF VARIABILITY	8.6 PCT				

VARIABLES IN THE EQUATION

VARIABLE	B	STD ERROR B	F	SIGNIFICANCE	BETA	ELASTICITY	PARTIAL	TOLERANCE	F	SIGNIFICANCE
SPD	1.3643733	.61832857E-01	486.88659	.000	.9643261	.71526				
NOSPD	.19669262	.43948618E-01	28.837528	.000	.1966284	.19318				
(CONSTANT)	19.887956	7.3681566	6.6877129	.015						

ALL VARIABLES ARE IN THE EQUATION.

SEPARATION PROJECTIONS, 6TH MONTH

87/15/82 15.36.35. PAGE 6

FILE MONAME (CREATION DATE = 87/15/82.)
DEPENDENT VARIABLE.. ACCOMP NOSPD,SPD

MULTIPLE REGRESSION

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL
SPD	1.3643733	.61832857E-01	22.065507	1.2380938 ; 1.4906529
NOSPD	.19669262	.43940610E-01	4.4763288	.10695392 ; .28643132
CONSTANT	19.007955	7.3501566	2.5860613	3.9969328 ; 34.018978

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

NOSPD .00193
SPD .00018 .00382
NOSPD SPD

SEPARATION PROJECTIONS, 6TH MONTH

87/15/82 15.36.35. PAGE 7

FILE MONAME (CREATION DATE = 87/15/82.)
DEPENDENT VARIABLE.. ACCOMP NOSPD,SPD

MULTIPLE REGRESSION

SUMMARY TABLE

STEP	VARIABLE ENTERED	REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	SPD		294.83171	.000	.95124	.90486	.90486	.95124	294.83171	.000
2	NOSPD		20.03762	.000	.97106	.94296	.03810	.13113	217.96469	.000

SEPARATION PROJECTIONS, 6TH MONTH

87/10/02 10.36.36. PAGE 8

FILE NAME (CREATION DATE - 87/15/82.)

***** MULTIPLE REGRESSION *****

+2SD

S.E.

-2SD

RESIDUAL

Y ESTIMATE

Y VALUE

OBSERVATION

1.	262.8888	254.4823	7.517681
2.	298.5888	215.7147	-7.714728
3.	149.8888	165.8788	-16.87875
4.	296.8888	186.4683	19.53965
5.	178.8888	165.1287	4.879358
6.	152.8888	151.7955	-2045478
7.	168.8888	168.2158	-2158898
8.	164.8888	152.8413	11.15071
9.	147.8888	168.7685	-13.76846
10.	156.8888	167.4186	-11.41859
11.	256.8888	262.3375	-6.337549
12.	217.8888	203.9631	8.936919
13.	168.8888	178.3345	-2.334459
14.	196.8888	211.1688	-25.16877
15.	125.8888	123.8315	1.165889
16.	148.8888	135.9705	12.92147
17.	119.8888	116.8773	2.122893
18.	198.8888	118.6455	-2.645518
19.	114.8888	185.9374	8.862638
20.	93.88888	99.38414	-6.384138
21.	119.8888	105.6988	13.38922
22.	128.8888	143.6634	-15.66282
23.	191.8888	125.8419	15.15015
24.	170.8888	159.8518	10.94896
25.	154.8888	123.5758	24.42588
26.	94.88888	109.8499	-15.84994
27.	99.88888	106.2339	-7.233863
28.	181.8888	84.58934	15.49066
29.	91.88888	94.24889	-3.248898
30.	94.88888	93.44884	-9.448843
31.	73.88888	78.53763	-5.537629
32.	76.88888	81.41608	-5.416076
33.	74.88888	82.38786	-8.387864

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED	33.
NUMBER OF 2 S.D. OUTLIERS	1. OR 3.83 PERCENT OF THE TOTAL
VON NEUMANN RATIO	2.12426
DURBIN-WATSON TEST	2.85989

NUMBER OF POSITIVE RESIDUALS	15.
NUMBER OF NEGATIVE RESIDUALS	18.
NUMBER OF RUNS OF SIGNS	18.

EXPECTED NUMBER OF RUNS OF SIGNS	17.
EXPECTED S.D. OF RUN DISTRIBUTION	2.86293
UNIT NORMAL DEVIATE	
Z = (EXPECTED-OBSERVED)/S.D.	48542
PROBABILITY OF OBTAINING .65. A	.34258

87/15/82 15.38.12. PAGE 1

VOGELBACK COMPUTING CENTER
NORTHWESTERN UNIVERSITY

S P S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 8.0 -- JUNE 18, 1979

RUN NAME SEPARATION PROJECTIONS, 7TH MONTH
VARIABLE LIST ACCOMP, NOSPD, SPD
INPUT MEDIUM DISK
N OF CASES 32
INPUT FORMAT FREEFIELD
VAR LABELS ACCOMP, NOSPD, SPD
LIST CASES CASES=32/VARIABLES-ACCOMP, NOSPD, SPD
REGRESSION METHOD=STEPWISE/VARIABLES-ACCOMP, NOSPD, SPD/
REGRESSION-ACCOMP WITH NOSPD, SPD/RESIDUALS/
STATISTICS ALL

###544B CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

SEPARATION PROJECTIONS, 7TH MONTH
FILE NAME (CREATION DATE = 87/15/82)

CASE-NO	ACCOMP	NOSPD	SPD
1	208.	158.	86.
2	149.	49.	51.
3	286.	132.	72.
4	178.	05.	68.
5	152.	39.	68.
6	160.	54.	63.
7	164.	75.	53.
8	147.	36.	62.
9	156.	55.	63.
10	256.	198.	83.
11	212.	119.	68.
12	160.	162.	46.
13	186.	229.	58.
14	125.	99.	43.
15	148.	145.	37.
16	119.	142.	28.
17	188.	139.	28.
18	114.	124.	23.
19	93.	46.	24.
20	119.	92.	34.
21	128.	191.	41.
22	191.	197.	48.
23	178.	179.	41.
24	154.	161.	35.
25	94.	251.	17.
26	99.	186.	22.
27	181.	153.	14.
28	91.	135.	19.
29	84.	189.	18.
30	73.	53.	11.
31	76.	145.	18.
32	74.	154.	17.

SEPARATION PROJECTIONS, 7TH MONTH

87/15/82 15.38.12. PAGE 3

SEPARATION PROJECTIONS, 7TH MONTH

87/15/82 15.39.12. PAGE 4

FILE NAME (CREATION DATE = 87/15/82.)

MULTIPLE REGRESSION

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	145.7198	45.2818	32
NOSPD	127.8758	57.7435	32
SPD	41.7813	28.8168	32

CORRELATION COEFFICIENTS.

A VALUE OF 99.9999 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

NOSPD	.13877	
SPD	.59155	-.13828
ACCOMP		NOSPD

SEPARATION PROJECTIONS. 7TH MONTH

FILE NAME (CREATION DATE = 87/18/82.)

DEPENDENT VARIABLE.. ACCOMP NOSPD.SPD

MEAN RESPONSE 148.71875 STD. DEV. 46.28899

VARIABLE(S) ENTERED ON STEP NUMBER 1.. SPD

87/18/82 15.38.12. PAGE 5

MULTIPLE REGRESSION

MULTIPLE R .98165

R SQUARE .81278

ADJUSTED R SQUARE .88654

STD OLVIATION 28.32893

ANALYSIS OF VARIANCE

REGRESSION 1.

RESIDUAL 38.

COEFF OF VARIABILITY 14.4 PCT

SUM OF SQUARES

53782.26889

12388.28786

MEAN SQUARE

53782.26889

412.94826

F

138.24223

SIGNIFICANCE

.888

VARIABLE

B

STD ERROR B

F

SIGNIFICANCE

BETA

ELASTICITY

SPD

2.8889883

.17632729

138.24223

.98165458

.59489

(CONSTANT)

57.118636

8.1587858

49.812253

.888

VARIABLE

PARTIAL

TOLERANCE

F

SIGNIFICANCE

NOSPD

.61459

.98898

17.682538

.888

VARIABLE

B

STD ERROR B

F

SIGNIFICANCE

BETA

ELASTICITY

SPD

2.8882571

.14283424

215.12934

.9385525

.61858

NOSPD

.21482814

.51283958E-81

17.682538

.2684398

.19622

(CONSTANT)

26.286515

9.8557848

7.8782731

.813

VARIABLE

PARTIAL

TOLERANCE

F

SIGNIFICANCE

SPD

29238.74448

265.82598

189.96158

.888

VARIABLE(S) ENTERED ON STEP NUMBER 2.. NOSPD

MULTIPLE R .93995

R SQUARE .88358

ADJUSTED R SQUARE .87546

STD DEVIATION 16.38428

ANALYSIS OF VARIANCE

REGRESSION 2.

RESIDUAL 29.

COEFF OF VARIABILITY 11.6 PCT

SUM OF SQUARES

58461.48879

7788.97996

MEAN SQUARE

29238.74448

265.82598

F

189.96158

SIGNIFICANCE

.888

VARIABLE

PARTIAL

TOLERANCE

F

SIGNIFICANCE

SPD

29238.74448

265.82598

189.96158

.888

VARIABLE

B

STD ERROR B

F

SIGNIFICANCE

BETA

ELASTICITY

SPD

2.8882571

.14283424

215.12934

.9385525

.61858

NOSPD

.21482814

.51283958E-81

17.682538

.2684398

.19622

(CONSTANT)

26.286515

9.8557848

7.8782731

.813

VARIABLE

PARTIAL

TOLERANCE

F

SIGNIFICANCE

SPD

29238.74448

265.82598

189.96158

.888

ALL VARIABLES ARE IN THE EQUATION.

SEPARATION PROJECTIONS, 7TH MONTH

87/15/82 15.38.12. PAGE 6

FILE NAME (CREATION DATE = 87/15/82)
DEPENDENT VARIABLE.. ACCOMP NOSPD,SPD

MULTIPLE REGRESSION

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL
SPD	2.0832571	.14283424	14.667288	1.7927645 ; 2.3737498
NOSPD	.21482814	.51243958E-01	4.1955378	.11818439 ; .31955268
CONSTANT	26.286515	9.8557848	2.6589985	6.8491733 ; 46.363857

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

NOSPD	.88262
SPD	.80181 .82817
NOSPD	SPD

SEPARATION PROJECTIONS, 7TH MONTH

87/15/82 15.38.12. PAGE 7

FILE NAME (CREATION DATE = 87/15/82)
DEPENDENT VARIABLE.. ACCOMP NOSPD,SPD

MULTIPLE REGRESSION

SUMMARY TABLE

STEP	VARIABLE ENTERED	REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	SPD		138.24223	.000	.98155	.81278	.81278	.98165	138.24223	.000
2	NOSPD		17.68254	.000	.99995	.88368	.87871	.13877	189.96158	.000

SEPARATION PROJECTIONS. 7TH MONTH

87/15/82 15.38.12. PAGE 8

FILE NAME (CREATION DATE = 87/15/82)

MULTIPLE REGRESSION

+2SD

R

-2SD

RESIDUAL

Y ESTIMATE

Y VALUE

OBSERVATION

1.	288.8888	226.8899	-10.88993	I
2.	149.8888	142.9792	6.828793	I
3.	286.8888	284.5503	1.441658	I
4.	178.8888	186.1284	-16.12839	I
5.	152.8888	159.5882	-7.588239	I
6.	160.8888	169.8524	-9.852432	I
7.	164.8888	152.7113	11.76175	I
8.	147.8888	163.1871	-16.18727	I
9.	156.8888	169.2673	-13.26726	I
10.	256.8888	241.6528	14.34717	I
11.	212.8888	176.7665	35.23251	I
12.	168.8888	156.8385	11.15158	I
13.	186.8888	196.2311	-10.23187	I
14.	125.8888	137.8546	-12.85456	I
15.	148.8888	134.4371	13.56289	I
16.	119.8888	115.8433	3.95698	I
17.	188.8888	114.3988	-6.398826	I
18.	114.8888	108.7681	13.23988	I
19.	93.88888	86.86678	6.913228	I
20.	119.8888	116.8814	2.198534	I
21.	128.8888	152.6522	-24.65223	I
22.	191.8888	168.5248	22.47688	I
23.	178.8888	158.8743	27.92571	I
24.	154.8888	133.7878	24.29216	I
25.	94.88888	115.5437	-21.54375	I
26.	99.88888	111.9962	-12.99621	I
27.	101.8888	88.24882	12.75918	I
28.	91.88888	94.79878	-3.798199	I
29.	84.88888	87.12141	-3.121411	I
30.	73.88888	68.58823	12.49177	I
31.	76.88888	94.85522	-18.85522	I
32.	74.88888	94.78542	-28.78542	I

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED	32.	1. OR	3.13 PERCENT OF THE TOTAL
NUMBER OF 2 S.D. OUTLIERS	1.		
VON NEUMANN RATIO	1.78799	DURBIN-WATSON TEST	1.68461
NUMBER OF POSITIVE RESIDUALS	16.		
NUMBER OF NEGATIVE RESIDUALS	16.		
NUMBER OF RUNS OF SIGNS	17.		
EXPECTED NUMBER OF RUNS OF SIGNS	17.		
EXPECTED S.D. OF RUN DISTRIBUTION	2.78243		
UNIT NORMAL DEVIATE	.17978		
Z-TESTED-OBSERVED)/S.D.	.42869		
PROBABILITY OF OBTAINING .GE. ABS(Z)			

VOGELBACK COMPUTING CENTER
NORTHWESTERN UNIVERSITY

S P S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 8.0 -- JUNE 18, 1979

RUN NAME SEPARATION PROJECTIONS, 8TH MONTH
VARIABLE LIST ACCOMP.NOSPD.SPD
INPUT MEDIUM DISK
N OF CASES 31
INPUT FORMAT FREEFIELD
VAR LABELS ACCOMP.NOSPD.SPD
LIST CASES CASES=31/VARIABLES=ACCOMP.NOSPD.SPD
REGRESSION METHOD=STEPWISE/VARIABLES=ACCOMP.NOSPD.SPD/
REGRESSION=ACCOMP WITH NOSPD.SPD/RESIDUALS/
STATISTICS ALL

***** CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

SEPARATION PROJECTIONS, 8TH MONTH
FILE NONAME (CREATION DATE - 87/15/82)

CASE-NO	ACCOMP	NOSPD	SPD
1	149.	56.	41.
2	286.	148.	68.
3	178.	94.	55.
4	152.	62.	54.
5	169.	58.	45.
6	164.	77.	46.
7	147.	37.	58.
8	156.	68.	56.
9	256.	228.	61.
10	212.	145.	49.
11	168.	192.	48.
12	186.	235.	48.
13	125.	113.	29.
14	148.	172.	27.
15	119.	158.	19.
16	108.	174.	16.
17	114.	145.	17.
18	93.	54.	21.
19	119.	185.	25.
20	128.	289.	34.
21	191.	288.	32.
22	178.	198.	33.
23	154.	178.	26.
24	94.	293.	18.
25	99.	221.	17.
26	181.	173.	7.
27	91.	152.	14.
28	84.	131.	14.
29	73.	68.	9.
30	76.	159.	12.
31	74.	165.	11.

SEPARATION PROJECTIONS, 8TH MONTH

87/15/82 15.42.38. PAGE 3

SEPARATION PROJECTIONS, 8TH MONTH

87/15/82 15.42.38. PAGE 4

FILE NAME (CREATION DATE - 87/15/82)

***** MULTIPLE REGRESSION *****

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	138.5484	45.2761	31
NOSPD	143.8323	63.7285	31
SPD	31.2983	16.9631	31

CORRELATION COEFFICIENTS.

A VALUE OF 99.9999 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

NOSPD	.89293
SPD	.85111
ACCOMP	-.29193
NOSPD	
SPD	

SEPARATION PROJECTIONS, 8TH MONTH

87/15/82 15.42.38. PAGE 5

FILE NAME (CREATION DATE = 87/15/82)

DEPENDENT VARIABLE.. ACCOMP NOSPD.SPD

MULTIPLE REGRESSION

MEAN RESPONSE 138.54839 STD. DEV. 46.27687

VARIABLE(S) ENTERED ON STEP NUMBER 1.. SPD

MULTIPLE R		ANALYSIS OF VARIANCE		DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.85111	REGRESSION		1.	44647.88994	44647.88994	76.21058	
ADJUSTED R SQUARE	.72438	RESIDUAL		29.	16949.78748	584.47543		
STD DEVIATION	24.17593	COEFF OF VARIABILITY		17.4 PCT				

----- VARIABLES IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F	BETA	VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
SPD	2.2716958	.26828622	76.210584	.85111871	NOSPD	.67998	.91478	24.878489	.000
(CONSTANT)	67.465638	9.2274145	53.458649	.51385					

----- VARIABLES IN THE EQUATION -----

MULTIPLE R		ANALYSIS OF VARIANCE		DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.92293	REGRESSION		2.	82883.22398	26191.61199	88.46178	.000
ADJUSTED R SQUARE	.84121	RESIDUAL		28.	9114.45344	325.61619		
STD DEVIATION	18.84287	COEFF OF VARIABILITY		13.8 PCT				

----- VARIABLES IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F	BETA	VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
SPD	2.8624754	.28387125	159.29108	.9688543					
NOSPD	.26517414	.54849138E-01	24.878489	.57872					
(CONSTANT)	28.439248	11.882526	2.9998238	.27376					

ALL VARIABLES ARE IN THE EQUATION.

SEPARATION PROJECTIONS, 8TH MONTH

87/15/82 18.42.38. PAGE 6

FILE NAME (CREATION DATE = 87/15/82)
DEPENDENT VARIABLE.. ACCOMP NOSPD,SPD

MULTIPLE REGRESSION

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL
SPD	2.5624754	.28303125	12.521889	2.1465848 ; 2.9783661
NOSPD	.26517414	.54841138E-01	4.9461685	.15445951 ; .37588876
CONSTANT	28.439248	11.087526	1.7317698	-3.7371382 ; 44.615627

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

NOSPD	.88292
SPD	.88328 .84122

NOSPD SPD

SEPARATION PROJECTIONS, 8TH MONTH

87/15/82 18.42.38. PAGE 7

FILE NAME (CREATION DATE = 87/15/82)
DEPENDENT VARIABLE.. ACCOMP NOSPD,SPD

MULTIPLE REGRESSION

SUMMARY TABLE

STEP	VARIABLE ENTERED	VARIABLE REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE CHANGE	R SQUARE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	SPD		76.21858	.888	.88111	.72438	.72438	.86111	76.21858	.888
2	NOSPD		24.87849	.888	.92293	.86179	.12741	.89293	98.46178	.888

SEPARATION PROJECTIONS, 8TH MONTH

87/15/02 15.42.38. PAGE 8

FILE MONAME (CREATION DATE - 87/15/02)

MULTIPLE REGRESSION

OBSERVATION Y VALUE Y ESTIMATE RESIDUAL

OBSERVATION	Y VALUE	Y ESTIMATE	RESIDUAL
1.	149.8888	149.3585	8.649587
2.	286.8888	213.4335	-7.433547
3.	178.8888	186.3818	-16.381777
4.	152.8888	175.2537	-23.253722
5.	168.8888	151.1307	8.869257
6.	164.8888	158.7315	6.268473
7.	147.8888	158.3745	-11.37446
8.	156.8888	179.8483	-23.84832
9.	256.8888	235.8886	20.91144
10.	212.8888	184.4508	27.54921
11.	168.8888	173.8517	-5.851788
12.	186.8888	183.2542	3.634646
13.	125.8888	174.7157	-48.82687
14.	148.8888	155.2368	-7.34796
15.	119.8888	111.8238	7.976285
16.	188.8888	187.5792	1.309096
17.	114.8888	102.4516	12.43728
18.	93.88888	88.57664	5.31224
19.	119.8888	112.3444	7.544444
20.	128.8888	162.9848	-34.09600
21.	191.8888	157.5947	34.29413
22.	178.8888	155.3848	23.50404
23.	154.8888	134.2646	20.62424
24.	94.88888	121.1883	-27.18828
25.	99.88888	122.6848	-23.68482
26.	181.8888	84.25178	97.63702
27.	91.88888	96.62837	-5.73949
28.	84.88888	91.85172	-7.96284
29.	73.88888	59.41198	14.47688
30.	76.88888	93.35164	-17.35164
31.	74.88888	92.38821	-18.38821

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED	31.	PERCENT OF THE TOTAL
NUMBER OF 2 S.D. OUTLIERS	0	0
VON NEUMANN RATIO	2.81154	DURBIN-WATSON TEST 1.94668
NUMBER OF POSITIVE RESIDUALS	18.	
NUMBER OF NEGATIVE RESIDUALS	13.	
NUMBER OF RUNS OF SIGNS	14.	
EXPECTED NUMBER OF RUNS OF SIGNS	16.	
EXPECTED S.D. OF RUN DISTRIBUTION	2.66343	
UNIT NORMAL DEVIATE		
Z-(EXPECTED-OBSERVED)/S.D.	-5.9952	
PROBABILITY OF OBTAINING .GE. ABS(Z)	.27441	

VOGLBACK COMPUTING CENTER
NORTHWESTERN UNIVERSITY

S P S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES
VERSION 8.0 -- JUNE 18, 1979

RUN NAME SEPARATION PROJECTIONS, 9TH MONTH
VARIABLE LIST ACCOMP, NOSPD, SPD
INPUT MEDIUM DISK
N OF CASES 35
INPUT FORMAT FREEFIELD
VAR LABELS ACCOMP, NOSPD, SPD
LIST CASES CASES=35/VARIABLES=ACCOMP, NOSPD, SPD
REGRESSION METHOD=STEPWISE/VARIABLES=ACCOMP, NOSPD, SPD/
REGRESSION=ACCOMP WITH NOSPD, SPD/RESIDUALS/
STATISTICS ALL

0005400 CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

SEPARATION PROJECTIONS, 9TH MONTH
FILE NAME (CREATION DATE - 87/15/82)

87/15/82. 18.46.21. PAGE 2

CASE-NO	ACCOMP	NOSPD	SPD
1	274.	254.	56.
2	278.	223.	68.
3	262.	151.	54.
4	288.	175.	46.
5	149.	163.	38.
6	286.	111.	55.
7	178.	65.	44.
8	152.	71.	48.
9	168.	85.	38.
10	164.	39.	35.
11	147.	61.	43.
12	156.	248.	48.
13	256.	152.	51.
14	212.	236.	37.
15	168.	255.	24.
16	186.	128.	29.
17	175.	187.	23.
18	148.	173.	21.
19	119.	194.	18.
20	188.	174.	15.
21	114.	59.	13.
22	93.	111.	17.
23	119.	225.	21.
24	128.	220.	22.
25	191.	287.	29.
26	178.	192.	25.
27	154.	311.	17.
28	94.	245.	7.
29	99.	196.	13.
30	181.	159.	7.
31	91.	153.	18.
32	84.	171.	12.
33	73.	164.	7.
34	76.	178.	11.
35	74.		9.

SEPARATION PROJECTIONS, 9TH MONTH

87/15/82 15.44.21. PAGE 3

SEPARATION PROJECTIONS, 9TH MONTH

87/15/82 15.44.21. PAGE 4

FILE MONAME (CREATION DATE 87/15/82) ***** MULTIPLE REGRESSION *****

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	151.6857	57.1756	35
MOSPD	162.2888	68.5148	35
SPD	28.6571	16.8749	35

CORRELATION COEFFICIENTS.

A VALUE OF 99.9999 IS PRINTED IF A COEFFICIENT CANNOT BE COMPUTED.

MOSPD	.21614	
SPD	.88688	-.12483
ACCOMP		MOSPD

SEPARATION PROJECTIONS, 9TH MONTH

FILE NAME (CREATION DATE = 87/15/82)

DEPENDENT VARIABLE... ACCOMP NOSPD,SPD

MEAN RESPONSE 151.68571 STD. DEV. 67.17557

VARIABLE(S) ENTERED ON STEP NUMBER 1.. SPD

MULTIPLE R .80689 ANALYSIS OF VARIANCE DF SUM OF SQUARES MEAN SQUARE F SIGNIFICANCE
R SQUARE .78514 REGRESSION 1. 87266.44886 87266.44886 128.68881
ADJUSTED R SQUARE .77863 RESIDUAL 33. 23881.89488 723.66954
STD DEVIATION 26.98111 COEFF OF VARIABILITY 17.7 PCT

----- VARIABLES IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F	BETA	PARTIAL	TOLERANCE	F	SIGNIFICANCE
SPD	3.822288	.27339475	128.68881	.8868816	.78987	.98462	32.328382	.888
(CONSTANT)	65.658437	9.8586418	52.522945	.56719				

----- VARIABLES NOT IN THE EQUATION -----

VARIABLE(S) ENTERED ON STEP NUMBER 2.. NOSPD

VARIABLE	B	STD ERROR B	F	BETA	PARTIAL	TOLERANCE	F	SIGNIFICANCE
MULTIPLE R	.94584							
R SQUARE	.89311							
ADJUSTED R SQUARE	.88642							
STD DEVIATION	19.26873							

----- VARIABLES IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F	BETA	PARTIAL	TOLERANCE	F	SIGNIFICANCE
SPD	3.141388	.19735187	253.37456	.9271522				
NOSPD	.27633323	.48686618E-01	32.328382	.59348				
(CONSTANT)	16.841388	18.761542	2.4498989	.3311366				

ALL VARIABLES ARE IN THE EQUATION.

SEPARATION PROJECTIONS, 9TH MONTH 87/15/82 15.44.21. PAGE 6

FILE NAME (CREATION DATE = 87/15/82)
 MULTIPLE REGRESSION
 DEPENDENT VARIABLE.. ACCOMP NOSPD.SPD

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL
SPD	3.1413838	.19735187	15.917744	2.7393928 ; 3.5433748
NOSPD	.27633323	.48686618E-01	5.6858947	.17732479 ; .37534167
CONSTANT	16.841388	10.761542	1.5649697	-5.8791642 ; 38.761926

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

NOSPD	.00236
SPD	.00119 .03895
NOSPD	
SPD	

SEPARATION PROJECTIONS, 9TH MONTH

FILE NAME (CREATION DATE = 87/15/82)
 MULTIPLE REGRESSION
 DEPENDENT VARIABLE.. ACCOMP NOSPD.SPD

SUMMARY TABLE

STEP	VARIABLE ENTERED	VARIABLE REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	SPD		128.58881	.000	.08688	.78514	.78514	.08688	128.58881	.000
2	NOSPD		32.32838	.000	.94584	.89311	.10796	.21614	133.67998	.000

SEPARATION PROJECTIONS, 9TH MONTH

FILE NAME CREATION DATE - 87/15/82)

87/15/82 16.44.21. PAGE 8

MULTIPLE REGRESSION

OBSERVATION Y VALUE Y ESTIMATE RESIDUAL -2SD S.D. +2SD

1.	274.8888	262.9475	11.95249
2.	278.8888	292.8778	-22.87779
3.	262.8888	228.2824	33.79758
4.	288.8888	289.7833	-1.793358
5.	143.8888	153.6238	-4.622358
6.	286.8888	234.6598	-28.65981
7.	178.8888	185.7353	-15.73526
8.	152.8888	185.5895	-33.58946
9.	168.8888	156.3863	3.613718
10.	164.8888	158.2781	13.72186
11.	147.8888	162.6979	-15.69788
12.	156.8888	159.3531	-3.353559
13.	256.8888	243.3719	12.62887
14.	212.8888	175.8752	36.92477
15.	188.8888	157.4452	18.55877
16.	186.8888	178.4865	-7.593516
17.	125.8888	122.2532	2.746885
18.	148.8888	134.4848	13.51525
19.	119.8888	121.1919	-2.191937
20.	188.8888	117.5788	9.578784
21.	114.8888	185.7614	-8.238648
22.	93.88888	86.54857	6.451435
23.	119.8888	113.4834	5.515572
24.	128.8888	148.1268	-28.12688
25.	191.8888	168.7348	22.6518
26.	178.8888	152.5778	25.42385
27.	154.8888	123.3889	38.69912
28.	94.88888	124.7787	-38.77878
29.	99.88888	125.3818	-26.38181
30.	181.8888	92.99238	8.887628
31.	91.88888	92.19228	-1.192282
32.	84.88888	96.81697	-12.81697
33.	73.88888	58.45873	14.54927
34.	76.88888	96.71525	-28.71525
35.	74.88888	92.89848	-18.89848

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED	35.	PERCENT OF THE TOTAL	1.77258
NUMBER OF 2 S.D. OUTLIERS	35.	DURBIN-WATSON TEST	1.77258
VON NEUMANN RATIO	1.82472		
NUMBER OF POSITIVE RESIDUALS	18.		
NUMBER OF NEGATIVE RESIDUALS	17.		
NUMBER OF RUNS OF SIGNS	16.		
EXPECTED NUMBER OF RUNS OF SIGNS	18.		
EXPECTED S.D. OF RUN DISTRIBUTION	2.91176		
UNIT NORMAL DEVIATE			
Z-EXPECTED-OBSERVED)/S.D.	-58195		
PROBABILITY OF OBTAINING .GE. ABS(Z)	.24763		

VOGELBACK COMPUTING CENTER
NORTHWESTERN UNIVERSITY

S P S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 8.0 -- JUNE 18, 1979

87/15/82 18.48.59. PAGE 1

RUN NAME SEPARAYON PROJECTIONS. L8TH MONTH
VARIABLE LIST ACCOMP.NOSPD,SPD
INPUT MEDIUM DISK
N OF CASES 34
INPUT FORMAT FREEFIELD
VAR LABELS ACCOMP.NOSPD,SPD
LIST CASES CAT'S-34/VARIABLES-ACCOMP.NOSPD,SPD
REGRESSION METHOD=STEPWISE/VARIABLES-ACCOMP.NOSPD,SPD/
REGRESSION-ACCOMP WITH NOSPD,SPD/RESIDUALS/
STATISTICS ALL

***** CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

87/15/82 15.46.59. PAGE 2

SEPARATION PROJECTIONS, 18TH MONTH
FILE NOME (CREATION DATE, 87/15/82)

CASE-NO	ACCOMP	NOSPD	SPD
1	278.	235.	61.
2	267.	153.	47.
3	288.	187.	34.
4	149.	67.	35.
5	286.	171.	48.
6	178.	124.	34.
7	152.	77.	35.
8	168.	81.	37.
9	164.	181.	38.
10	147.	51.	37.
11	156.	66.	38.
12	256.	256.	39.
13	212.	168.	36.
14	168.	253.	28.
15	186.	288.	23.
16	125.	124.	15.
17	148.	196.	17.
18	119.	188.	13.
19	188.	213.	11.
20	114.	196.	8.
21	93.	73.	13.
22	119.	118.	17.
23	128.	249.	15.
24	191.	233.	22.
25	178.	219.	19.
26	154.	281.	11.
27	94.	325.	5.
28	99.	267.	6.
29	191.	215.	5.
30	91.	176.	9.
31	84.	164.	8.
32	73.	81.	6.
33	76.	177.	7.
34	74.	183.	6.

SEPARATION PROJECTIONS, 18TH MONTH

87/16/82 15.45.59. PAGE 3

SEPARATION PROJECTIONS, 18TH MONTH

87/16/82 15.45.59. PAGE 4

FILE MONAME (CREATION DATE - 87/16/82)

***** MULTIPLE REGRESSION *****

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	148.8882	53.8648	34
NOSPD	172.6765	78.8446	34
SPD	22.3235	14.7766	34

CORRELATION COEFFICIENTS.

A VALUE OF 99.9999 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

NOSPD	.12189	
SPD	.86862	-.24566
ACCOMP		NOSPD

SEPARATION PROJECTIONS, 18TH MONTH

87/15/82 18.45.59. PAGE 5

FILE NAME (CREATION DATE - 87/15/82)

DEPENDENT VARIABLE.. ACCOMP NOSPD.SPD

MULTIPLE REGRESSION

MEAN RESPONSE 148.80824 STD. DEV. 53.86488

VARIABLE(S) ENTERED ON STEP NUMBER 1.. SPD

MULTIPLE R		ANALYSIS OF VARIANCE		DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.75458	REGRESSION	1.	72248.62484	72248.62484	98.34464		.000
ADJUSTED R SQUARE	.74683	RESIDUAL	32.	23586.11126	734.56598			
STD DEVIATION	27.18288	COEFF OF VARIABILITY	18.3 PCT					

VARIABLES IN THE EQUATION

VARIABLE	B	STD ERROR B	F	SIGNIFICANCE	BETA	ELASTICITY	VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
SPD	3.1663612	.31928985	98.344637	.000	.8585179	.47731	NOSPD	.59639	.93965	29.189267	.000
(CONSTANT)	77.483878	8.5893274	82.743786	.000							

VARIABLE(S) ENTERED ON STEP NUMBER 2.. NOSPD

MULTIPLE R		ANALYSIS OF VARIANCE		DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.87356	REGRESSION	2.	83648.18898	41824.09449	187.89356		.000
ADJUSTED R SQUARE	.86548	RESIDUAL	31.	12186.63448	393.53659			
STD DEVIATION	19.76288	COEFF OF VARIABILITY	13.3 PCT					

VARIABLES IN THE EQUATION

VARIABLE	B	STD ERROR B	F	SIGNIFICANCE	BETA	ELASTICITY	VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
SPD	3.4851187	.24816987	218.57218	.000	.9568616						
NOSPD	.27864215	.58893785E-01	29.189267	.000	.52836	.3659565					
(CONSTANT)	29.554553	11.748588	4.8258933	.054	.31568						

ALL VARIABLES ARE IN THE EQUATION.

SEPARATION PROJECTIONS, 18TH MONTH
 FILE MONAME (CREATION DATE = 87/15/82)
 DEPENDENT VARIABLE.. ACCOMP NOSPD,SPD
 MULTIPLE REGRESSION
 87/15/82 15.45.59. PAGE 6

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL
SPD	3.4851187	.24816987	14.511186	2.9952987 ; 3.9749468
NOSPD	.27064715	.50803285C-B1	5.4827892	.16847528 ; .37288918
CONSTANT	23.554553	11.740588	2.8862635	-.39837122 ; 47.499477

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

NOSPD	.88251
SPD	.88296 .85768
NOSPD	SPD

SEPARATION PROJECTIONS, 18TH MONTH
 FILE MONAME (CREATION DATE = 87/15/82)
 DEPENDENT VARIABLE.. ACCOMP NOSPD,SPD
 MULTIPLE REGRESSION
 87/15/82 15.45.59. PAGE 7

SUMMARY TABLE

STEP	VARIABLE ENTERED	VARIABLE REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	SPD		98.34464	.888	.86862	.76458	.75458	.86862	98.34464	.888
2	NOSPD		29.18927	.888	.93464	.87366	.11906	.12109	187.88366	.888

SEPARATION PROJECTIONS, 18TH MONTH

87/15/82 15.45.59. PAGE 8

FILE NAME (CREATION DATE - 87/15/82)

MULTIPLE REGRESSION

+2SD

-2SD

R

Y VALUE

Y ESTIMATE

RESIDUAL

1.	278.8000	299.7477	-29.7477
2.	262.8000	228.7634	33.2366
3.	288.8000	192.6587	15.3413
4.	149.8000	163.6667	-14.6667
5.	206.8000	237.1701	-31.1701
6.	170.8000	175.6802	-5.6802
7.	15.0000	166.3732	-14.3732
8.	160.8000	174.4260	-14.4260
9.	164.8000	155.4438	9.5562
10.	147.8000	166.3867	-19.3867
11.	156.8000	145.9785	10.8215
12.	256.8000	228.7596	27.2404
13.	212.8000	194.4867	17.5133
14.	168.8000	162.2707	6.2293
15.	106.8000	179.4921	-5.5000
16.	125.8000	109.3910	15.6090
17.	148.8000	135.8474	12.1526
18.	119.8000	119.7418	-7.4182
19.	188.8000	119.5376	-11.5376
20.	114.8000	104.4814	9.5186
21.	93.8000	88.6179	4.3821
22.	119.8000	114.7373	4.2627
23.	128.8000	143.2212	-15.2212
24.	191.8000	163.2868	27.7132
25.	178.8000	149.8424	28.9576
26.	154.8000	116.2899	37.7101
27.	94.8000	129.2895	-35.2895
28.	99.8000	116.7267	-17.7267
29.	101.8000	99.1682	1.8318
30.	91.8000	102.5536	-11.5536
31.	84.8000	95.8288	-11.8288
32.	73.8000	66.3878	6.6122
33.	76.8000	95.8540	-19.8540
34.	74.8000	93.9927	-19.9927

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED	34.	R OR	B PERCENT OF THE TOTAL
NUMBER OF 2 S.D. OUTLIERS			
VON NEUMANN RATIO	1.63866		DURBIN-WATSON TEST 1.89047
NUMBER OF POSITIVE RESIDUALS	18.		
NUMBER OF NEGATIVE RESIDUALS	16.		
NUMBER OF RUNS OF SIGNS	15.		
EXPECTED NUMBER OF RUNS OF SIGNS	18.		
EXPECTED S.D. OF RUN DISTRIBUTION	2.86072		
UNIT NORMAL DEViate			
Z-(EXPECTED-OBSERVED)/S.D.			
PROBABILITY OF OBTAINING .GE. ABS(Z)			

VOELBACK COMPUTING CENTER
NORTHWESTERN UNIVERSITY

87/18/82 15.48.15. PAGE 1

S P S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES
VERSION 8.0 -- JUNE 18, 1979

RUN NAME SEPARATION PROJECTIONS. 11TH MONTH
VARIABLE LIST ACCOMP.NOSPD.SPD
INPUT MEDIUM DISK
N OF CASES 33
INPUT FORMAT FREEFIELD
VAR LABELS ACCOMP.NOSPD.SPD
LIST CASES CASES-33/VARIABLES-ACCOMP.NOSPD.SPD
REGRESSION METHOD-STEPWISE/VARIABLES-ACCOMP.NOSPD.SPD/
STAT STICS REGRESSION-ACCOMP WITH NOSPD.SPD/RESIDUALS/
ALL

88954488 CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

SEPARATION PROJECTIONS, 11TH MONTH
FILE NAME (CREATION DATE - 87/15/82)

87/15/82 15.48.15. PAGE 2

CASE-NO	ACCOMP	NOSPD	SPD
1	252.	167.	49.
2	208.	199.	29.
3	149.	75.	38.
4	286.	187.	37.
5	178.	128.	25.
6	152.	84.	38.
7	165.	88.	35.
8	164.	189.	23.
9	147.	69.	35.
10	156.	83.	23.
11	256.	267.	34.
12	212.	171.	29.
13	168.	275.	19.
14	186.	296.	22.
15	155.	154.	13.
16	148.	218.	13.
17	119.	192.	18.
18	108.	233.	8.
19	114.	210.	8.
20	93.	76.	18.
21	119.	145.	14.
22	128.	262.	8.
23	191.	243.	13.
24	176.	738.	16.
25	154.	784.	18.
26	94.	334.	4.
27	99.	270.	6.
28	141.	232.	3.
29	91.	194.	8.
30	84.	186.	4.
31	73.	186.	5.
32	76.	196.	6.
33	74.	205.	6.

SEPARATION PROJECTIONS, 11TH MONTH

87/15/82 15.48.15. PAGE 3

SEPARATION PROJECTIONS, 11TH MONTH

87/15/82 15.48.15. PAGE 4

FILE MONAME (CREATION DATE = 87/15/82.)

***** MULTIPLE REGRESSION *****

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	144.3939	58.1354	33
NOSPD	183.8788	71.9387	33
SPD	17.7273	12.1251	33

CORRELATION COEFFICIENTS.

A VALUE OF 99.99999 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

NOSPD	.84313	
SPD	.83825	-.36715
ACCOMP		NOSPD

SEPARATION PROJECTIONS, 11TH MONTH

8/7/15/82

16.48.18.

PAGE 5

FILE NAME (CREATION DATE = 8/7/15/82)

MULTIPLE REGRESSION

DEPENDENT VARIABLE.. ACCOMP NOSPD.SPD

MEAN RESPONSE 144.39394 STD. DEV. 68.13648

VARIABLE(S) ENTERED ON STEP NUMBER 1.. SPD

MULTIPLE R	.83825	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.68931	REGRESSION	1.	55444.27639	55444.27639	68.77951	
ADJUSTED R SQUARE	.67929	RESIDUAL	31.	24989.68248	806.11621		
STD DEVIATION	28.39219	COEFF OF VARIABILITY	19.7 PCT				

VARIABLES IN THE EQUATION

VARIABLES NOT IN THE EQUATION

VARIABLE	B	STD ERROR B	F	BETA	VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
SPD	3.4329662	.41394247	68.77958	.8382499	NOSPD	.67113	.86528	24.586769	.000
(CONSTANT)	83.536812	8.8473189	89.152274	.42147					

VARIABLE(S) ENTERED ON STEP NUMBER 2.. NOSPD

MULTIPLE R	.91863	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.82925	REGRESSION	2.	65699.99987	33349.99994	72.84985	.000
ADJUSTED R SQUARE	.81787	RESIDUAL	30.	13733.87891	457.79596		
STD DEVIATION	21.35617	COEFF OF VARIABILITY	14.8 PCT				

VARIABLES IN THE EQUATION

VARIABLES NOT IN THE EQUATION

VARIABLE	B	STD ERROR B	F	BETA	VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
SPD	4.8435897	.33536611	145.37129	.9779876					
NOSPD	.28827958	.5552584E-01	24.586769	.49642					
(CONSTANT)	21.176885	14.234517	2.2131247	.35692					

ALL VARIABLES ARE IN THE EQUATION.

SEPARATION PROJECTIONS, 11TH MONTH

87/15/82 15.48.15. PAGE 6

FILE MONAME (CREATION DATE = 87/15/82)
DEPENDENT VARIABLE.. ACCOMP NOSPD,SPD

MULTIPLE REGRESSION

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL
SPD	4.8435897	.32526611	12.857882	3.3866887 ; 4.7284187
NOSPD	28877958	.56525884E-01	4.9585847	.16484884 ; .39571896
CONSTANT	21.176885	14.274517	1.4876576	-7.8946767 ; 58.246847

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

NOSPD	.88328
SPD	.88696 .11247
NOSPD	
SPD	

SEPARATION PROJECTIONS, 11TH MONTH

87/15/82 15.48.15. PAGE 7

FILE MONAME (CREATION DATE = 87/15/82)
DEPENDENT VARIABLE.. ACCOMP NOSPD,SPD

MULTIPLE REGRESSION

SUMMARY TABLE

STEP	VARIABLE ENTERED	VARIABLE REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	SPD		68.77951	.888	.83825	.68931	.68931	.83825	68.77951	.888
2	NOSPD		24.58677	.888	.91863	.82926	.13994	.84313	72.84985	.888

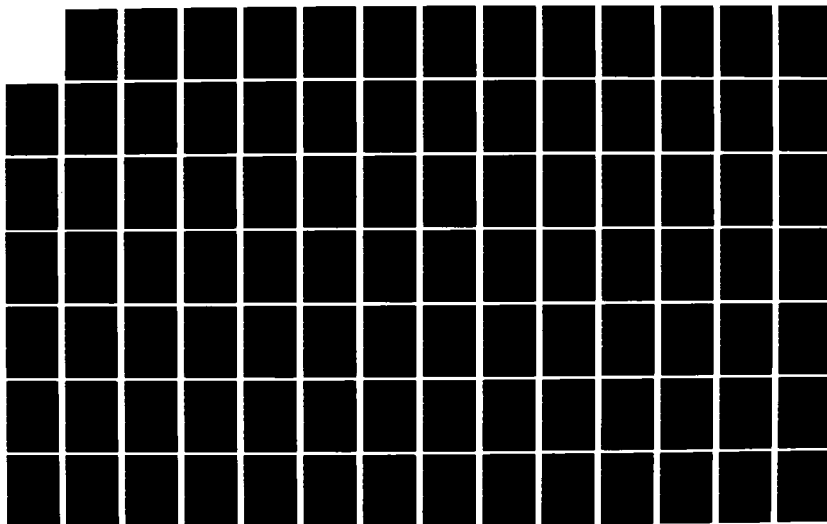
AD-A124 836

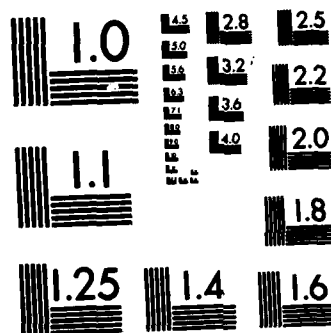
STATISTICAL TECHNIQUES FOR DETERMINING OFFICER
SEPARATION AND RETIREMENT. (U) AIR FORCE INST OF TECH
WRIGHT-PATTERSON AFB OH SCHOOL OF ENGI. A C DRENSTEDT
DEC 82 AFIT/GOR/05/82D-2 F/G 12/1

3/4

UNCLASSIFIED

NL





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

SEPARATION PROJECTIONS, 11TH MONTH

07/15/82 15.40.15. PAGE 8

FILE NAME (CREATION DATE - 07/15/82)

MULTIPLE REGRESSION

OBSERVATION Y VALUE Y ESTIMATE RESIDUAL

1.	262.0000	266.1147	-4.114738
2.	208.0000	194.2135	13.78651
3.	149.0000	163.5023	-14.50234
4.	206.0000	223.1982	-17.19821
5.	170.0000	158.1396	11.86040
6.	152.0000	166.0249	-14.02485
7.	160.0000	187.3635	-27.36352
8.	164.0000	144.7273	19.27273
9.	147.0000	102.0000	45.00000
10.	156.0000	137.4400	18.56000
11.	256.0000	233.4000	22.60000
12.	212.0000	186.3657	25.63434
13.	168.0000	175.0796	-7.079632
14.	186.0000	193.0000	-7.000000
15.	125.0000	116.0000	9.000000
16.	140.0000	132.6000	7.400000
17.	119.0000	115.4240	3.576000
18.	100.0000	118.8293	-8.829293
19.	114.0000	112.3829	1.617142
20.	93.00000	62.91242	30.08758
21.	119.0000	118.4257	.5742513
22.	128.0000	126.9574	1.042688
23.	191.0000	141.8496	49.15037
24.	178.0000	150.3365	27.66347
25.	154.0000	118.7882	35.21188
26.	94.00000	130.9635	-36.96348
27.	99.00000	123.3540	-24.35404
28.	101.0000	98.33146	2.668542
29.	91.00000	107.0000	-16.00000
30.	84.00000	89.48211	-5.482111
31.	73.00000	65.49767	7.502329
32.	76.00000	100.3719	-24.37193
33.	74.00000	102.8944	-28.89444

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED	32.	OR	3.03 PERCENT OF THE TOTAL
NUMBER OF 2 S.D. OUTLIERS	1.		
VON NEUMANN RATIO	1.76546	DURBIN-WATSON TEST	1.71196
NUMBER OF POSITIVE RESIDUALS	18.		
NUMBER OF NEGATIVE RESIDUALS	15.		
NUMBER OF RUNS OF SIGNS	17.		
EXPECTED NUMBER OF RUNS OF SIGNS	17.		
EXPECTED S.D. OF RUN DISTRIBUTION	2.00293		
UNIT NORMAL DEViate	.04865		
Z-(EXPECTED-OBSERVED)/S.D.	.40868		
PROBABILITY OF OBTAINING .GE. ABS(Z)			

87/18/92 18.08.17. PAGE 1

VOGELBACK COMPUTING CENTER
NORTHWESTERN UNIVERSITY

S P S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 8.0 -- JUNE 18, 1979

RUN NAME SEPARATION PROJECTIONS. 12TH MONTH
VARIABLE LIST ACCOMP.NOSPD.SPD
INPUT MEDIUM DISK
N OF CASES 31
INPUT FORMAT FREEFIELD
VAR LABELS ACCOMP.NOSPD.SPD
LIST CASES CASES-31/VARIABLES-ACCOMP.NOSPD.SPD
REGRESSION METHOD-STEPWISE/VARIABLES-ACCOMP.NOSPD.SPD/
REGRESSION-ACCOMP WITH NOSPD.SPD/RESIDUALS/
STATISTICS ALL

ENDS4488 CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

SEPARATION PROJECTIONS, 12TH MONTH
 FILE NAME (CREATION DATE = 87/15/92)

87/15/92 15.55.17. PAGE 2

CASE-NO	ACCOMP	NOSPD	SPD
1	149.	88.	27.
2	206.	196.	31.
3	178.	134.	28.
4	152.	98.	27.
5	168.	98.	27.
6	164.	118.	28.
7	147.	75.	31.
8	156.	184.	21.
9	256.	204.	25.
10	212.	177.	26.
11	168.	278.	13.
12	186.	313.	17.
13	125.	169.	18.
14	148.	229.	8.
15	119.	208.	7.
16	180.	245.	5.
17	114.	222.	8.
18	91.	88.	8.
19	119.	164.	13.
20	128.	279.	4.
21	191.	256.	9.
22	178.	248.	12.
23	154.	289.	5.
24	94.	340.	2.
25	99.	232.	4.
26	181.	248.	6.
27	91.	214.	1.
28	84.	208.	1.
29	73.	99.	4.
30	76.	211.	4.
31	74.	224.	3.

SEPARATION PROJECTIONS, 12TH MONTH

87/15/92 18.58.17. PAGE 3

SEPARATION PROJECTIONS, 12TH MONTH

87/15/92 18.58.17. PAGE 4

FILE NAME (CREATION DATE - 87/15/92)

..... MULTIPLE REGRESSION

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	138.5484	45.2761	31
NOSPD	195.9677	75.1877	31
SPD	12.8387	9.8289	31

CORRELATION COEFFICIENTS.

A VALUE OF 99.9999 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

NOSPD	.85638	
SPD	.72213	-.49472
ACCOMP		NOSPD

SEPARATION PROJECTIONS, 12TH MONTH

FILE NAME (CREATION DATE = 87/15/82)
DEPENDENT VARIABLE.. ACCOMP NOSPD.SPD

87/15/82. 15.88.17. PAGE 5

MULTIPLE REGRESSION

MEAN RESPONSE 138.54839 STD. DEV. 45.27607
VARIABLE(S) ENTERED ON STEP NUMBER 1.. SPD

MULTIPLE R		ANALYSIS OF VARIANCE		DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.72213	REGRESSION	1.	32869.89895	32869.89895	31.60318		.000
ADJUSTED R SQUARE	.58498	RESIDUAL	28.	29420.87837	1050.76132			
STD DEVIATION	31.85532	COEFF OF VARIABILITY	23.8 PCT					

VARIABLES IN THE EQUATION

VARIABLE	B	STD ERROR B	F	SIGNIFICANCE	BETA	ELASTICITY	VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
SPD	3.3264659	.59172274	31.603896	.000	.7221334	.38826	NOSPD	.60658	.75594	25.813385	.000
(CONSTANT)	96.848857	9.5184145	101.85528	.000							

VARIABLE(S) ENTERED ON STEP NUMBER 2.. NOSPD

MULTIPLE R		ANALYSIS OF VARIANCE		DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.86444	REGRESSION	2.	45954.67895	22977.33893	41.39289		.000
ADJUSTED R SQUARE	.72921	RESIDUAL	28.	15843.88736	565.12741			
STD DEVIATION	23.56872	COEFF OF VARIABILITY	17.8 PCT					

VARIABLES IN THE EQUATION

VARIABLE	B	STD ERROR B	F	SIGNIFICANCE	BETA	ELASTICITY	VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
SPD	4.6781477	.58336123	82.432971	.000	.9921208	.42358					
NOSPD	.32925711	.65833986E-01	25.813385	.000	.5465119	.46571					
(CONSTANT)	15.349814	17.563953	.76376845	.398							

ALL VARIABLES ARE IN THE EQUATION.

SEPARATION PROJECTIONS, 12TH MONTH

87/18/82 15.55.17. PAGE 6

FILE NAME (CREATION DATE = 87/15/82.)
 MULTIPLE REGRESSION
 DEPENDENT VARIABLE.. ACCOMP NOSPD,SPD

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL
SPD	4.5781477	.52336123	8.7392685	3.5398598 ; 5.6012368
NOSPD	.32925711	.65833986E-01	5.0013384	.19448247 ; .46411176
CONSTANT	15.349814	17.563953	.87393847	-28.628313 ; 61.327942

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

NOSPD	.88433
SPD	.81637 .25337

NOSPD SPD

SEPARATION PROJECTIONS, 12TH MONTH

87/18/82 15.55.17. PAGE 7

FILE NAME (CREATION DATE = 87/15/82.)
 MULTIPLE REGRESSION
 DEPENDENT VARIABLE.. ACCOMP NOSPD,SPD

SUMMARY TABLE

STEP	VARIABLE ENTERED	VARIABLE REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE CHANGE	R SQUARE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	SPD		31.62318	.888	.72213	.52148	.52148	.72213	31.62318	.888
2	NOSPD		25.81331	.888	.86444	.74726	.22578	.85538	41.39259	.888

SEPARATION PROJECTIONS, 12TH MONTH

87/15/82 15.55.17. PAGE 8

FILE NAME (CREATION DATE - 87/15/82)

MULTIPLE REGRESSION

-2SD

B.B

-2SD

RESIDUAL

Y ESTIMATE

Y VALUE

OBSERVATION

1.	149.8888	155.8844	-15.88437
2.	206.8888	221.5588	-15.55879
3.	178.8888	19.8732	19.12678
4.	152.8888	168.3769	-16.37694
5.	168.8888	171.8118	-11.81187
6.	164.8888	145.6851	18.39489
7.	147.8888	181.7107	-34.71868
8.	156.8888	145.5657	11.47434
9.	236.8888	226.4851	29.59498
10.	212.8888	192.4522	19.54784
11.	168.8888	166.2952	1.784788
12.	186.8888	196.8998	-10.89988
13.	125.8888	116.6957	8.304256
14.	148.8888	176.9016	-21.81838
15.	119.8888	113.1923	5.807729
16.	108.8888	118.8685	-10.86855
17.	114.8888	125.8881	-11.88808
18.	93.88888	88.88562	12.11438
19.	119.8888	128.7599	-9.759981
20.	128.8888	125.4931	2.586868
21.	191.8888	148.7718	50.22964
22.	178.8888	149.2133	28.78671
23.	154.8888	107.8153	46.98471
24.	94.88888	136.4375	-42.43753
25.	99.88888	126.4889	-27.48891
26.	101.8888	97.88558	3.994422
27.	91.88888	113.2317	-22.23172
28.	84.88888	85.77138	-1.771385
29.	73.88888	66.22686	6.773141
30.	76.88888	103.1857	-27.18566
31.	74.88888	102.8139	-28.81385

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED	31.	OR	3.23 PERCENT OF THE TOTAL
NUMBER OF 2 S.D. OUTLIERS	1.		
VON NEUMANN RATIO	1.72358	DURBIN-WATSON TEST	1.66798
NUMBER OF POSITIVE RESIDUALS	16.		
NUMBER OF NEGATIVE RESIDUALS	15.		
NUMBER OF RUNS OF SIGNS	17.		
EXPECTED NUMBER OF RUNS OF SIGNS	16.		
EXPECTED S.D. OF RUN DISTRIBUTION	2.73414		
UNIT NORMAL DEVIATE	.37164		
Z-(EXPECTED-OBSERVED)/S.D.	.35688		
PROBABILITY OF OBTAINING .GE. ABS(Z)			

APPENDIX D

Data Base Size Optimization

Statistics for Separation Regression Analysis

Table D-I
SEPI OBSERVATION ANALYSIS STATISTICS

# OBS	F STAT	R ²	ADJ R ²	$\sqrt{MSE}$	VAR. F NOSPD	STATS SPD	D-W
37	1847.99	.99088	.99035	6.61	57.33	3554.36	2.51
36	1646.77	.99008	.98948	6.62	56.63	3001.58	2.56
35	1226.79	.98713	.98632	6.69	48.41	1814.47	2.51
34	1050.87	.98546	.98453	6.70	47.87	1717.34	2.49
33	861.92	.98289	.98175	6.77	39.45	1547.12	2.52
32	717.64	.98019	.97883	6.72	38.55	1314.44	2.52
31	652.13	.97898	.97748	6.79	37.79	1195.03	2.56
30	643.25	.97944	.97792	6.84	30.27	1155.88	2.41
29	648.70	.98035	.97884	6.54	34.70	1144.10	2.43
28	621.55	.98029	.97871	6.61	33.30	1088.83	2.43
27	601.91	.98045	.97882	6.70	31.84	1027.38	2.33
26	601.47	.98124	.97961	6.66	24.08	972.56	2.24
25	616.29	.98246	.98087	6.52	27.09	947.20	2.29
24	585.58	.98238	.98071	6.68	19.04	795.13	2.28
23	558.63	.98241	.98066	6.80	16.80	665.98	2.14
22	402.68	.97695	.97453	6.60	19.02	568.88	2.23
21	295.49	.97044	.96716	6.77	17.23	396.25	2.24
20	255.56	.96781	.96402	6.95	15.72	330.97	2.25
19	201.06	.96173	.95695	7.01	14.75	316.59	2.26
18	208.34	.96525	.96062	6.88	12.14	319.28	2.36
17	184.01	.96335	.95812	7.09	11.53	268.30	2.29
16	176.48	.96448	.95901	7.23	10.31	254.84	2.39
15	169.17	.96575	.96004	7.39	10.32	238.36	2.32
14	158.57	.96648	.96038	7.63	9.56	223.57	2.27
13	148.22	.96737	.96084	7.82	6.08	211.19	2.37
12	133.29	.96734	.96008	8.24	3.85	157.31	2.33

Table D-II

SEP2 OBSERVATION ANALYSIS STATISTICS

# OBS	F STAT	R ²	ADJ R ²	√MSE	VAR. F NOSPD	STATS SPD	D-W
36	1018.50	.98406	.98309	8.39	49.59	1844.89	2.37
35	796.34	.98030	.97907	8.27	50.70	1185.34	2.27
34	717.87	.97886	.97750	8.08	55.33	1178.80	2.37
33	582.22	.97488	.97321	8.21	38.71	1081.47	2.32
32	500.15	.97183	.96988	8.02	37.54	948.07	2.44
31	453.16	.97003	.96789	8.11	36.63	857.12	2.43
30	439.04	.97017	.96796	8.24	30.37	818.63	2.36
29	407.47	.96908	.96670	8.21	31.04	752.39	2.36
28	386.09	.96864	.96613	8.34	29.57	707.80	2.37
27	386.56	.96847	.96584	8.51	25.71	659.84	2.33
26	367.77	.96968	.96704	8.47	20.59	636.15	2.09
25	406.07	.97363	.97123	8.00	26.24	677.75	2.19
24	390.28	.97380	.97131	8.14	17.40	599.53	2.18
23	368.22	.97356	.97092	8.33	12.64	508.79	2.03
22	365.69	.97468	.97201	6.92	18.72	556.00	2.19
21	266.79	.96737	.96374	7.10	15.93	343.29	2.07
20	276.71	.97020	.96669	6.68	16.27	355.46	2.32
19	214.03	.96397	.95946	6.81	15.73	320.40	2.31
18	244.96	.97029	.96633	6.36	13.55	357.51	2.49
17	216.05	.96862	.96413	6.55	12.46	287.32	2.40
16	210.43	.97004	.96543	6.64	12.30	280.80	2.51
15	197.25	.97048	.96556	6.86	11.22	249.84	2.53
14	188.15	.97160	.96643	7.03	11.00	230.23	2.57
13	167.82	.97107	.96528	7.37	8.07	203.71	2.57
12	150.95	.97105	.96462	7.76	5.89	157.82	2.57
11	132.15	.97062	.96327	8.23	5.08	132.19	2.49

Table D-III

SEP3 OBSERVATION ANALYSIS STATISTICS

# OBS	F STAT	R ²	ADJ R ²	$\sqrt{MSE}$	VAR. F NOSPD	STATS SPD	D-W
35	649.05	.97594	.97444	9.14	46.95	971.86	2.21
34	558.40	.97299	.97125	9.13	46.22	929.97	2.13
33	482.32	.96984	.96783	8.99	33.00	888.90	2.23
32	396.04	.96468	.96224	8.98	30.86	748.11	2.28
31	354.58	.96202	.95930	9.13	29.77	669.83	2.24
30	354.44	.96331	.96059	9.13	23.81	660.66	2.09
29	339.86	.96316	.96032	8.96	25.83	622.12	2.13
28	321.37	.96256	.95956	9.11	24.28	581.51	2.14
27	308.70	.96258	.95946	9.27	19.73	541.83	2.14
26	304.22	.96358	.96041	9.28	16.63	519.76	1.91
25	324.55	.96722	.96424	8.92	20.04	540.25	2.03
24	308.83	.96712	.96399	9.12	14.76	478.68	2.01
23	294.30	.96714	.96385	9.29	10.42	416.47	1.99
22	210.82	.95688	.95234	9.03	10.50	311.51	2.03
21	155.28	.94522	.93913	9.21	7.84	191.15	1.90
20	207.98	.96074	.95612	7.67	12.23	273.91	2.64
19	188.66	.95932	.95424	7.23	16.81	295.86	3.18
18	182.35	.96050	.95523	7.33	13.70	276.26	3.26
17	160.11	.95811	.95213	7.58	11.92	228.62	3.27
16	148.20	.95798	.95152	7.86	11.07	211.57	3.27
15	136.84	.95800	.95099	8.18	9.93	193.53	3.26
14	125.62	.95805	.95043	8.54	9.13	177.69	3.27
13	112.59	.95748	.94897	8.93	6.59	161.08	3.27
12	101.09	.95738	.94791	9.41	4.48	126.96	3.22
11	93.39	.95893	.94866	9.73	4.08	117.64	3.20
10	53.09	.93816	.92049	9.99	2.56	86.86	2.87

Table D-IV
SEP4 OBSERVATION ANALYSIS STATISTICS

# OBS	F STAT	R ²	ADJ R ²	$\sqrt{MSE}$	VAR. F NOSPD	STATS SPD	D-W
34	375.84	.96039	.95784	11.06	32.67	673.45	2.13
33	372.11	.96125	.95867	10.29	24.08	713.84	2.42
32	301.98	.95418	.95102	10.22	22.87	584.79	2.44
31	270.42	.95078	.94726	10.40	21.99	528.39	2.44
30	263.39	.95124	.94763	10.53	18.34	511.23	2.27
29	269.68	.95401	.95047	10.01	22.00	515.12	2.47
28	254.46	.95318	.94943	10.19	21.16	479.86	2.47
27	244.04	.95313	.94923	10.37	17.24	450.06	2.45
26	247.88	.95566	.95181	10.24	14.11	446.90	2.28
25	260.06	.95942	.95573	9.93	16.60	460.38	2.36
24	249.01	.95954	.95569	10.12	11.72	418.42	2.36
23	237.15	.95954	.95549	10.31	7.78	365.84	2.38
22	155.12	.94229	.93622	10.44	7.25	240.62	2.41
21	112.43	.92588	.91765	10.71	5.55	143.31	2.27
20	135.41	.94093	.93398	9.41	6.26	179.00	2.85
19	102.27	.92745	.91838	9.65	5.57	162.77	2.90
18	96.56	.92792	.91831	9.91	4.39	148.49	2.83
17	89.26	.92728	.91689	9.98	4.95	127.57	2.95
16	83.66	.92791	.91681	10.30	4.72	119.15	2.99
15	77.63	.92825	.91629	10.69	4.36	110.55	3.00
14	71.32	.92840	.91538	11.15	4.03	101.38	3.00
13	63.60	.92712	.91254	11.69	2.60	89.91	2.99
12	58.58	.92866	.91280	12.18	1.55	77.60	3.05
11	52.17	.92879	.91098	12.81	1.34	68.97	3.04
10	27.69	.88779	.85573	13.46	.92	45.29	2.85

Table D-V
SEP5 OBSERVATION ANALYSIS STATISTICS

# OBS	F STAT	R ²	ADJ R ²	$\sqrt{\text{MSE}}$	VAR. F NOSPD	STATS SPD	D-W
33	264.35	.94630	.94272	12.00	15.98	515.78	2.82
32	212.91	.93624	.93184	12.06	15.25	416.90	2.86
31	190.48	.93154	.92665	12.26	14.45	374.70	2.79
30	195.20	.93531	.93052	12.13	11.81	382.40	2.63
29	190.52	.93612	.93121	11.80	12.90	371.00	2.75
28	179.29	.93482	.92961	12.02	11.89	345.45	2.75
27	171.96	.93477	.92933	12.24	9.58	325.93	2.69
26	180.07	.93997	.93475	11.92	7.24	335.15	2.63
25	176.47	.94133	.93599	11.93	7.96	322.39	2.66
24	171.14	.94219	.93669	12.10	5.13	300.97	2.65
23	170.88	.94471	.93918	12.05	2.44	281.11	2.67
22	112.19	.92194	.91372	12.15	2.16	185.70	2.71
21	80.48	.89942	.88825	12.48	1.85	111.07	2.56
20	87.21	.91119	.90074	11.54	1.44	122.33	2.94
19	64.74	.89002	.87628	11.89	1.26	105.15	2.94
18	60.81	.89020	.87556	12.23	1.00	96.83	2.92
17	53.42	.88414	.86759	12.60	1.05	80.17	2.95
16	50.08	.88512	.86744	13.00	1.05	74.66	2.98
15	46.21	.88509	.86594	13.53	.96	68.89	2.98
14	42.36	.88509	.86420	14.13	.87	62.93	2.96
13	39.52	.88768	.86522	14.52	.21	59.16	2.93
12	36.03	.88898	.86430	15.20	.07	50.74	2.93
11	32.63	.89080	.86350	15.86	.11	46.82	2.93
10	17.66	.83459	.78733	16.34	.08	28.59	2.64

Table D-VI

SEP6 OBSERVATION ANALYSIS STATISTICS

# OBS	F STAT	R ²	ADJ R ²	$\sqrt{MSE}$	VAR. F NOSPD	STATS SPD	D-W
33	247.96	.94296	.93916	12.37	20.04	486.89	2.06
32	197.85	.93172	.92701	12.48	19.18	388.68	2.03
31	178.57	.92731	.92211	12.64	19.01	352.26	2.05
30	184.38	.93178	.92672	12.45	15.83	362.28	1.84
29	180.59	.93285	.92768	12.09	16.07	355.29	1.94
28	170.82	.93181	.92636	12.29	15.67	333.33	1.95
27	163.00	.93143	.92571	12.55	13.47	314.01	1.95
26	154.08	.93055	.92451	12.82	11.94	291.47	1.91
25	150.33	.93182	.92562	12.87	12.66	278.64	1.86
24	151.73	.93528	.92911	12.80	8.00	272.19	1.85
23	154.17	.93909	.93300	12.65	4.29	261.13	1.82
22	100.59	.91371	.90463	12.77	3.97	169.97	1.84
21	71.94	.88880	.87645	13.12	3.39	102.29	1.84
20	61.71	.87893	.86469	13.47	3.18	88.43	1.71
19	78.25	.90724	.89565	10.92	7.97	129.76	2.53
18	74.82	.90889	.89674	11.14	6.42	120.76	2.50
17	65.60	.90358	.88981	11.50	6.12	103.36	2.51
16	60.75	.90334	.88847	11.93	5.66	95.47	2.51
15	56.60	.90416	.88818	12.36	5.25	88.98	2.47
14	53.23	.90635	.88933	12.76	5.12	83.25	2.35
13	54.16	.91548	.89857	12.59	1.71	85.43	2.07
12	50.07	.91753	.89921	13.10	1.82	73.49	1.68
11	71.86	.94727	.93409	11.02	3.35	108.38	2.26
10	40.05	.91963	.89667	11.39	3.37	67.23	2.44

Table D-VII
SEP7 OBSERVATION ANALYSIS STATISTICS

# OBS	F STAT	R ²	ADJ R ²	$\sqrt{MSE}$	VAR. F NOSPD	STATS SPD	D-W
32	109.96	.88350	.87546	16.30	17.60	215.13	1.65
31	104.14	.88149	.87303	16.13	19.22	204.97	1.70
30	100.73	.88182	.87306	16.39	18.29	197.41	1.71
29	88.49	.87191	.86206	16.70	17.59	173.22	1.67
28	88.03	.87566	.86571	16.60	16.64	170.85	1.74
27	85.80	.87730	.86707	16.79	13.51	164.26	1.74
26	84.51	.88022	.86980	16.83	10.74	158.30	1.70
25	79.60	.87858	.86754	17.17	10.26	145.32	1.58
24	86.96	.89227	.88201	16.52	5.39	152.76	1.66
23	106.39	.91409	.90549	15.02	1.48	175.74	1.70
22	66.99	.87580	.86273	15.33	1.44	115.99	1.63
21	50.91	.84978	.83308	15.25	2.14	76.74	1.72
20	43.69	.83715	.81799	15.62	2.08	65.38	1.66
19	33.79	.80858	.78465	15.69	2.59	57.10	1.78
18	41.24	.84614	.82562	14.48	1.13	68.39	1.75
17	35.97	.83708	.81381	14.94	1.12	58.73	1.76
16	33.30	.83668	.81155	15.50	1.03	54.28	1.72
15	31.84	.84145	.81503	15.90	.92	52.00	1.62
14	30.86	.84874	.82124	16.21	1.01	50.23	1.62
13	27.86	.84785	.81742	16.90	.40	45.97	1.55
12	27.81	.86075	.82981	17.02	.01	43.41	1.46
11	55.91	.93323	.91654	12.40	.01	90.49	2.09
10	29.19	.89292	.86233	13.15	.00	50.79	2.15

Table D-VIII
SEP8 OBSERVATION ANALYSIS STATISTICS

# OBS	F STAT	R ²	ADJ R ²	$\sqrt{MSE}$	VAR. F NOSPD	STATS SPD	D-W
31	80.46	.85179	.84121	18.04	24.07	159.29	1.95
30	78.25	.85287	.84197	18.29	23.25	154.39	1.95
29	69.04	.84154	.82935	18.58	22.69	136.09	1.96
28	67.45	.84365	.83115	18.62	21.77	131.95	2.02
27	71.77	.85675	.84481	18.14	19.28	139.16	2.05
26	67.89	.85514	.84255	18.51	17.66	129.09	2.06
25	63.54	.85244	.83902	18.93	16.03	117.72	2.02
24	64.25	.85954	.84616	18.86	10.42	114.45	2.06
23	89.75	.89975	.88973	16.97	4.15	150.51	2.21
22	55.47	.85378	.83839	16.62	3.85	97.54	2.20
21	39.64	.81496	.79440	16.93	4.01	62.90	2.13
20	34.94	.80433	.78130	17.12	3.96	56.16	2.22
19	25.11	.75835	.72814	17.63	3.72	43.86	2.24
18	24.48	.76550	.73424	17.88	2.77	41.80	2.23
17	21.35	.75313	.71786	18.40	2.60	36.33	2.23
16	20.03	.75504	.71735	18.99	2.47	34.03	2.26
15	18.57	.75581	.71511	19.73	2.24	31.50	2.26
14	17.65	.76243	.71924	20.32	2.22	29.90	2.23
13	16.35	.76575	.71891	20.96	.86	28.33	2.19
12	14.99	.76914	.71783	21.91	.41	24.86	1.98
11	33.43	.89289	.86611	15.71	1.05	57.62	2.57
10	19.88	.85029	.80752	15.54	.90	35.74	2.43

Table D-IX
SEP9 OBSERVATION ANALYSIS STATISTICS

# OBS	F STAT	R ²	ADJ R ²	$\sqrt{MSE}$	VAR. F NOSPD	STATS SPD	D-W
35	133.68	.89311	.88642	19.27	32.32	253.37	1.77
34	110.99	.87746	.86956	19.45	27.32	216.78	1.66
33	92.63	.86064	.85135	19.33	28.93	183.71	1.54
32	80.56	.84746	.83694	18.66	18.97	159.14	1.54
31	71.30	.83587	.82415	18.99	27.42	141.11	1.54
30	68.69	.83576	.82359	19.32	24.96	135.49	1.48
29	67.11	.83773	.82525	18.80	28.30	132.29	1.66
28	66.22	.84120	.82850	18.76	27.97	129.68	1.70
27	84.19	.87524	.86485	16.92	28.64	163.52	1.86
26	80.29	.87472	.86382	17.22	25.43	153.44	1.83
25	75.36	.87236	.86105	17.58	23.67	140.66	1.68
24	90.81	.89636	.88649	16.20	15.93	163.82	1.80
23	110.10	.91676	.90841	14.79	8.57	186.73	1.94
22	78.02	.89146	.88003	14.33	10.03	138.66	2.03
21	55.87	.86125	.84584	14.66	9.70	88.98	2.05
20	48.08	.84979	.83212	15.00	8.53	79.59	2.04
19	35.01	.81399	.79074	15.47	7.47	62.56	2.00
18	34.53	.82158	.79779	15.60	5.91	60.38	1.94
17	30.37	.81269	.78593	16.02	5.55	52.96	1.91
16	28.44	.81394	.78532	16.55	5.15	49.52	1.93
15	26.70	.81652	.78594	17.10	4.93	46.42	1.87
14	25.56	.82292	.79072	17.54	4.70	44.47	1.81
13	23.85	.82669	.79203	18.03	2.19	42.42	1.72
12	23.48	.83917	.80343	18.29	.92	40.22	1.69
11	28.92	.87850	.84813	16.73	1.47	50.53	2.16
10	14.37	.80411	.74814	17.78	1.32	25.56	2.28

Table D-X

SEP10 OBSERVATION ANALYSIS STATISTICS

# OBS	F STAT	R ²	ADJ R ²	$\sqrt{MSE}$	VAR. F NOSPD	STATS SPD	D-W
34	107.08	.87356	.86540	19.76	29.19	210.57	1.59
33	96.50	.86547	.85650	18.99	35.17	192.05	1.52
32	81.23	.84853	.83809	18.59	34.69	160.81	1.57
31	73.65	.84028	.82887	18.73	32.58	146.03	1.50
30	72.57	.84315	.83154	18.88	29.21	143.41	1.47
29	77.31	.85605	.84497	17.71	36.55	152.55	1.71
28	74.02	.85553	.84397	17.90	35.44	145.17	1.73
27	76.09	.86377	.85242	17.69	32.61	147.97	1.80
26	81.74	.87666	.86593	17.08	30.41	156.49	1.84
25	76.72	.87460	.86320	17.45	27.73	143.80	1.67
24	108.32	.91163	.90322	14.96	21.54	197.20	1.80
23	111.56	.91774	.90951	14.70	13.73	190.77	1.75
22	69.67	.88000	.86737	15.06	12.97	124.25	1.72
21	57.18	.86400	.84889	14.51	11.88	92.54	1.82
20	49.02	.85223	.83485	14.88	11.35	82.46	1.86
19	37.08	.82252	.80034	15.11	11.33	67.71	1.96
18	34.56	.82169	.79791	15.59	10.22	61.64	1.97
17	29.85	.81002	.78288	16.14	9.54	52.85	1.97
16	27.86	.81080	.78170	16.69	9.89	49.26	1.98
15	26.63	.81614	.78550	17.12	8.68	47.02	1.85
14	26.99	.83070	.79992	17.15	8.60	47.77	1.81
13	24.84	.83245	.79894	17.73	4.90	44.97	1.70
12	26.54	.85502	.82281	17.36	2.44	46.44	1.66
11	30.30	.88338	.85423	16.39	3.58	54.00	2.13
10	15.93	.81982	.76834	17.05	3.55	28.89	2.40

Table D-XI

SEP11 OBSERVATION ANALYSIS STATISTICS

# OBS	F STAT	R ²	ADJ R ²	$\sqrt{MSE}$	VAR. F NOSPD	STATS SPD	D-W
33	72.85	.82925	.81787	21.40	24.59	145.37	1.71
32	55.47	.79279	.77850	21.74	23.56	110.32	1.71
31	49.67	.78012	.76441	21.98	21.91	98.89	1.64
30	48.85	.78347	.76743	22.19	19.42	97.01	1.66
29	44.06	.77216	.75463	22.28	20.01	87.42	1.70
28	41.58	.76884	.75035	22.64	19.56	82.01	1.66
27	40.98	.77350	.75462	22.81	17.20	80.19	1.68
26	45.55	.79843	.78090	21.84	15.62	87.80	1.68
25	43.07	.79655	.77805	22.22	15.13	81.20	1.36
24	71.45	.87188	.85967	18.01	10.58	131.67	1.29
23	68.64	.87283	.86012	18.27	6.99	119.52	1.26
22	41.85	.81499	.79551	18.71	6.75	75.67	1.28
21	29.28	.76486	.73873	19.08	5.72	46.53	1.30
20	26.32	.75591	.72719	19.13	6.37	43.97	1.45
19	25.45	.76080	.73090	17.54	11.03	46.85	2.15
18	24.54	.76595	.73474	17.86	9.76	44.52	2.20
17	21.10	.75089	.71531	18.48	9.13	38.04	2.22
16	19.59	.75091	.71259	19.15	8.44	35.21	2.23
15	18.46	.75470	.71382	19.77	8.09	33.08	2.25
14	16.94	.75488	.71031	20.64	7.41	30.36	2.25
13	15.13	.75163	.70196	21.59	4.39	27.79	2.13
12	19.06	.80899	.76655	19.93	2.52	34.36	2.53
11	16.74	.80719	.75899	21.08	2.01	30.60	2.41
10	11.55	.76737	.70090	19.38	1.75	21.52	2.15

Table D-XII

SEP12 OBSERVATION ANALYSIS STATISTICS

# OBS	F STAT	R ²	ADJ R ²	$\sqrt{\text{MSE}}$	VAR. F NOSPD	STATS SPD	D-W
31	41.39	.74726	.72921	23.56	25.01	82.43	1.67
30	40.86	.75165	.73325	23.76	22.47	81.16	1.69
29	36.48	.73724	.71703	23.92	22.80	72.36	1.72
28	34.96	.73659	.71552	24.16	22.78	68.86	1.66
27	34.71	.74312	.72171	24.29	20.59	67.77	1.71
26	33.93	.74688	.72486	24.47	18.46	65.05	1.69
25	32.10	.74478	.72158	24.89	17.91	59.94	1.47
24	43.59	.80589	.78740	22.17	13.41	78.96	1.62
23	42.32	.80885	.78974	22.40	9.46	72.10	1.58
22	25.12	.72556	.69668	22.78	7.71	45.56	1.47
21	16.66	.64929	.61032	23.31	6.92	25.54	1.53
20	13.65	.61628	.57113	23.98	6.34	21.78	1.52
19	9.74	.54910	.49274	24.08	7.05	17.48	1.89
18	9.08	.54774	.48744	24.83	6.41	15.95	1.85
17	7.98	.53263	.46587	25.31	5.85	13.97	1.82
16	7.38	.53156	.45950	26.27	5.44	12.83	1.81
15	6.86	.53340	.45563	27.27	5.10	11.88	1.82
14	6.63	.54665	.46423	28.07	4.97	11.54	1.91
13	5.84	.53856	.44627	29.42	3.09	10.50	1.80
12	8.01	.64038	.56047	27.35	2.03	14.29	2.36
11	7.22	.64338	.55422	28.67	1.46	13.11	2.32
10	4.38	.55575	.42882	26.78	1.04	8.17	2.02

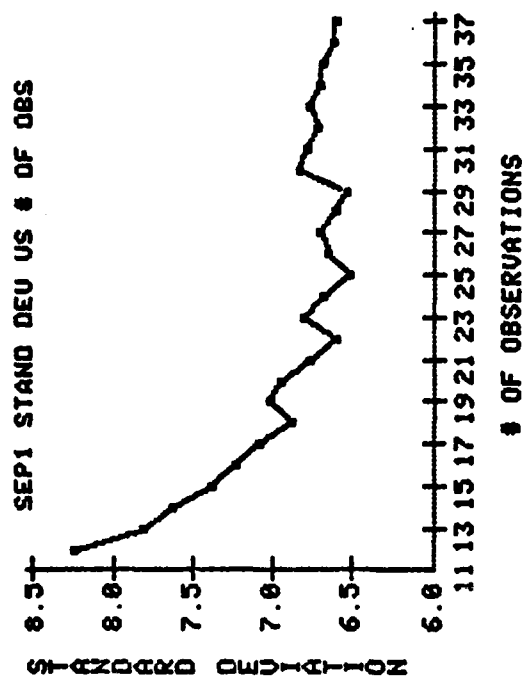


FIGURE D-1

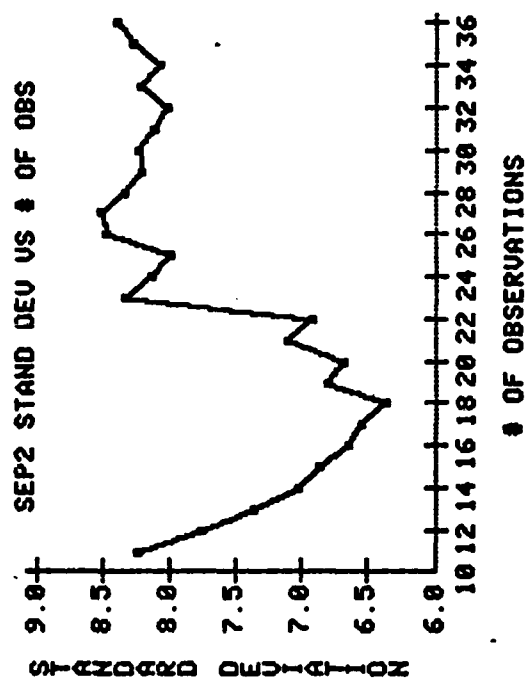


FIGURE D-3

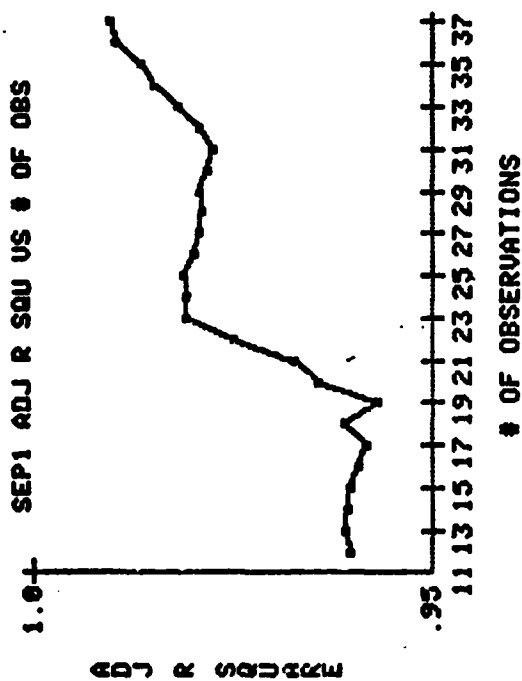


FIGURE D-2

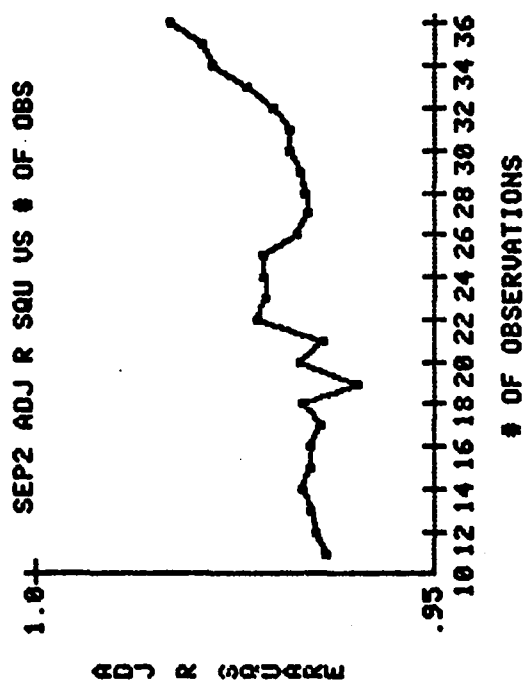


FIGURE D-4

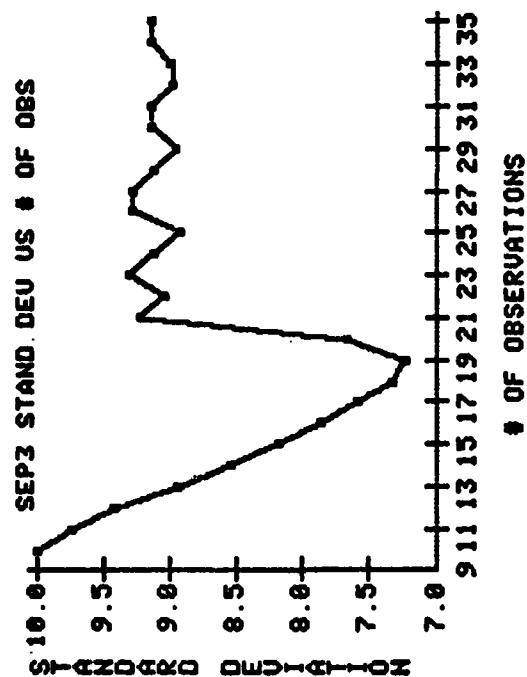


FIGURE D-5

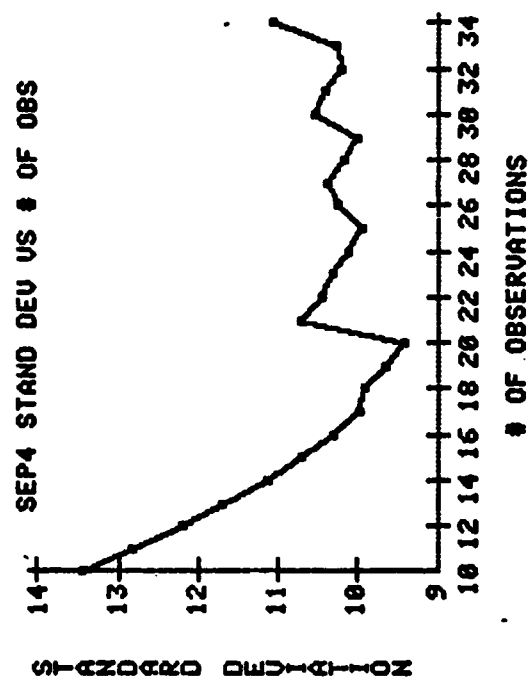


FIGURE D-7

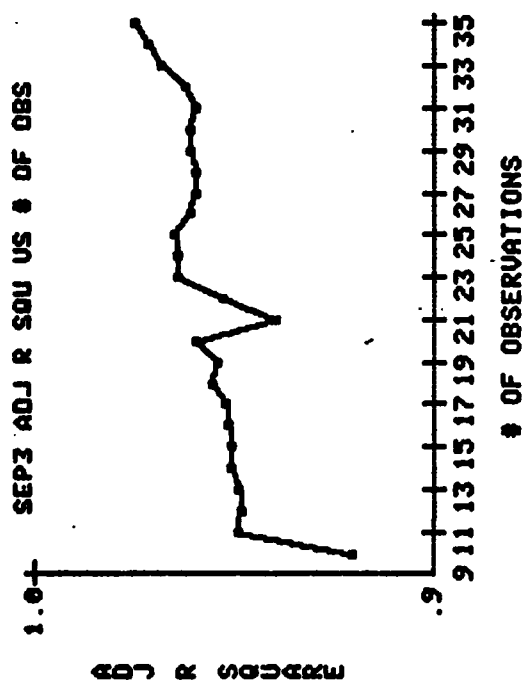


FIGURE D-6

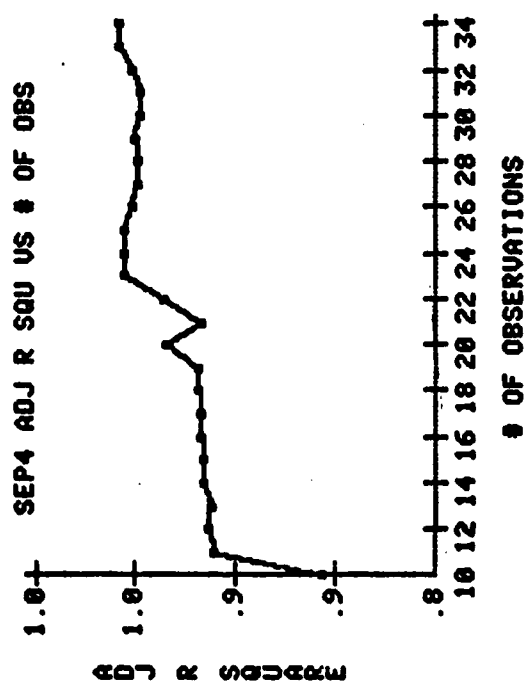


FIGURE D-8

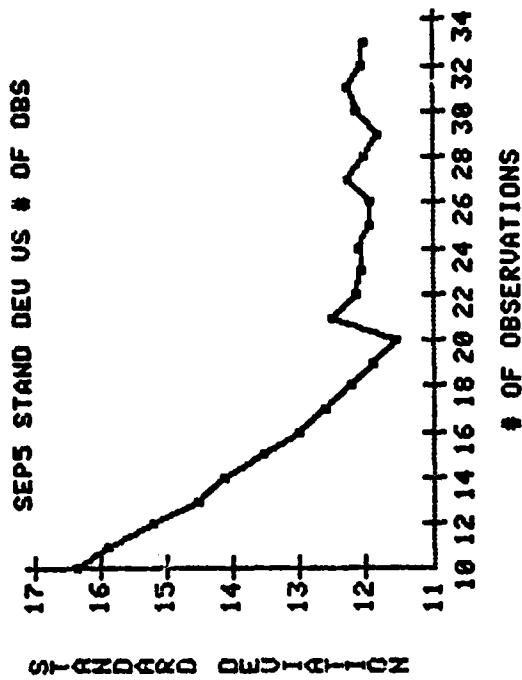


FIGURE D-9

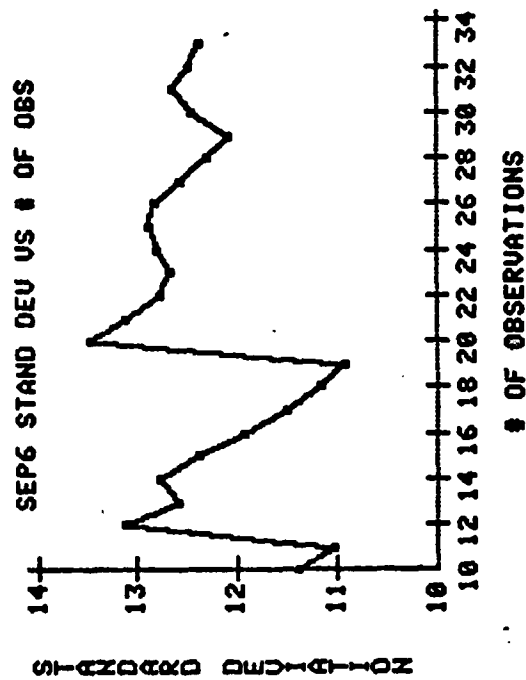


FIGURE D-11

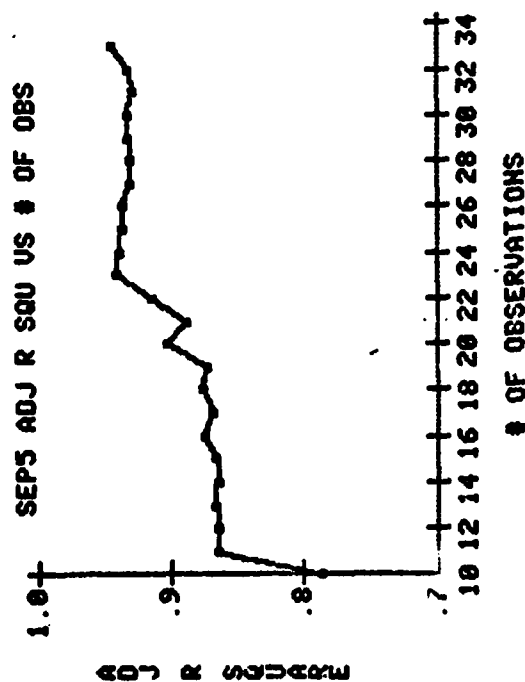


FIGURE D-10

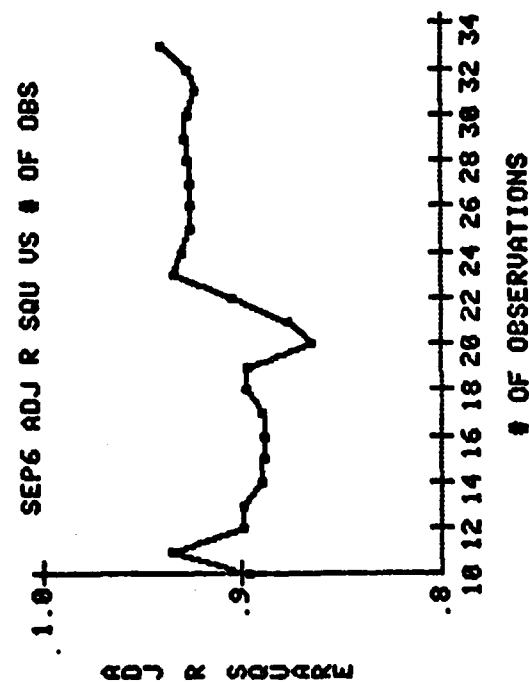


FIGURE D-12

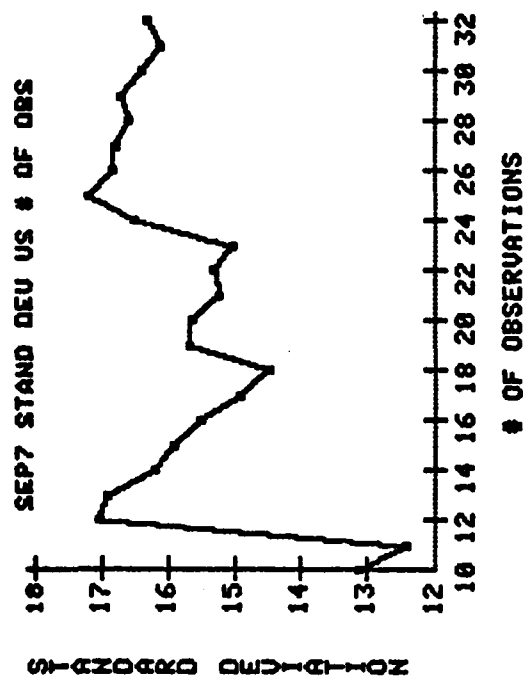


FIGURE D-13

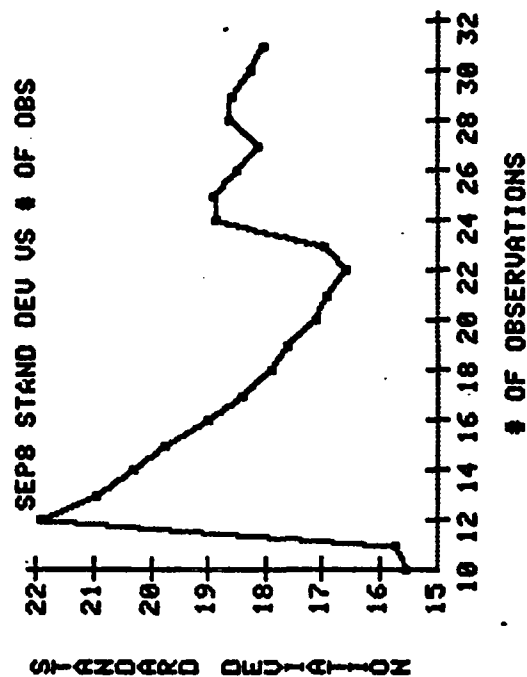


FIGURE D-15

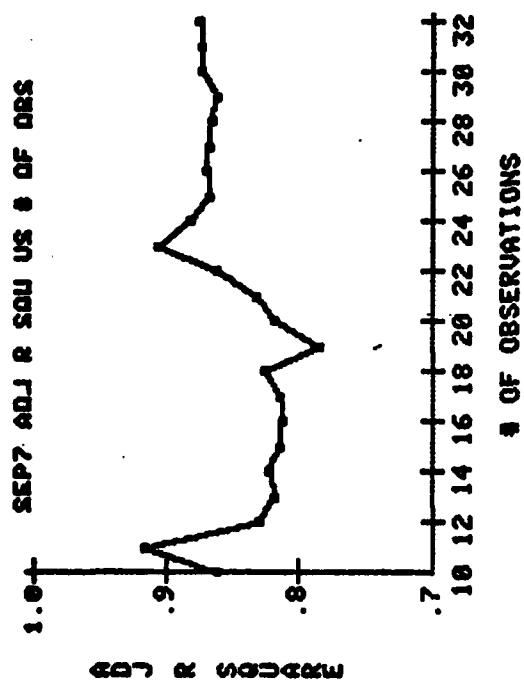


FIGURE D-14

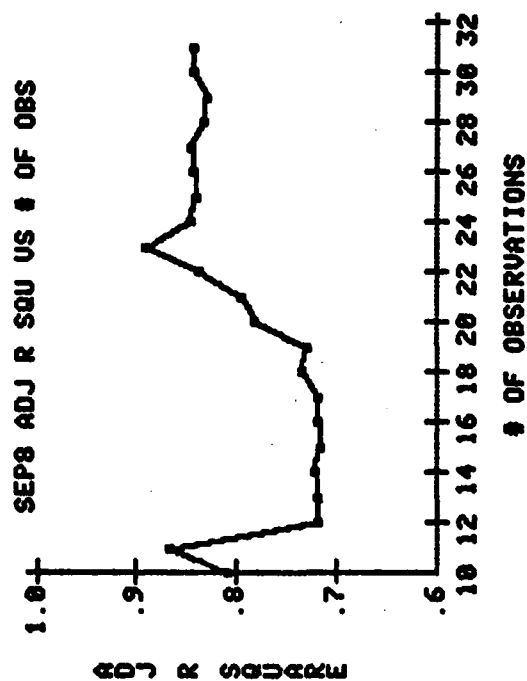


FIGURE D-16

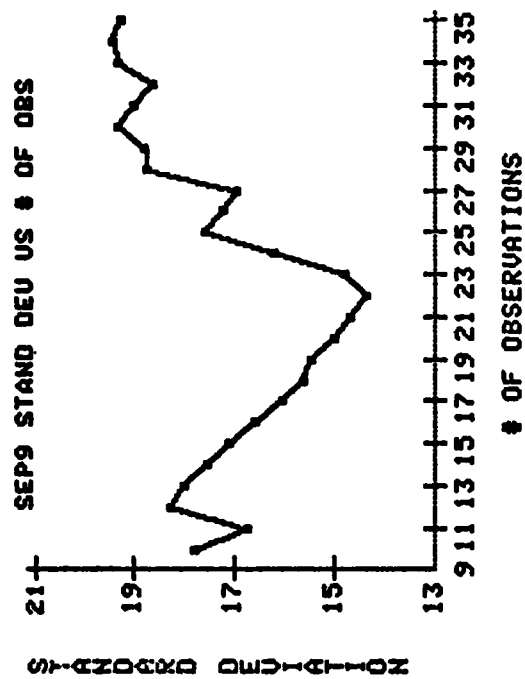


FIGURE D-17

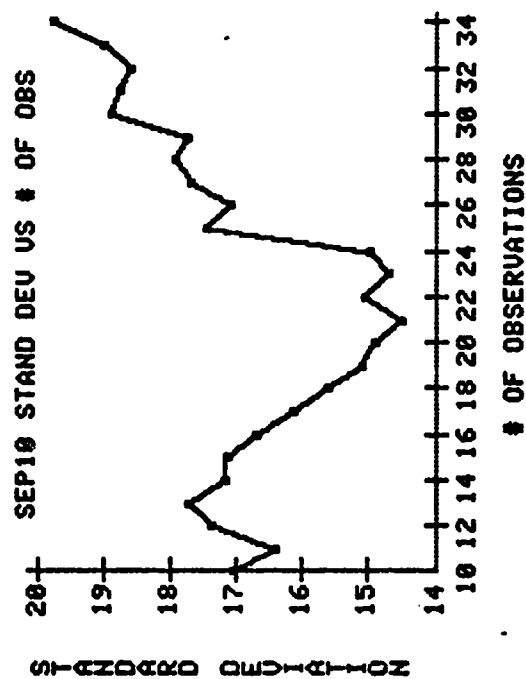


FIGURE D-19

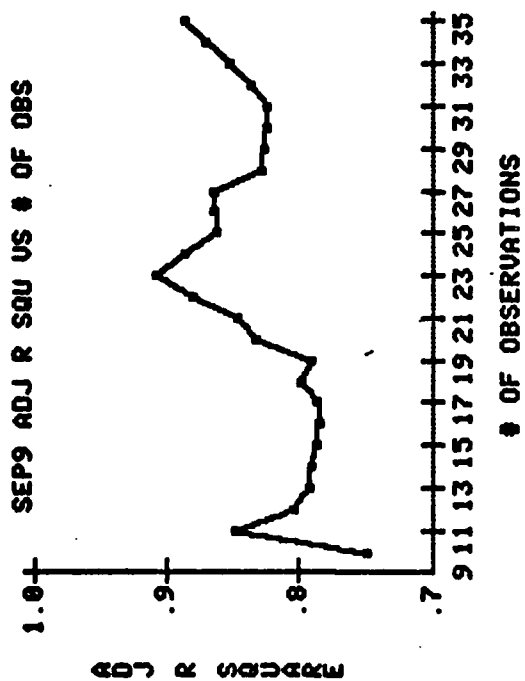


FIGURE D-18

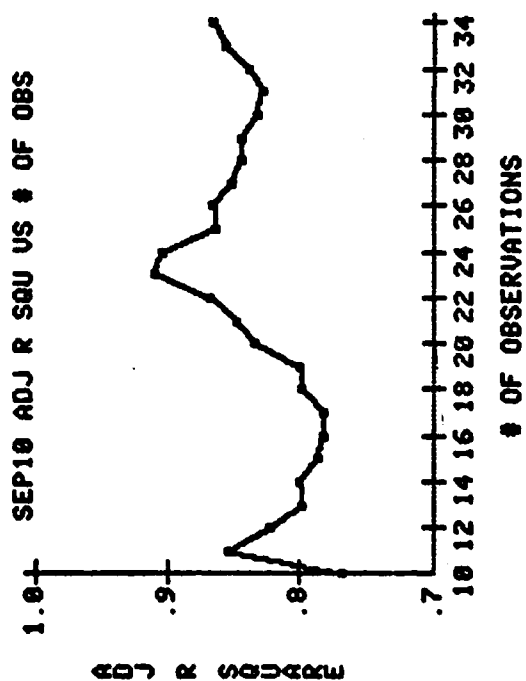


FIGURE D-20

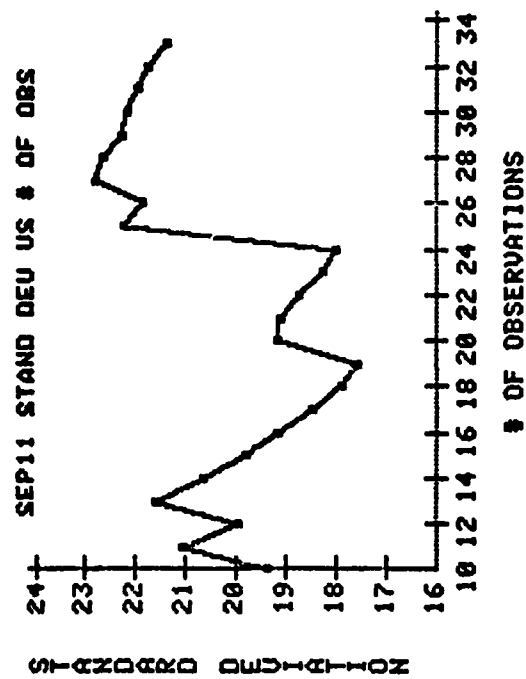


FIGURE D-21

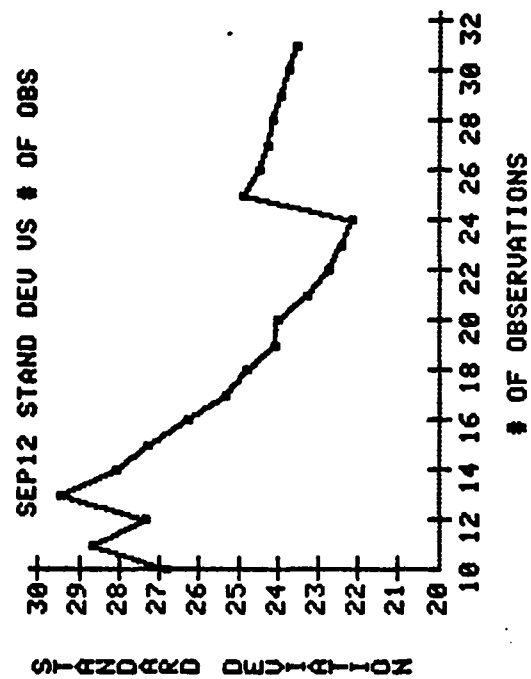


FIGURE D-23

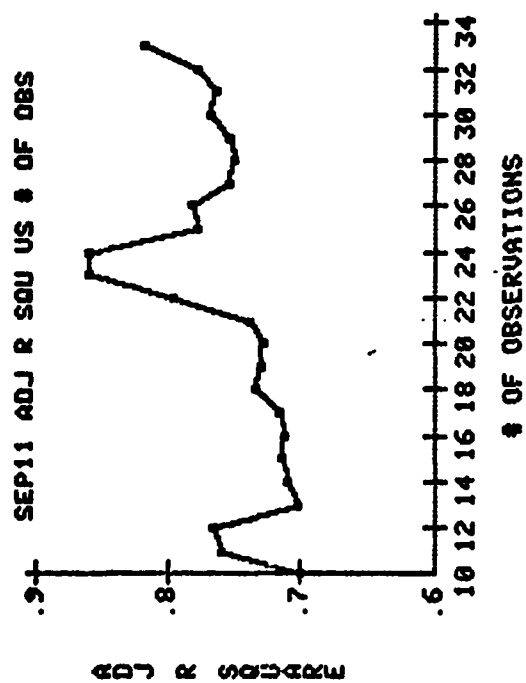


FIGURE D-22

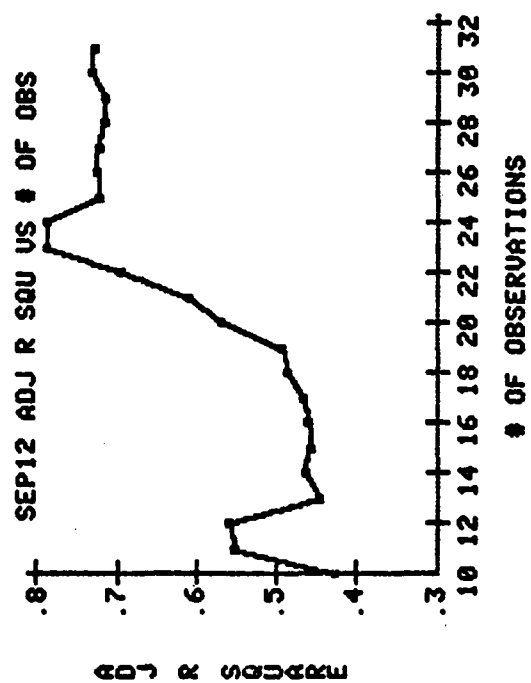


FIGURE D-24

APPENDIX E
Prediction Errors Associated with
Separation Regression Model

Table E-I

SEP1
OF OBSERVATIONS vs PREDICTION ERRORS
ERROR=PREDICTION-ACTUAL

	OCT 81	NOV 81	DEC 81	JAN 82	FEB 82	MAR 82	APR 82	MAY 82	JUN 82	JUL 82		
ACTUAL LOSSES	94	99	101	91	84	73	76	74	131	117		
# OF OBS	Error										$\bar{X}$	S.D.
MAX	4	-3	-6	1	10	7	-15	1	-12	5	.8	8.2
25	6	-1	-1	3	12	8	-14	3	-12	5	.9	8.3
24	7	-1	-2	4	12	8	-14	3	-12	4	.9	8.4
23	7	-1	-1	4	12	9	-14	3	-12	5	1.2	8.5
22	7	-1	-1	4	11	8	-14	2	-12	5	.9	8.2
21	8	-1	-1	3	12	8	-14	1	-12	5	.9	8.4
20	8	-1	-2	4	14	-3	-17	1	-12	5	-.3	9.1

Table E-II

SEP2
OF OBSERVATIONS vs PREDICTION ERRORS
ERROR=PREDICTION-ACTUAL

	OCT 81	NOV 81	DEC 81	JAN 82	FEB 82	MAR 82	APR 82	MAY 82	JUN 82	JUL 82		
ACTUAL LOSSES	94	99	101	91	84	73	76	74	131	117		
# OF OBS	Error										$\bar{X}$	S.D.
MAX	7	-2	1	2	10	6	-14	4	-7	-4	.3	7.2
25	10	0	2	5	13	8	-11	6	-7	-4	2.2	7.7
24	10	1	3	5	14	8	-11	6	-8	-3	2.5	7.9
23	11	1	3	5	14	8	-12	6	-7	-3	2.6	8.1
22	11	1	3	5	14	9	-12	6	-7	-4	2.6	8.2
21	11	2	3	5	13	7	-12	6	-6	-4	2.5	7.8
20	12	2	3	5	13	8	-12	1	-6	-3	2.3	7.8

Table E-III
SEP3
OF OBSERVATIONS vs PREDICTION ERRORS
ERROR=PREDICTION-ACTUAL

	OCT 81	NOV 81	DEC 81	JAN 82	FEB 82	MAR 82	APR 82	MAY 82	JUN 82	JUL 82		
ACTUAL LOSSES	94	99	101	91	84	73	76	74	131	117		
# OF OBS	Error										$\bar{X}$	S.D.
MAX	13	-1	1	8	13	7	2	8	-7	0	4.4	6.5
25	13	-2	1	9	14	10	3	10	-8	0	5.0	7.3
24	14	-1	2	9	13	10	3	10	-8	0	5.2	7.1
23	13	0	3	9	14	10	2	9	-8	0	5.2	6.9
22	14	1	3	10	14	10	2	9	-8	0	5.5	7.1
21	14	1	3	10	14	11	2	9	-8	0	5.6	7.1
20	13	1	3	10	13	10	2	9	-8	0	5.3	6.8
19	14	1	3	9	13	10	1	7	-8	0	5.0	6.8
18	14	1	3	9	13	11	-2	6	-7	1	4.9	6.9
17	14	2	3	9	13	10	-4	3	-6	2	4.6	6.8
16	13	1	2	9	11	10	-5	2	-6	2	3.9	6.6
15	13	0	3	7	10	8	-10	2	-6	2	2.9	7.1

Table E-IV
SEP4
OF OBSERVATIONS vs PREDICTION ERRORS
ERROR=PREDICTION-ACTUAL

	OCT 81	NOV 81	DEC 81	JAN 82	FEB 82	MAR 82	APR 82	MAY 82	JUN 82	JUL 82		
ACTUAL LOSSES	94	99	101	91	84	73	76	74	131	117		
# OF OBS	Error										$\bar{X}$	S.D.
MAX	23	1	1	9	13	-3	-5	15	-4	-4	4.6	9.8
25			1	9	15	2	-4	17	-5	-4	3.9	8.8
24		1	2	10	15	3	-2	17	-5	-4	4.1	8.1
23	23	2	3	10	15	3	-2	17	-5	-4	6.2	9.6
22	20	3	3	10	15	3	-2	16	-5	-4	5.9	8.9
21	20	3	3	11	16	3	-3	16	-5	-4	6.0	9.1
20	20	3	3	12	15	4	-3	16	-5	-4	6.1	9.1
19	20	3	3	12	15	3	-4	15	-5	-5	5.7	9.2
18	21	3	3	11	15	3	-4	14	-6	-4	5.6	9.3

Table E-V
SEP5
OF OBSERVATIONS vs PREDICTION ERRORS
ERROR=PREDICTION-ACTUAL

	OCT 81	NOV 81	DEC 81	JAN 82	FEB 82	MAR 82	APR 82	MAY 82	JUN 82	JUL 82		
ACTUAL LOSSES	94	99	101	91	84	73	76	74	131	117		
# OF OBS	Error										$\bar{X}$	S.D.
MAX	32	2	-3	5	19	1	-6	11	5	-11	5.5	12.6
25					19	2	-4	13	4	-10	4.0	10.7
24				5	21	3	-4	13	4	-10	4.6	10.2
23			-3	6	21	4	-3	13	3	-10	3.9	9.8
22		2	-1	6	21	4	-3	12	2	-10	3.8	9.0
21	32	3	-1	6	21	4	-3	12	2	-10	6.6	12.2
20	32	3	-1	7	21	5	-4	12	1	-20	6.6	12.4
19	32	2	-1	6	21	6	-5	12	-1	-10	6.2	12.6
18	30	3	-1	6	21	5	-5	11	-2	-10	5.8	12.1

Table E-VI
SEP6
OF OBSERVATIONS vs PREDICTION ERRORS
ERROR=PREDICTION-ACTUAL

	OCT 81	NOV 81	DEC 81	JAN 82	FEB 82	MAR 82	APR 82	MAY 82	JUN 82	JUL 82		
ACTUAL LOSSES	94	99	101	91	84	73	76	74	131	117		
# OF OBS	Error										$\bar{X}$	S.D.
MAX	17	11	-14	6	13	10	9	11	4	-5	6.2	9.3
25						10	11	12	3	-5	6.2	7.2
24					13	12	10	11	3	-5	7.3	7.0
23				6	15	12	10	12	3	-5	7.6	6.8
22			-14	7	15	12	10	12	3	-5	5.0	9.9
21		11	-12	7	15	13	10	12	2	-5	5.9	9.1
20	17	13	-12	7	15	13	10	12	3	-5	7.3	9.4
19	19	13	-13	7	15	13	10	12	1	-6	7.1	10.1
18	19	11	-13	7	15	12	10	11	-2	-4	6.6	9.9

Table E-VII

SEP7
OF OBSERVATIONS vs PREDICTION ERRORS
ERROR=PREDICTION-ACTUAL

	OCT 81	NOV 81	DEC 81	JAN 82	FEB 82	MAR 82	APR 82	MAY 82	JUN 82	JUL 82		
ACTUAL LOSSES	94	99	101	91	84	73	76	74	131	117		
# OF OBS											Error	$\bar{X}$ S.D.
MAX	38	25	-1	9	9	-7	30	26	10	-6	13.3	15.7
23						-7	29	24	11	-7	10.0	16.9
22					9	-10	28	24	10	-7	9.0	15.5
21				9	7	-11	29	23	10	-7	8.6	14.5
20			-1	7	6	-11	27	22	9	-6	6.5	13.2
19		25	-3	7	7	-12	27	22	9	-6	8.4	14.0
18	38	24	-3	7	6	-12	26	22	7	-5	11.0	15.9

MEAN AND STANDARD DEVIATION
FOR
FEBRUARY THROUGH JULY

# of Obs	$\bar{X}$	S.D.
MAX	10.3	15.5
22	9.0	15.5
21	8.5	15.9
20	7.7	15.2
19	7.8	15.2
18	7.3	14.8

Table E-VIII

SEP8
OF OBSERVATIONS vs PREDICTION ERRORS
ERROR=PREDICTION-ACTUAL

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL		
	81	81	81	82	82	82	82	82	82	82		
ACTUAL LOSSES	94	99	101	91	84	73	76	74	131	117		
# OF OBS											Error	$\bar{X}$ S.D.
MAX	47	38	-4	16	13	-9	28	31	26	-18		20.3 17.5
21						-9	28	31	26	-20		11.2 23.9
20					13	-11	27	30	30	-20		10.5 21.1
19				16	12	-11	27	28	24	-16		11.4 18.0
18			-4	15	12	-12	25	28	25	-19		8.8 18.2

MEAN AND STANDARD DEVIATION
FOR
MARCH THROUGH JULY

# of Obs	$\bar{X}$	S.D.
MAX	11.4	23.0
21	11.2	23.9
20	10.0	23.6
19	10.4	21.9
18	9.4	22.9

Table E-IV

SEP9
OF OBSERVATIONS vs PREDICTION ERRORS
ERROR=PREDICTION-ACTUAL

	OCT 81	NOV 81	DEC 81	JAN 82	FEB 82	MAR 82	APR 82	MAY 82	JUN 82	JUL 82		
ACTUAL LOSSES	94	99	101	91	84	73	76	74	131	117		
# OF OBS											Error	$\bar{X}$ S.D.
MAX	60	41	5	11	22	-11	29	29	45	-11	22.0	23.6
24						-11	29	26	45	-11	15.6	25.3
23					22	-9	26	30	45	-10	17.3	22.2
22				11	22	-14	30	30	44	-13	15.7	22.3
21			5	12	20	-9	30	30	46	-14	18.5	17.0
20		41	5	9	23	-8	30	26	46	-16	17.3	21.3
19	60	41	1	12	23	-9	26	25	44	-16	20.7	24.1
18	59	39	6	12	23	-14	26	21	44	-16	20.0	24.1
17	57	42	6	12	20	-15	22	21	44	-15	19.4	23.9
16	62	42	6	9	19	-17	22	21	40	-15	18.9	24.8

MEAN AND STANDARD DEVIATION
FOR
MARCH THROUGH JULY

# of Obs	$\bar{X}$	S.D.
MAX	16.2	25.7
24	15.6	25.3
23	16.4	24.7
22	15.4	27.0
21	16.6	26.5
20	15.6	26.4
19	14.0	25.5
18	12.2	26.3
17	11.4	25.8
16	10.2	25.1

APPENDIX F

Separation's Time Series Analysis

Computer Output (Undifferenced Data)

HOW LONG IS THE TIME SERIES?
 ENTER TITLE SEP ANALYSIS
 DO YOU WANT TO DIFFERENCE OR TRANSFORM (Y/N)?N
 SEP ANALYSIS
 MEAN = .352386 J70149 VARIANCE = .018439999999999994

DO YOU WANT TO SEE THE FT AUTO OUTPUT (Y/N)?Y
 LAG AUTOCORRELATION PARTIAL AUTOCORRELATION
 1 .013404 .815877
 2 .010759 .555822
 3 .007625 .464032
 4 .004236 .261439
 5 .002367 .144051
 6 .001751 .06583
 7 .002244 .135568
 8 .002797 .170243
 9 .004651 .283172
 10 .006222 .378692
 11 .007251 .441322
 12 .007716 .465372
 13 .006195 .371592
 14 .003627 .220745
 15 .000791 .042640
 16 .001810 .110191
 17 .003586 .218254
 18 .004010 .244074
 19 .004082 .248492
 20 .003832 .233219
 21 .002153 .131040
 22 .001089 .061466
 23 .000165 .010057
 24 .000331 .020152
 25 .000545 .033150
 26 .001962 .119418
 27 .004073 .247932
 28 .005460 .332362
 29 .006651 .404832
 30 .006336 .385672
 31 .006575 .402292
 32 .006298 .383362
 33 .005246 .319332

THE APPROXIMATED 2 S.E. BAND IS +/- .2443

2-DENOTES AUTOCORRELATION OUTSIDE 2 S.E. BAND

HOW MANY INTENSITY VALUES DO YOU WANT TO SEE?
 0 - DEFAULT OF 45; N .LT. LV/8 -->33
 INTENSITY
 1 .015 67.000 .589
 2 .030 33.500 .000
 3 .045 22.333 .031
 4 .060 16.750 .023
 5 .075 13.400 .128
 6 .090 11.167 .157
 7 .104 9.571 .032
 8 .119 8.375 .002
 9 .134 7.444 .011
 10 .149 6.700 .002
 11 .164 6.091 .038
 12 .179 5.583 .000
 13 .194 5.154 .001
 14 .209 4.786 .000
 15 .224 4.467 .005
 16 .239 4.188 .001
 17 .254 3.941 .001
 18 .269 3.722 .008
 19 .284 3.526 .002
 20 .299 3.350 .007
 21 .313 3.190 .003
 22 .328 3.045 .012
 23 .343 2.913 .001
 24 .358 2.792 .003
 25 .373 2.680 .002
 26 .388 2.577 .005
 27 .403 2.481 .000
 28 .418 2.393 .007
 29 .433 2.310 .011
 30 .448 2.233 .001
 31 .463 2.161 .004
 32 .478 2.094 .001
 33 .493 2.030 .001

(F(M) = ACF(M))

R-ARRAY

K	1	2	3	4	5	6	7	8	9	10
(-15)	.0000	.1846	.3429	.3101	.2628	.5328	.130251	.1864	.0000	.5178
(-14)	.2307	.2281	.4010	.0922	.2497	.6310	.130251	.4251	.12141	.16164
(-13)	.3716	.5757	.2463	.6922	.2722	.5549	.5209	.5209	2.2782	1.2015
(-12)	.4836	.6006	.1590	.17546	.3738	.4559	1.2374	4.104	4.4732	1.487
(-11)	.4414	.2942	.7286	.1389	.1688	.3855	1.8445	1.841	2.2536	.6138
(-10)	.3787	.1641	.9529	.0856	.1634	.2854	1.3673	3.9783	1.6540	5.7793
(-9)	.2831	.0858	.9610	.1657	.5907	.9001	1.2111	1.1673	1.4294	2.0792x
(-8)	.1702	.0150	.9893	.3023	.3270	.6319	2.4807	.4532	1.6977x	.2949
(-7)	.1366	.2772	.9893	.4355	.7066	.2637	.372966	1.7954x	.3815	.2768
(-6)	.1066	.1900	.9332	.1673	.7799	.2552	1.5574x	.0977	.3678	.1951
(-5)	.1441	.0130	.9136	.17019	.960	1.3110x	.2380	.2606	.4240	.8018
(-4)	.2615	.2156	.7476	4.9250	1.1781x	.2464	.81366	.6418	.7028	.5799
(-3)	.6541	.2730	2.1204	1.4278x	.1329	.2543	.7283	2.1133	2.1846	.4199
(-2)	.5567	.0564	1.1671x	.2497	.1986	.7118	.5498	.6124	1.3971	.1928
(-1)	.3159	.18159x	.3393	.14528	.1667	.3917	.5776	.1215	.5528	.0000
(0)	1.0000x	.0487	.3572	.2348	.0842	.2489	1.6129	.6925	.3021	.0000
(1)	.3159	.3303	.8146	.1272	.5340	.4544	.2053	.272	.0000	.0000
(2)	.5567	.2268	.6650	.1955	.3535	.4098	.15192	.175	.0000	.0000
(3)	.6541	.0075	.9709	.3003	.2632	.1981	.2409	.0000	.0000	.0000
(4)	.2615	.0606	.1385	.2545	.2584	.2141	.0000	.0000	.0000	.0000
(5)	.1441	.2219	.2719	.1624	.3316	.6078	.0000	.0000	.0000	.0000
(6)	.1066	.0159	.2240	.1824	.2096	.0483	.0000	.0000	.0000	.0000
(7)	.1366	.2875	.1575	1.8061	.2251	.0000	.0000	.0000	.0000	.0000
(8)	.1702	.1390	.0950	.5311	.3448	.0000	.0000	.0000	.0000	.0000
(9)	.2831	.1930	1.3912	.4465	.0000	.0000	.0000	.0000	.0000	.0000
(10)	.3787	.2707	.8012	.0234	.0000	.0000	.0000	.0000	.0000	.0000
(11)	.4414	2.0011	.1709	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(12)	.6536	.3510	.1553	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(13)	.2207	.2180	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(14)	.0426	.1468	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(15)	.1102	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(16)										

(F(N) = ((-1)^(N+1)) * FACT(N))

R-array

N	1	2	3	4	5	6	7	8	9	10
(-15)	-1.102	-0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(-14)	-0.426	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(-13)	-0.207	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(-12)	-0.486	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(-11)	-0.414	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(-10)	-0.377	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(-9)	-0.231	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(-8)	-0.173	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(-7)	-0.136	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(-6)	-0.106	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(-5)	-0.141	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(-4)	-0.2615	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(-3)	-0.461	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(-2)	-0.667	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(-1)	-0.859	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(0)	1.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(1)	0.859	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(2)	0.667	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(3)	0.461	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(4)	0.2615	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(5)	0.141	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(6)	0.106	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(7)	0.136	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(8)	0.173	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(9)	0.231	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(10)	0.377	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(11)	0.414	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(12)	0.486	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(13)	0.716	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(14)	0.993	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(15)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(16)	-1.102	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

K	1	2	3	4	5	6	7	8	9
(-13)	1.0000	3.8328	0.0281	2.0398	-3.0513	0.6041	51.8277	-1.0079	-12.8280
(-14)	1.0000	4.8827	-1.5638	-3.4722	-3.8774	12.9146	-7.7116	11.3025	-10.4856
(-15)	1.0000	2.4774	-3.1570	5.6972	-4.5617	-5.9059	-3.3385	3.4528	-12.6326
(-16)	1.0000	4.1014	-3.5782	0.012	-3.4255	1.248	-7.527	8.007	-12.0917
(-17)	1.0000	3.5852	-1.768	1.8555	-0.1851	4.401	-3.2755	12.5580	-13.5568
(-18)	1.0000	1.584	-1.3623	5.8835	-10.6591	20.7003	-7.9924	1.854	-13.7819
(-19)	1.0000	1.6631	-1.8226	7.2638	-17.5105	17.5105	6.8321	9.8268	-10.5965
(-20)	1.0000	-35.1483	-5.6838	-3.440	-14.9419	26.0424	-5.0035	36.7321	-2.3812
(-21)	1.0000	4.3054	-15.1385	1.926	-20.3810	-1.6328	-12.0656	1.944	-3.5455
(-22)	1.0000	2.4422	-9.7126	27.2388	-12.1880	0.5202	-1.8441	-5.603	-3.6991
(-23)	1.0000	47.2686	-5.8097	2.8068	-17.4593	1.5968	-1.2879	1.0178	-3.7706
(-24)	1.0000	4.2974	18.6509	10.1241	-1.3608	3.1449	2.2559	3.1983	-6.1694
(-25)	1.0000	2.5377	7.8458	1.7711	-4.8806	0.191	-4.8064	-4.666	-6.4305
(-26)	1.0000	69.4822	-1.5065	820	-4.3556	-10.846	-1.3171	5.184	-5.8847
(-27)	1.0000	1.8648	-3.1423	3.7566	-1.7799	-5.7339	-2.644	4.330	-4.9753
(-28)	1.0000	14.8483	-6.3296	-1.4639	1.5923	-7.0657	-4.0260	5.7367	0.0000
(-29)	1.0000	3.5692	-2.9551	1.5597	5.4543	-1.2315	-3.0399	5.3755	0.0000
(-30)	1.0000	1.6476	-5.0238	-7.2156	-9.9626	2.510	-6.0568	0.0000	0.0000
(-31)	1.0000	-1.4270	-8.8171	-1.7374	-5.2431	5.379	-7.881	0.0000	0.0000
(-32)	1.0000	5.0270	1.5697	4.8846	-4.0464	7.597	0.0000	0.0000	0.0000
(-33)	1.0000	2.1383	1.6836	2.3970	-3.6081	5.0036	0.0000	0.0000	0.0000
(-34)	1.0000	-31.848	-4.6920	5.8613	-4.7544	0.000	0.0000	0.0000	0.0000
(-35)	1.0000	-2.2466	-4.2412	-3.550	-4.7208	0.000	0.0000	0.0000	0.0000
(-36)	1.0000	4.2266	27.6285	5.2756	0.0000	0.000	0.0000	0.0000	0.0000
(-37)	1.0000	3.7734	5.0869	2.0454	0.0000	0.000	0.0000	0.0000	0.0000
(-38)	1.0000	8.2546	-2.1634	0.0000	0.0000	0.000	0.0000	0.0000	0.0000
(-39)	1.0000	2.9720	-1.5452	0.0000	0.0000	0.000	0.0000	0.0000	0.0000
(-40)	1.0000	3.7570	0.0000	0.0000	0.0000	0.000	0.0000	0.0000	0.0000
(-41)	1.0000	3.3265	0.0000	0.0000	0.0000	0.000	0.0000	0.0000	0.0000
(-42)	1.0000	-1.7012	0.0000	0.0000	0.0000	0.000	0.0000	0.0000	0.0000
(-43)	1.0000	-1.9540	0.0000	0.0000	0.0000	0.000	0.0000	0.0000	0.0000
(-44)	1.0000	-1.1932	0.0000	0.0000	0.0000	0.000	0.0000	0.0000	0.0000
(-45)	1.0000	1.5842	0.0000	0.0000	0.0000	0.000	0.0000	0.0000	0.0000
(-46)	1.0000	0.0000	0.0000	0.0000	0.0000	0.000	0.0000	0.0000	0.0000



APPENDIX G

Separation's Time Series Analysis

Computer Output (Nonseasonally Differenced Data)

HOW LONG IS THE TIME SERIES? 67
 ENTER TITLE SEP ANALYSIS DIFF 1
 DO YOU WANT TO DIFFERENCE OR TRANSFORM (Y/N)? Y
 WHAT IS THE ORDER OF THE NON-SEASONAL DIFFERENCE (ID1)? 01
 WHAT IS THE ORDER OF THE SEASONAL DIFFERENCING (ID2)? 00
 TRANSFORMATION COEFF: IP=0 (LN), IP>0(2(1)-2(1)XIP)
 LENGTH OF SEASON: IS=00
 SEP ANALYSIS DIFF 1
 MEAN = .0002575757575757 VARIANCE = .005796433654789

DO YOU WANT TO SEE THE FTAUTO OUTPUT (Y/N)? Y
 LAG AUTOCORRELATION PARTIAL AUTOCORRELATION

1	-.00456	-.078739	-.058434
2	-.00373	-.064272	-.05881
3	-.00238	-.041027	-.05017
4	-.001364	-.025331	-.04621
5	-.000934	-.0161297	-.042347
6	-.001085	-.017233	-.04088
7	-.00041	-.007082	-.041268
8	-.001504	-.0293942	-.039080
9	-.000227	-.039080	-.084686
10	-.000479	-.062580	-.075166
11	-.00762	-.131500	-.261642
12	-.02053	-.358518	-.125127
13	-.00650	-.112200	-.061283
14	-.000558	-.056309	-.010536
15	-.000474	-.081851	-.043204
16	-.000584	-.100730	-.025549
17	-.001121	-.193480	-.129375
18	-.000296	-.051149	-.109067
19	-.000175	-.030166	-.163314
20	-.001551	-.2676148	-.012854
21	-.000691	-.119180	-.087973
22	-.000350	-.060308	-.173788
23	-.001134	-.195653	-.027117
24	-.001327	-.228897	-.144000
25	-.000078	-.013525	-.058423
26	-.000827	-.142714	-.05266
27	-.000753	-.129863	-.032900
28	-.000013	-.002273	-.001356
29	-.001369	-.236137	-.208536
30	-.000391	-.067385	
31	-.000398	-.066680	
32	-.001026	-.177017	
33	-.000088	-.015114	

THE APPROXIMATED 2 S.E. BAND IS +/- .2443

2-DENOTES AUTOCORRELATION OUTSIDE 2 S.E. BAND

HOW MANY INTENSITY VALUES DO YOU WANT TO SEE?
 0 - DEFAULT OF 45; N .LT. LU/2 -->33
 INTENSITY

	FQ	P
1	.015	66.000
2	.030	33.000
3	.045	22.000
4	.061	16.500
5	.076	13.200
6	.091	11.000
7	.106	9.429
8	.121	8.250
9	.136	7.333
10	.152	6.600
11	.167	6.000
12	.182	5.500
13	.197	5.077
14	.212	4.714
15	.227	4.400
16	.242	4.125
17	.258	3.882
18	.273	3.657
19	.288	3.474
20	.303	3.300
21	.318	3.143
22	.333	3.000
23	.348	2.870
24	.364	2.750
25	.379	2.640
26	.394	2.538
27	.409	2.444
28	.424	2.357
29	.439	2.276
30	.455	2.200
31	.470	2.129
32	.485	2.063
33	.500	2.000

(F(M) - ACF(M))

R-ARRAY

K	1	2	3	4	5	6	7	8	9	10
(-5)	.0819	1.136	.3294	.3871	.0829	.0000	.9553	.3048	.0863	.51.7588
(-4)	.0983	1.3644	.5472	.4804	.0083	.104	.3720	.6192	.0867	.0862
(-3)	.1122	1.4532	.6951	.5187	.0760	.4068	.7804	.8620	.1616	.1565
(-2)	.1559	.0539	.4609	.3895	.3974	.4066	.1084	1.2074	.1537	.6.6266
(-1)	.1315	.0344	.8336	.241	.4637	.3797	.4285	.5898	.1581	.2319
(0)	.0826	.5275	.2146	.091	.5938	3.1598	.4326	1.6377	.0882	.2748
(1)	.0391	.225	.7778	.500	.9.2960	15.8322	.7570	1.1659	.2424	.27872
(2)	.2594	.1821	.0751	.6822	.3.3469	.3007	.5605	.4778	.33072	
(3)	.0071	.1863	.8665	.4015	.5512	2.3985	.0108	.48728	.0520	.0236
(4)	.1872	.6944	10.3752	.8010	.0663	2.7322	.48492	.1565	.0028	.0614
(5)	.1612	.8364	.0543	.753	.3.3751	.61562	.0023	.1545	.0590	.0590
(6)	.2353	.068	.4001	.885	.78392	.1307	.1530	.3540	.0576	.5.535
(7)	.0410	.3167	.10.8334	1.02472	.1682	.6328	.2328	.6706	.1050	.0316
(8)	.0643	.4061	.97512	.2408	.0171	.4772	.1903	.2783	.0455	.7.1235
(9)	.0787	.92132	.0496	.255	.5758	.3315	.1786	.6399	.0453	.0.0000
(10)	1.00002	.0538	3.4676	.213	.3439	.6.7804	.3771	.4599	.0141	.0.0000
(11)	.0787	.055	.1058	.2609	.4015	1.1381	.1242	.2793	.0.0000	.0.0000
(12)	.0643	.7231	.2258	.3841	.6281	.5531	.3794	.1588	.0.0000	.0.0000
(13)	.0410	.2243	.7.0027	.3755	.6220	4.4644	.6618	.0.0000	.0.0000	.0.0000
(14)	.2353	1.3988	.1686	.160	.6238	.0355	.0904	.0.0000	.0.0000	.0.0000
(15)	.1612	1.3988	.3283	.278	.1035	.0522	.0.0000	.0.0000	.0.0000	.0.0000
(16)	.1872	.297	1.6603	.2343	.0889	.037	.0.0000	.0.0000	.0.0000	.0.0000
(17)	.0071	.2515	.1052	.4267	.0603	.0.0000	.0.0000	.0.0000	.0.0000	.0.0000
(18)	.2594	.0759	.2671	.5599	.1937	.0.0000	.0.0000	.0.0000	.0.0000	.0.0000
(19)	.0391	.0386	.0431	.5460	.0.0000	.0.0000	.0.0000	.0.0000	.0.0000	.0.0000
(20)	.0826	.242	.5532	.033	.0.0000	.0.0000	.0.0000	.0.0000	.0.0000	.0.0000
(21)	.1315	.487	.2259	.0.0000	.0.0000	.0.0000	.0.0000	.0.0000	.0.0000	.0.0000
(22)	.3559	.0800	.1675	.0.0000	.0.0000	.0.0000	.0.0000	.0.0000	.0.0000	.0.0000
(23)	.1122	1.1616	.0.0000	.0.0000	.0.0000	.0.0000	.0.0000	.0.0000	.0.0000	.0.0000
(24)	.0863	.0921	.0.0000	.0.0000	.0.0000	.0.0000	.0.0000	.0.0000	.0.0000	.0.0000
(25)	.0819	.0.0000	.0.0000	.0.0000	.0.0000	.0.0000	.0.0000	.0.0000	.0.0000	.0.0000
(26)	.1007	.0.0000	.0.0000	.0.0000	.0.0000	.0.0000	.0.0000	.0.0000	.0.0000	.0.0000

(F(N) = ((-1)^(N+1)) * 2 * N)

R-ARRAY

N	1	2	3	4	5	6	7	8	9	10
(-15)	.0819	-1.2767	.3872	-1.5845	.0465	-1.0698	-1.647	-1.5159	-.0927	-1.087
(-14)	.0663	-1.040	.2932	-.3303	.0887	-.1337	-.247	-1.1519	.0755	-1.189
(-13)	.1122	-.2390	.0823	-.2878	.0786	-.1555	-.111	-1.7576	.1424	.0048
(-12)	.3559	-.0248	-.2522	.0805	-.2375	.0781	.0127	1.2506	.1053	.0721
(-11)	.1315	-.0078	-.1710	.3937	-.4202	-.8238	14.1547	-2.1422	-.1436	-.2070
(-10)	.0826	.1886	-.2726	.0548	-.4626	-.8892	-.8279	-6.019	-.091	-.2057
(-9)	.0391	.3042	.4222	.3332	-.1288	-.7559	.6725	4.5051	.1968	-.62002
(-8)	-.2594	.1923	.0417	.2601	1.3266	-.4607	.7282	-.3052	.53572	.0525
(-7)	-.0071	.2009	-.2380	.5709	-.6137	-.78932	-.0183	-.78932	.0842	.0459
(-6)	.1872	.0519	-.1958	-.6224	-.0116	-.4525	-.7912	.2536	-.0823	.0526
(-5)	.1612	.1563	.0533	-.0543	.4457	-1.0692	-.0838	.2604	-.0475	-.0637
(-4)	-.2353	-.0865	1.9368	-1.7792	.82902	.2138	-.2593	-1.4419	.0523	.1626
(-3)	-.0640	-.0699	.5174	-.2547	-.0932	.0982	-.3025	.2465	.0720	.1295
(-2)	.0643	4.0140	1.14182	.1126	-.0932	.0952	-.1691	1.0110	.0401	.0150
(-1)	.0787	-1.07872	-.0521	.1424	-.1007	.2108	-.3417	-.7042	-.0395	.0000
(0)	1.00002	-.0630	-.1656	.126	-.3819	.2235	-12.4539	.3622	.0152	.0000
(1)	.0787	.0888	.5119	.2027	.1691	.3203	-.1441	.6852	.0000	.0000
(2)	.0643	.1596	-.2216	.5462	-.3703	1.2131	-.3887	-.1338	.0000	.0000
(3)	-.0410	.3191	-.1328	.1622	-.5001	-.1773	-.0401	.0000	.0000	.0000
(4)	-.2353	.0456	-.0463	.1036	-.5654	-.0223	.0155	.0000	.0000	.0000
(5)	.1612	.1039	-.1825	.7349	.0619	.0728	.0000	.0000	.0000	.0000
(6)	-.1872	.2693	-.0912	-.3717	.0092	.0306	.0000	.0000	.0000	.0000
(7)	-.0071	.2656	-.1337	.2197	-.0637	.0000	.0000	.0000	.0000	.0000
(8)	-.2594	.1842	.0548	-.2083	.1453	.0000	.0000	.0000	.0000	.0000
(9)	.0391	-.3138	-.0236	-.2518	.0000	.0000	.0000	.0000	.0000	.0000
(10)	.0826	-.0565	.2508	.1156	.0000	.0000	.0000	.0000	.0000	.0000
(11)	-.1315	-.2296	.1210	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(12)	.3559	-.0463	.1970	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(13)	-.1122	-.0885	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(14)	.0663	1.1344	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(15)	.0819	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(16)	-.1007	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

(4.1)

DO YOU WANT THE D STATISTIC?
 ENTER THE MAX NR ORDERS
 ENTER THE MAX MA ORDERS
 DO YOU WANT TO SEE THE D STAT?
 0-VES. 1-NO-->0

D STATISTIC

ORDER OF NR	0	ORDER OF MA	1	2
0	.5408E+00	.8112E+01	.7402E+00	
1	.1429E-02	.9838E-01	.8991E-02	
2	.1109E-06	.8594E-04	.1284E+00	
3	.1131E-04	.1354E-02	.9472E-01	
4	.2871E+00	.3911E+01	.1978E-02	
5	.2431E-01	.2647E-05	.1382E-01	

ORDER OF AUTOREGRESSION SELECTED 4
 ORDER OF MOVING AVERAGE SELECTED 1
 DO YOU WANT ANOTHER D STATISTIC?
 ENTER THE MAX NR ORDER7
 ENTER THE MAX MA ORDER2
 DO YOU WANT TO SEE THE D STAT?
 0-VES. 1-NO-->0

D STATISTIC

ORDER OF NR	0	ORDER OF MA	1	2
0	.4261E+01	.6539E-01	.2012E+01	
1	.1792E-04	.8153E-01	.4791E-02	
2	.8693E-04	.2891E-04	.3289E+01	
3	.4588E-05	.4787E-01	.3705E-03	
4	.8844E+00	.1558E-01	.2907E+01	
5	.3463E-06	.1231E-03	.1380E-01	
6	.1468E+01	.1590E-03	.2985E-03	
7	.1164E-10	.1917E-02	.7585E-02	

ORDER OF AUTOREGRESSION SELECTED 0
 ORDER OF MOVING AVERAGE SELECTED 0
 DO YOU WANT ANOTHER D STATISTIC?

APPENDIX H

Residual Analysis of Separation Data

using an ARIMA(4,1,1) Model

THIS PROGRAM GENERATES THE RESIDUALS FOR SEP ANALYSIS MODEL
 MODEL CHOSEN IS ARIMA(4,1,1)
 EQUATION MODELED IS:
 $Z(T) - .5419Z(T-1) - .1522Z(T-2) - .0109Z(T-3) + .3451Z(T-4) =$
 $.00258A(T) - .7678A(T-1)$

MEAN--.0034739058232 VARIANCE-.004613295358421

LAG	AUTOCOV.	AUTOCORR.	PART. AUTOCORR.
1	-.000117	-.025359	-.025359
2	-.000159	-.041046	-.041716
3	-.000027	-.005823	-.007985
4	.000024	.005203	.003131
5	.000064	.013813	.013497
6	.000233	.050426	.051591
7	.000920	.201697 *	.206743 *
8	-.000774	-.167693	-.157457
9	-.000083	-.018861	-.007772
10	.000045	.009677	-.002026
11	.000484	.104927	.105434
12	.001346	.291656 *	.311042 *
13	.000419	.090717	.116670
14	.000300	.065083	.086311
15	-.000560	-.121488	-.055774
16	-.000449	-.097320	-.155603
17	-.000286	-.062102	-.138349
18	.000425	.092120	.080051
19	.000303	.065589	-.009449
20	-.001208	-.261836 *	-.226573 *
21	-.000058	-.014281	-.039177
22	-.000422	-.091573	-.110061
23	.000657	.142509	.120487
24	.000593	.128628	.069664
25	-.000156	-.035945	-.161446
26	.000428	.092820	.117010
27	-.000817	-.177157	-.039686
28	-.000256	-.055547	-.008841
29	-.000935	-.202752	-.155368
30	.000723	.156741	.075908
31	-.000157	-.033935	.010030
32	-.000771	-.167167	-.002389
33	-.000530	-.114930	-.155419

UNCONDITIONAL SUM OF SQUARES FOR A= .3104584147242
 UNCONDITIONAL SUM OF SQUARES FOR B= .3104586046387

PORTMANTEAU LACK OF FIT TEST = 33.34829991886

THE ASSOCIATED CUMULATIVE PERIODOGRAM VALUES ARE

1	.015	.081
2	.030	.087
3	.045	.099
4	.061	.104
5	.076	.154
6	.091	.184
7	.106	.198
8	.121	.201
9	.136	.213
10	.152	.214
11	.167	.306
12	.182	.406
13	.197	.410
14	.212	.414
15	.227	.460
16	.242	.464
17	.258	.490
18	.273	.548
19	.288	.576
20	.303	.626
21	.318	.650
22	.333	.735
23	.348	.738
24	.364	.744
25	.379	.763
26	.394	.789
27	.409	.784
28	.424	.896
29	.439	.921
30	.455	.922
31	.470	.970
32	.485	.976
33	.500	1.024

APPENDIX I

Separation's Time Series Analysis

Computer Output (Seasonally Differenced Data)

ENTER TITLE SEP ANALYSIS DIFF:2
DO YOU WANT TO DIFFERENCE OR TRANSFORM (Y/N)?Y
WHAT IS THE ORDER OF THE NON-SEASONAL DIFFERENCE(ID1)-00
WHAT IS THE ORDER OF THE SEASONAL DIFFERENCE(ID2)-01
TRANSFORMATION COEFF: IP=0 (LN),IP>0(1)-2(1)X(1P)1
LENGTH OF SEASON: IS=012
SEP ANALYSIS DIFF:2
MEAN = -.023618181818 VARIANCE = .01320329057851

DO YOU WANT TO SEE THE FTAUTO OUTPUT (Y/N)?Y
LAG AUTOCORRELANCE AUTOCORRELATION PARTIAL AUTOCORRELATION

LAG	AUTOCORRELANCE	AUTOCORRELATION	PARTIAL AUTOCORRELATION
1	.09573	.725945	.725945
2	.009184	.695616	.358259
3	.005138	.692087	.262846
4	.007790	.590029	-.055350
5	.006705	.507857	-.127592
6	.006198	.469414	-.032775
7	.005383	.483437	.192836
8	.005214	.394822	-.033490
9	.003952	.259336	-.215392
10	.003525	.266973	-.135218
11	.002027	.153553	-.169774
12	.000075	.005553	-.242422
13	.000528	.040014	.195788
14	.000380	-.028791	.058254
15	.001349	-.102208	-.053759
16	.001492	-.112995	-.053418
17	.002049	-.155203	-.095760
18	.002284	-.172975	.106035
19	.002765	-.209434	.199907
20	.003244	-.245660	-.076476
21	.002546	-.192822	.054889
22	.002965	-.234598	-.031993
23	.002494	-.188865	.027662
24	.003210	-.243147	-.260372
25	.002981	-.225761	.031570
26	.002949	-.223371	-.050442
27	.003480	-.263533	-.077629

THE APPROXIMATED 2 S.E. BAND IS +/- .2443
3-DENOTES AUTOCORRELATION OUTSIDE 2 S.E. BAND

I	F0	P	INTACTY
1	.012	55.000	.426
2	.036	27.500	.10
3	.055	18.333	.007
4	.073	13.750	.001
5	.091	11.000	.019
6	.109	9.167	.010
7	.127	7.857	.225
8	.145	6.875	.004
9	.164	6.111	.001
10	.182	5.500	.003
11	.200	5.000	.005
12	.218	4.583	.005
13	.236	4.231	.001
14	.255	3.929	.015
15	.273	3.667	.017
16	.291	3.438	.014
17	.309	3.235	.003
18	.327	3.056	.008
19	.345	2.895	.008
20	.364	2.750	.015
21	.382	2.619	.005
22	.400	2.500	.001
23	.418	2.391	.015
24	.436	2.292	.001
25	.455	2.200	.012
26	.473	2.115	.004
27	.491	2.037	

(F(M) * ((-1)^(M-1)) * SPCF(M))

R-ARRAY

K	1	2	3	4	5	6	7	8	9	10
(-15)	1.022	.0375	-.1357	.6763	-.0402	.0262	-.0071	.0050	-.3186	-.1158
(-14)	-.0288	.1538	-.0279	11.2799	-.0097	.0392	-.1163	.0519	-.0093	-.0551
(-13)	-.0400	.1338	-.0804	-.0322	-.0193	.0237	-.0222	.0360	-.0076	-.0547
(-12)	-.0536	.1386	-.0428	.1386	-.0276	.0283	-.1216	.2005	.0476	-.0366
(-11)	-.1537	-.0602	.0039	.1206	-.0034	.0584	-.0110	.2655	.0882	-.0944
(-10)	-.2679	-.0279	-.1460	.0309	-.0867	.6457	-.2212	.2366	.0877	-.0957
(-9)	-.2993	-.0122	-.0493	.0243	-.0632	-.0462	-.0621	.1667	.1371	-.2688*
(-8)	-.3949	.0550	-.0668	.0341	.1231	.4123	.1858	.0462	.2211*	-.0363
(-7)	-.4834	.0264	-.0060	.0324	.0758	-.1282	.3555	.2288*	.0476	-.0125
(-6)	-.4694	-.0195	-.0469	.0063	.0615	-.0584	.2835*	.0077	.0385	.0172
(-5)	-.5079	.0030	-.0557	-.0683	.1880	-.2931*	-.0547	.0588	.0240	.0603
(-4)	-.5900	.0555	.1650	.0595	.3599*	.0096	.0666	.0347	.0149	.0291
(-3)	-.6921	.0159	.1372	-.2733*	.0332	.0457	.0067	.0573	.0078	.0324
(-2)	-.6956	-.1196	-.3735*	-.0154	.0213	.0207	-.0041	.0992	-.0379	.0173
(-1)	-.7250	-.2750*	-.0982	-.0454	-.0238	-.0381	-.0102	.0718	-.0518	.0000
(0)	1.0000*	-.0955	-.0458	.0024	.0345	.0533	.0937	.0576	.1762	.0000
(1)	-.7250	.0126	-.0643	.0257	-.0634	-.5914	.1708	.0417	.0000	.0000
(2)	-.6956	.0094	.0186	.0309	-.0480	.1388	-.0276	.0304	.0000	.0000
(3)	-.6921	.0026	.0115	.0291	-.2865	.0209	.0094	.0000	.0000	.0000
(4)	-.5900	-.0174	-.0364	.0346	.0034	.0220	.0291	.0000	.0000	.0000
(5)	-.5079	.0258	-.1093	-.0347	.0239	.0425	.0000	.0000	.0000	.0000
(6)	-.4694	.0507	.0205	-.1253	-.1112	.0187	.0000	.0000	.0000	.0000
(7)	-.4834	-.0128	-.0073	-.1468	-.0267	.0000	.0000	.0000	.0000	.0000
(8)	-.3949	-.0228	.1289	.0480	-.0516	.0000	.0000	.0000	.0000	.0000
(9)	-.2993	-.0417	-.0482	-7.4612	.0000	.0000	.0000	.0000	.0000	.0000
(10)	-.2679	.0525	-.0451	-.3939	.0000	.0000	.0000	.0000	.0000	.0000
(11)	-.1536	.0384	-.27751	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(12)	-.0057	.0386	-.0654	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(13)	-.0400	-.4383	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(14)	-.0288	-.0549	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(15)	-.1022	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
(16)	-.1130	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

S-ARRAY

(-15)	1.0000	-1.2817	1.2418	3.9885	4.2015	-3.1704	2.6688	33.7036	-2.1544	-7.0302
(-14)	1.0000	-1.3858	1.1649	2.6800	4.1866	-5.3395	2.1838	6.1719	8.9756	-18.7864
(-13)	1.0000	-1.1747	1.0000	-1.1747	5.4500	-5.5170	-0.5371	-5.6737	25.2450	-80.0000
(-12)	1.0000	3.9228	3.9228	-4.1320	4.6914	-44.0283	1.1855	-3.8945	23.6637	12.6584
(-11)	1.0000	1.1365	1.9766	-37.2404	4.8235	1.1164	3.6640	68.8724	27.8499	5.5906
(-10)	1.0000	9.7923	1.3152	-6.4878	-1.5230	-3.3607	20.8501	-15.0064	19.6128	1.6110
(-9)	1.0000	-2.2152	1.0000	-3.2920	1.1373	-2.1002	17.7117	-70.7542	9.2908	-1.2865*
(-8)	1.0000	-2.2242	1.0000	-2.4751	-1.1373	-13.5174	-7.9716	-7.2812	48.9617*	5.9730*
(-7)	1.0000	-1.9713	3.683	21.9403	5.4725	-15.5174	7.9716	-8.2276*	1.6377*	-2.2581
(-6)	1.0000	-2.0819	2.4893	-6.7903	7.5822	14.6395	4.5844*	-1.5866*	1.8325	-1.5736
(-5)	1.0000	-2.1618	-3.5931	-6.6250	7.1224	10.0937*	1.3301*	-1.3642	4.0888	-2.6324
(-4)	1.0000	-2.1730	1.5210	-3.5306	26.3847*	-1.2879*	-2.2392	-2.5683	6.9139	-13.2856
(-3)	1.0000	-2.0051	20.9560	-5.3188*	1.4722*	-1.6609	2.8577	10.6513	8.7111	36.1649
(-2)	1.0000	-2.0423	-3.0000*	-1.3680*	4.6533	-5.2188	1.9232	-3.1885	9.3977	5.2532
(-1)	1.0000	-2.3792*	1.1070*	-1.1786	2.4639	-5.6776	4.1522	-34.6629	14.3581	3.9949
(0)	1.0000	-1.7250*	2.2102	-2.3472	-2.4122	-1.7313	3.3522	-7.5682	1.4537	0.0000
(1)	1.0000	-1.5594	-5.8229	-2.2611	-1.0881	-2.772	2.8233	-5.2820	-4.6877	0.0000
(2)	1.0000	-1.5949	-5.3549	-5.3549	1.142	-3.6889	6.2911	-2.7108	0.0000	0.0000
(3)	1.0000	-1.8525	-19.8684	-19.8684	1.732	-5.4754	-3.0222	-5.0857	0.0000	0.0000
(4)	1.0000	-1.8607	-3.9524	-3.9524	5.4106	-38.7852	-4.8624	0.0000	0.0000	0.0000
(5)	1.0000	-1.9243	-2.7016	-2.7016	4.8755	-3.0895	0.0000	0.0000	0.0000	0.0000
(6)	1.0000	-2.0239	1.8669	1.8669	5.8040	3.6732	0.0000	0.0000	0.0000	0.0000
(7)	1.0000	-1.8168	33.8263	33.8263	6.2533	2.6016	0.0000	0.0000	0.0000	0.0000
(8)	1.0000	-1.7580	-4.7058	-4.7058	2.772	0.0000	0.0000	0.0000	0.0000	0.0000
(9)	1.0000	-1.8919	-0.178	-0.178	2.794	0.0000	0.0000	0.0000	0.0000	0.0000
(10)	1.0000	-1.5752	-2.9564	-2.9564	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(11)	1.0000	-1.0368	-3.3814	-3.3814	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(12)	1.0000	-3.0789	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(13)	1.0000	-2.805	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(14)	1.0000	-4.5500	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(15)	1.0000	-2.1055	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(16)	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000



(F(M) - ACF(M))

R-ARRAY

1	1	2	3	4	5	6	7	8	9	10
-1.122	-0.670	-0.256	.113	-1.795	-2.058	-0.636	-0.217	-0.2771	1.2017	43.7068
-0.088	-0.256	-0.179	.038	-1.682	-3.147	.618	-9.2771	-0.73147	1.2466	-1.8199
0.407	-1.779	-1.492	.162	-2.006	-3.5912	.6795	-0.3923	-0.8380	.4756	-2.3300
0.057	-1.492	-1.232	.450	-3.776	-2.8376	.464	-0.5562	-0.5562	2.392	-8.1685
1.556	-2.232	-1.889	.016	-3.759	-1.5366	.037	-0.827	-0.827	2.2451	3.7035
2.670	-4.889	-3.601	.3601	-3.842	.139	.742	-1.0828	-1.0828	1.8929	2.6378
3.949	-1.175	-1.175	.593	-3.213	.172	.2626	-1.1813	-1.1813	3.3506	-2.1321*
3.949	-5.460	-1.034	-1.034	-8.948	-3.683	1.2887	-0.4045	-0.4045	2.7175*	.2883
4.324	-1.7647	.286	.286	-1.7194	.897	2.0727	-2.8116*	-2.8116*	-5.853	.7436
4.934	.4955	.7891	.7891	-0.875	1.0227	2.3571*	.0942	.0942	-.6545	.6759
5.079	.0407	.6020	.6020	-9.736	5.5255	.4545	.5147	.5147	-5.193	13.4545
5.900	-6.717	-5.7528	.57528	-9.664	2.7934*	.383	.2460	.2460	-4.901	1.2395
6.031	5.0756	5.0756	-94.2394	-2.9589*	-3.54	.0468	.2688	.2688	.3938	.9057
6.556	5.7740	5.7740	2.371*	.1656	-6.229	.4472	.3151	.3151	-9.156	-6.5369
7.250	-1.7250*	-1.7250*	.6359	.3244	.3922	.0503	.3001	.3001	-9.315	0.0000
1.0000*	-6.180	-6.180	-164.5956	.0336	.2866	.1532	.6275	.6275	-6.626	0.0000
7.210	-6.087	-6.087	-2.2411	-3.584	-1.898	1.4141	-6.2597	-6.2597	0.0000	0.0000
6.556	19.4240	19.4240	.204	-1.6416	-1.155	.4681	.1986	.1986	0.0000	0.0000
6.821	-0.328	-0.328	.1939	-1.7633	-4.458	-2.0937	.0000	.0000	0.0000	0.0000
5.900	-2.318	-2.318	1.2389	.4582	1.4339	-3.3161	.0000	.0000	0.0000	0.0000
5.079	-6.547	-6.547	-1.6896	.4310	2.0768	-3.409	.0000	.0000	0.0000	0.0000
4.934	-3.4475	-3.4475	.2458	.3906	-1.831	.1468	.0000	.0000	0.0000	0.0000
4.324	.1268	.1268	.0181	.4018	.861	.0000	.0000	.0000	0.0000	0.0000
3.949	-1.656	-1.656	-3.787	.2993	-1.915	.0000	.0000	.0000	0.0000	0.0000
2.993	.7821	.7821	.5174	.1113	.0000	.0000	.0000	.0000	0.0000	0.0000
2.670	.1946	.1946	-0.108	.1059	.0000	.0000	.0000	.0000	0.0000	0.0000
1.536	-0.413	-0.413	-0.022	.0000	.0000	.0000	.0000	.0000	0.0000	0.0000
0.057	-0.513	-0.513	.0551	.0000	.0000	.0000	.0000	.0000	0.0000	0.0000
0.400	.0715	.0715	.0000	.0000	.0000	.0000	.0000	.0000	0.0000	0.0000
0.088	.0980	.0980	.0000	.0000	.0000	.0000	.0000	.0000	0.0000	0.0000
-1.022	0.0000	0.0000	.0000	.0000	.0000	.0000	.0000	.0000	0.0000	0.0000
-1.130	0.0000	0.0000	.0000	.0000	.0000	.0000	.0000	.0000	0.0000	0.0000

S-ARRAY

(-15)	1.0000	1.4754	3.7243	1.1322	5.4020	5.5116	5.7291	9	-.0186
(-14)	1.0000	-5.0000	-17.3708	1.1292	-.0655	-.4119	-.4987	8	-.6718
(-13)	1.0000	-4.2164	.6699	.3326	-.0036	-.4009	1.0863	7	1.2990
(-12)	1.0000	-3.6000	.3771	.0539	.4350	-.3280	1.4698	6	0.9540
(-11)	1.0000	-3.8888	-11.9466	.0115	.3310	1.0417	-.8461	5	-.1425
(-10)	1.0000	-3.9000	.5224	-.3799	-.1524	-1.0577	-.9082	4	-.4213
(-9)	1.0000	.8155	.1824	-.4755	1.1682	4.9314	-.5470	3	-.7529*
(-8)	1.0000	-.0663	.1256	-.3888	1.5894	2.5547	3.9842*	2	-.1622*
(-7)	1.0000	-.1045	-.4133	-.4624	1.6248	1.3673	1.334*	1	-.0823
(-6)	1.0000	-.1485	.4872	4.2801	-1.0592	4.8802*	-.6960	0	-.0391
(-5)	1.0000	-3.0250	.4228	-.2423	-1.2138*	1.593*	-.1801		-.0118
(-4)	1.0000	-.0436	.4944	2.4588*	-1.1549*	1.0702	-.2100		-.3119
(-3)	1.0000	-.0958	-.4949*	-.1373*	-.1702	.4120	-.1729		1.2933
(-2)	1.0000	-.4955*	-.1301*	-.1583	-.2412	1.4551	.3890		-.0139
(-1)	1.0000	1.764*	-.1650	1.477	-.5128	-1.2318	-.7978		-.1116
()	1.0000*	.0066	-.1647	1.8937	-.6018	-.9540	-.3865		0.0000
(1)	1.0000	1.670	-.1622	.3636	-.1159	-.7316	.4275		0.0000
(2)	1.0000	1.477	.1016	.4066	1.0936	.2908	0.0000		0.0000
(3)	1.0000	-.8451	-.7582	.4777	-.0546	.3818	0.0000		0.0000
(4)	1.0000	1.381	-.2085	.0139	.0251	.3812	0.0000		0.0000
(5)	1.0000	1.274	-.2175	.0580	-.3851	.6275	0.0000		0.0000
(6)	1.0000	.1851	-.5989	.3539	-1.1021	0.0000	0.0000		0.0000
(7)	1.0000	.5579	12.3594	.1927	-.3149	0.0000	0.0000		0.0000
(8)	1.0000	.6188	-.7552	.7489	0.0000	0.0000	0.0000		0.0000
(9)	1.0000	.3131	-1.1920	-.5422	0.0000	0.0000	0.0000		0.0000
(10)	1.0000	1.1678	11.1381	0.0000	0.0000	0.0000	0.0000		0.0000
(11)	1.0000	1.4717	-1.6561	0.0000	0.0000	0.0000	0.0000		0.0000
(12)	1.0000	4.1142	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000
(13)	1.0000	.9493	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000
(14)	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000
(15)	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000
(16)	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000

DO YOU WANT THE D STATISTIC?
 ENTER THE MAX AR ORDER
 ENTER THE MAX MA ORDER
 DO YOU WANT TO SEE THE D STAT?
 0=YES, 1=NO-->0

D STATISTIC						
ORDER OF AR	0	ORDER OF MA		3	4	5
		1	2			6
0	.4135E+00	.1689E+00	.1068E+00	.3004E+00	.4801E-01	.1261E+01
1	.1317E-02	.1154E-01	.2655E+00	.5206E-01	.4313E+00	.2420E+00
2	.1035E-04	.2456E-02	.8221E-02	.2934E-06	.1390E+01	.1229E+01
3	.5833E-01	.3066E-01	.3044E-04	.4677E-03	.6740E-01	.7286E+01
4	.2335E-05	.8019E-01	.2137E-03	.4996E+01	.1433E-01	.2456E-02
5	.3992E+00	.5946E-01	.5055E-01	.1660E-01	.3698E-02	.4419E-03
6	.2842E-06	.3907E-01	.1597E-01	.7809E-03	.1219E+00	.2459E-01

ORDER OF AUTOREGRESSION SELECTED
 ORDER OF MOVING AVERAGE SELECTED
 DO YOU WANT ANOTHER D STATISTIC?
 ENTER THE MAX AR ORDER
 ENTER THE MAX MA ORDER
 DO YOU WANT TO SEE THE D STAT?
 0=YES, 1=NO-->0

D STATISTIC						
ORDER OF AR	0	ORDER OF MA		3	4	
		1	2			
0	.4491E-01	.3913E-01	.1463E+00	.2889E+00	.2207E+00	
1	.3781E-03	.1388E-01	.1227E+00	.1378E+00	.4245E-01	
2	.1243E-04	.1149E-02	.2295E-01	.4205E-04	.4042E+00	
3	.1612E-01	.8023E-01	.5427E-04	.1404E-02	.3340E-02	

ORDER OF AUTOREGRESSION SELECTED
 ORDER OF MOVING AVERAGE SELECTED
 DO YOU WANT ANOTHER D STATISTIC?
 ENTER THE MAX AR ORDER
 ENTER THE MAX MA ORDER
 DO YOU WANT TO SEE THE D STAT?
 0=YES, 1=NO-->0

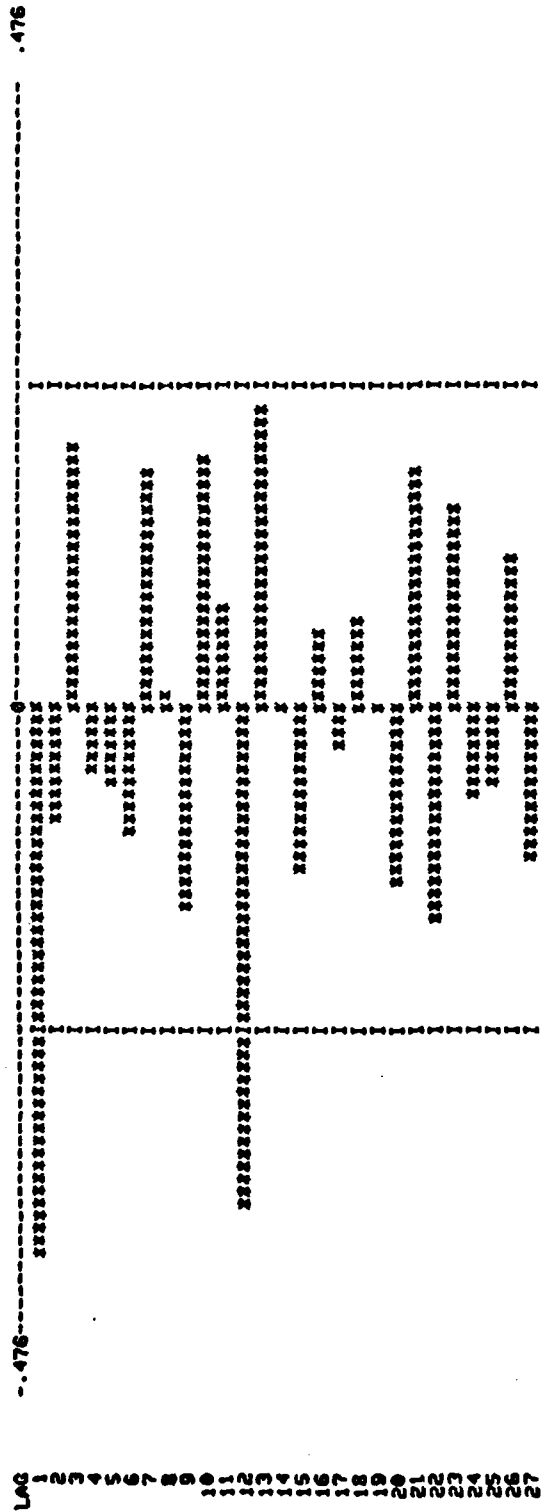
ENTER TITLE SEP ANAL DIFF12.1
DO YOU WANT TO DIFFERENCE OR TRANSFORM (Y/N)?Y
WHAT IS THE ORDER OF THE NON-SEASONAL DIFFERENCING(I)?01
WHAT IS THE ORDER OF THE SEASONAL DIFFERENCING(I)?00
TRANSFORMATION COEFF: IP=0 (LN), PD=0(Z(1)-Z(1)XIP)1
LENGTH OF SEASON: IS=00
SEP ANAL DIFF12.1
MEAN = -.003185185185185 VARIANCE = .007107743484224

DO YOU WANT TO SEE THE FTAUTO OUTPUT (Y/N)?Y
LAG AUTOCORRELATION PARTIAL AUTOCORRELATION
1 -.003079 -.433164
2 -.000649 -.34113
3 .001439 .001097
4 -.002386 .045547
5 -.000451 -.002338
6 -.000751 -.231472
7 .001320 .000940
8 .000038 .129782
9 .001131 -.008703
10 .001362 .092520
11 .000511 .196185
12 .002770 .299120
13 .001618 .111639
14 .000028 .059009
15 -.000521 .062125
16 .000387 .022214
17 .000275 .145805
18 .000441 .188593
19 .000007 .166470
20 .001048 .104933
21 .001261 .016452
22 .001193 .077112
23 .001096 .154235
24 .000574 .132410
25 .000482 .080792
26 .000808 .067783
27 .000862 .113641
THE APPROXIMATED 2 S.E. BAND IS +/- .2443
1-DEMOTES AUTOCORRELATION OUTSIDE 2 S.E. BAND

LU= S4
HOW MANY INTENSITY VALUES DO YOU WANT TO SEE?
0 - DEFAULT OF 45; N.L.T. LU=2 -->27
1
FO INTENSITY
1 .019 54.000 .003
2 .037 27.000 .004
3 .056 18.000 .003
4 .074 13.500 .001
5 .093 10.800 .002
6 .111 9.000 .003
7 .130 7.714 .009
8 .148 6.750 .002
9 .167 6.000 .000
10 .185 5.400 .002
11 .204 4.900 .004
12 .222 4.500 .020
13 .241 4.154 .001
14 .259 3.857 .005
15 .278 3.600 .033
16 .296 3.375 .055
17 .315 3.176 .032
18 .333 3.000 .001
19 .352 2.842 .008
20 .370 2.700 .027
21 .389 2.571 .073
22 .407 2.455 .002
23 .426 2.348 .032
24 .444 2.250 .013
25 .463 2.160 .036
26 .481 2.077 .004
27 .500 2.000 .002

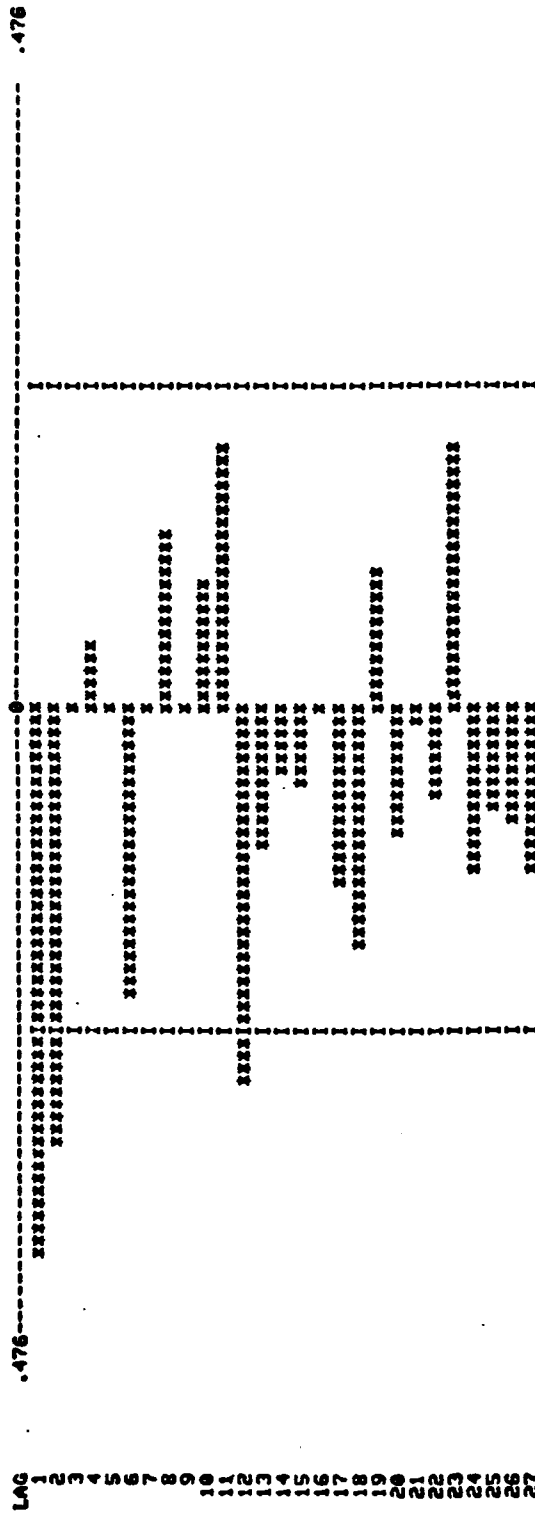
SEP ANA1 DIFF12.1

AUTOCORRELATION PLOT



SEP ANNA DIFF12.1

PARTIAL AUTOCORRELATION PLOT



FIRST LINE VAR(R(K)), SECOND LINE STD(R(K))

1	.017012	.028584	.023949	.034008	.038559	.020954	.030520	.034409	.030707	.025756
2	.130429	.169069	.154755	.186033	.196365	.144756	.174701	.185486	.175234	.160486

1-888-AY

237

S-ARRAY

(-15)	1.0000	-3.692	1.1269	-6.2243	1.1938	-1.5278	-135.7599	-3549	2.1028	-25.4550
(-14)	1.0000	-58.0261	1.8734	-1.1039	5.0737	-1.0882	-3.7577	-1.8759	-0.0774	-26.2082
(-13)	1.0000	-7.128	1.0608	-1.6830	7.0767	-1.0816	-7.7680	-1.0925	24.6823	-12.7345
(-12)	1.0000	-8.557	1.926	-5.2545	2.446	4.2119	4.8083	-1.603	15.4041	-1.5005
(-11)	1.0000	-3.5673	1.8631	-3.109	22.605	4.364	4.2042	-16.1908	-5.0355	5.8777
(-10)	1.0000	-1.695	1.715	-2.511	.4555	-1.0695	4.4959	-15.532	-5.4982	5.4261
(-9)	1.0000	-35.4109	1.6537	-1.5037	-1.2033	-3.1965	6.4930	55.3053	-5.4982	87.9037x
(-8)	1.0000	-1.313	1.1046	1.0658	2.8434	-2.3465	6.2365	-3.3094	-5.4982	-7.7501x
(-7)	1.0000	-1.6007	1.6573	2.725	2.6703	363.3553	3.8458	1044.179x	-5.4982	7.4386
(-6)	1.0000	-1.3563	-2.717	-5.6817	2.5238	16.702	3.834x	134.810	.7133	-1.7012
(-5)	1.0000	2.7265	2.2190	5.7271	-15.5238	78.192x	.8870x	1.2974	.0989	-1.3215
(-4)	1.0000	-5.498	2.4990	-2.2720	-15.7215x	-7.207x	.8901	-1.2974	1.6022	-3.9264
(-3)	1.0000	-5.7530	2.2062	-694.7568x	.5732	-18.9468	1.2914	15.9948	5.4790	1.9569
(-2)	1.0000	1.3086x	2.217x	-32.3713	4.5338	-4.7019	1.3436	-3.4327	-8.232	3.673
(-1)	1.0000	-1.2104	1.6137	-5.772	4.7365	-76.118	2.0569	.8829	-1.163	3.5894
(0)	1.0000x	1.2214	.5380	-14.2766	.0833	-1.546	2.4808	1.078	-3.6584	0.0000
(1)	1.0000	1.2214	.9727	-2.694	1.0331	-1.5306	2.7473	1.3948	-1.7151	0.0000
(2)	1.0000	-2.7317	2.454	-664	707	-2.5575	-0.0359	1.653	0.0000	0.0000
(3)	1.0000	-2.1678	-2.1949	-8031	2.8302	-1.3365	-1.5747	0.0000	0.0000	0.0000
(4)	1.0000	-2.6647	1.6882	-3.0185	16.0800	4.2113	-113.8048	0.0000	0.0000	0.0000
(5)	1.0000	.7583	1.3930	-2.5734	2.8410	4.6252	0.0000	0.0000	0.0000	0.0000
(6)	1.0000	-1.0291	.5832	-1.9815	15.7982	2.1641	0.0000	0.0000	0.0000	0.0000
(7)	1.0000	28.4887	1.7109	-1.7316	12.0059	0.0000	0.0000	0.0000	0.0000	0.0000
(8)	1.0000	.2041	1.6560	-18.3868	.6750	0.0000	0.0000	0.0000	0.0000	0.0000
(9)	1.0000	-1.3749	1.8011	-1.8856	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(10)	1.0000	4.4256	.7371	-1.8818	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(11)	1.0000	-4.152	.6233	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(12)	1.0000	-1.0175	1.1248	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(13)	1.0000	31.4710	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(14)	1.0000	-5803	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(15)	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(16)	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

(a,p)

R-ARRAY

239

S-ARRAY

(-15)	1.0000	-1.0308	4.4891	2	12.5895	2.1714	146.5069	7	6.9910	9	61.3726
(-14)	1.0000	-56.0261	5.2098	2	-1.9973	-5.6125	7.0428	7	-23.6474	9	-16.5559
(-13)	1.0000	-2.7128	2.1171	2	-5.5377	7.2821	-2.7435	7	-309.6095	9	12.5681
(-12)	1.0000	-1.8473	2.2074	2	7.5213	1.6120	12.9185	7	-20.9912	9	2.6644
(-11)	1.0000	-1.8473	2.2074	2	-1.1933	-1.0763	6.3483	7	11.7074	9	14.6255
(-10)	1.0000	-1.6673	2.7180	2	-6.5008	5.8845	21.8889	7	-1.8473	9	16.8662
(-9)	1.0000	-1.0339	2.7193	2	-3.6215	2.6691	14.9106	7	-16.4741	9	-20.2575
(-8)	1.0000	33.1109	2.2040	2	-3.6215	-47.6274	15.4581	7	-15.3073	9	-2.0032
(-7)	1.0000	-1.5587	1.9332	2	-3.5557	6.6414	9.8278	7	1.9865	9	-23.1219
(-6)	1.0000	-3.9993	6.2742	2	-4.7715	6.9300	38.3666	7	2.1371	9	4.2634
(-5)	1.0000	-1.1437	4.3437	2	-20.9319	-48.6023	-80.5866	7	.5376	9	2.1598
(-4)	1.0000	-4.7265	4.8291	2	-5.4742	-40.2943	-1.9522	7	-3.7250	9	-3.8566
(-3)	1.0000	-1.4502	5.6015	2	5.7461	1.8353	2.2745	7	7.4663	9	-1.9384
(-2)	1.0000	3.7530	5.6061	2	-1.3228	2.2245	3.0854	7	10.2289	9	8.7000
(-1)	1.0000	-3.5086	1.9250	2	77.5564	1.7810	4.7188	7	35.5257	9	-8.9151
(0)	1.0000	-1.4332	1.9250	2	-2.7750	11.0630	3.7448	7	-12.1630	9	0.0000
(1)	1.0000	-7836	1.8127	2	23.8047	3.3043	6.1821	7	2.6837	9	0.0000
(2)	1.0000	-3.2214	1.9040	2	-3.6146	-9.5062	1.3230	7	0.0000	9	0.0000
(3)	1.0000	-1.2683	1.6803	2	-3.5580	9.0669	16.9356	7	0.0000	9	0.0000
(4)	1.0000	.1678	2.5891	2	-3.4718	-1.348	-4.9369	7	0.0000	9	0.0000
(5)	1.0000	.6647	3.3686	2	.9488	4.0329	-110.4677	7	0.0000	9	0.0000
(6)	1.0000	-2.7583	2.2947	2	2155	2.9234	0.0000	7	0.0000	9	0.0000
(7)	1.0000	-9709	3.0531	2	-3.8514	-17.1515	0.0000	7	0.0000	9	0.0000
(8)	1.0000	-30.8887	4.2535	2	-5.5589	2.8744	0.0000	7	0.0000	9	0.0000
(9)	1.0000	-2.2041	3.6607	2	34.1737	1.3722	0.0000	7	0.0000	9	0.0000
(10)	1.0000	-6251	3.5947	2	-1.7533	0.0000	0.0000	7	0.0000	9	0.0000
(11)	1.0000	-6.4256	2.0498	2	1.0170	0.0000	0.0000	7	0.0000	9	0.0000
(12)	1.0000	-1.5828	2.4829	2	0.0000	0.0000	0.0000	7	0.0000	9	0.0000
(13)	1.0000	-5825	1.9987	2	0.0000	0.0000	0.0000	7	0.0000	9	0.0000
(14)	1.0000	-33.7710	0.0000	2	0.0000	0.0000	0.0000	7	0.0000	9	0.0000
(15)	1.0000	-1.4197	0.0000	2	0.0000	0.0000	0.0000	7	0.0000	9	0.0000
(16)	1.0000	0.0000	0.0000	2	0.0000	0.0000	0.0000	7	0.0000	9	0.0000

(2,0)

DO YOU WANT THE D STATISTIC?
 ENTER THE MAX AR ORDER3
 ENTER THE MAX MA ORDER0
 DO YOU WANT TO SEE THE D STAT?
 0-YES, 1-NO-->0

D STATISTIC

ORDER OF AR	ORDER OF MA
0	.2544E+02
1	.1859E-04
2	.7058E+04
3	.4544E-14

ORDER OF AUTOREGRESSION SELECTED 2
 ORDER OF MOVING AVERAGE SELECTED 0
 DO YOU WANT ANOTHER D STATISTIC?
 ENTER THE MAX AR ORDER3
 ENTER THE MAX MA ORDER1
 DO YOU WANT TO SEE THE D STAT?
 0-YES, 1-NO-->0

D STATISTIC

ORDER OF AR	ORDER OF MA
0	.2944E+02
1	.1859E-04
2	.7058E+04
3	.4544E-14

ORDER OF AUTOREGRESSION SELECTED 2
 ORDER OF MOVING AVERAGE SELECTED 0
 DO YOU WANT ANOTHER D STATISTIC?

THIS PROGRAM GENERATES THE RESIDUALS FOR THE SEP ANAL.
 MODEL CHOSEN IS ARMA(1,0)
 EQUATION MODELED IS:
 Z(T) = .82303Z(T-1) + .3229A(T)

MEAN = .118976575043 VARIANCE = .005251422365458

LAG	AUTOCORR.	PART. AUTOCORR.
1	-.009086	-.009086
2	.11483	.11410
3	.000601	.083128
4	.000437	.086225
5	-.00946	-.180146
6	-.00041	-.195051
7	-.000715	-.113474
8	.000231	-.084043
9	-.001147	-.136148
10	.000344	.044057
11	.000466	.105151
12	.000856	-.218604
13	.001851	.032817
14	.000642	.084562
15	.000532	.232580
16	-.000351	.293898
17	-.000439	.109633
18	-.000787	.025536
19	-.000255	-.034542
20	-.00108	-.029697
21	-.001265	-.065788
22	.000526	.048687
23	-.000392	.040540
24	.000934	-.198628
25	.001170	-.004117
26	-.000825	-.138807
27	.000733	.074601
28	-.000724	.156602
29	.00042	.015470
30	-.001095	-.035998
31	.000125	.074403
32	-.000446	-.112358
33	-.000973	.054701
34	-.000284	-.013233
35	-1	-.025270
36	-1	-.205362
37	-1	0.000000
38	-1	0.000000
39	-1	0.000000
40	-1	0.000000
41	-1	0.000000
42	-1	0.000000
43	-1	0.000000
44	-1	0.000000
45	-1	0.000000

UNCONDITIONAL SUM OF SQUARES FOR A = 1.306513716311
 UNCONDITIONAL SUM OF SQUARES FOR E = 1.38517824319

PORTMANTEAU LACK OF FIT TEST = 42.76372598953

THE ASSOCIATED CUMULATIVE PERIODIC VALUES ARE
 INPUT ANY NUMBER AFTER CLEARING SCREEN1

1 .015
 2 .030

3 .045
 4 .050
 5 .075
 6 .090
 7 .104
 8 .119
 9 .134
 10 .149
 11 .164
 12 .179
 13 .194
 14 .209
 15 .224
 16 .239
 17 .254
 18 .269
 19 .284
 20 .299
 21 .313
 22 .328
 23 .343
 24 .358
 25 .373
 26 .388
 27 .403
 28 .418
 29 .433
 30 .448
 31 .463
 32 .478
 33 .493

.073
 .085
 .169
 .279
 .313
 .313
 .329
 .335
 .332
 .332
 .333
 .435
 .453
 .459
 .465
 .496
 .513
 .550
 .574
 .644
 .662
 .688
 .704
 .750
 .757
 .822
 .928
 .940
 .989
 .992
 1.000

APPENDIX J

Residual Analysis of Separation Data
using an ARIMA(2,1,0)*(1,1,0)₁₂ Model

THIS PROGRAM GENERATES THE RESIDUALS FOR THE SEP ANAL.
MODEL CHOSEN IS ARIMA(2,1,0)(1,1,0)SUB12

MEAN--.0001421538346571 VARIANCE-.004060342419214

LAG	AUTOCOV.	AUTOCORR.	PART. AUTOCORR.
1	-.000134	-.033006	-.033006
2	-.000053	-.012951	-.014056
3	-.000100	-.024661	-.023794
4	-.000023	-.005679	-.007123
5	-.000617	-.151839	-.151066
6	-.000823	-.202579	-.218399
7	-.000988	-.243253	-.236057
8	-.000092	-.022647	-.051098
9	-.000247	-.060872	-.078751
10	-.000271	-.066848	-.036807
11	-.000338	-.082238	-.020170
12	-.000761	-.187421	-.184427
13	-.000653	-.160773	-.083303
14	-.000037	-.009069	-.020732
15	-.000540	-.132990	-.104447
16	-.000032	-.007955	-.000574
17	-.000389	-.095802	-.170085
18	-.000387	-.095315	-.052597
19	-.000193	-.047564	-.086579
20	-.000556	-.164067	-.157406
21	-.000134	-.022924	-.065526
22	-.000086	-.021217	-.040503
23	-.000432	-.106386	-.138413
24	-.000991	-.244110	-.211213
25	-.000056	-.013878	-.056179
26	-.000368	-.090510	-.031670
27	-.000444	-.109425	-.089720

UNCONDITIONAL SUM OF SQUARES FOR A: .224546407715
UNCONDITIONAL SUM OF SQUARES FOR E: .224799784947

PORTMANTEAU LACK OF FIT TEST = 19.43075010048

THE ASSOCIATED CUMULATIVE PERIODOGRAM VALUES ARE

1	.019
2	.037
3	.056
4	.074
5	.093
6	.111
7	.130
8	.148
9	.167
10	.185
11	.204
12	.222
13	.241
14	.259
15	.278
16	.296
17	.315
18	.333
19	.352
20	.370
21	.389
22	.407
23	.426
24	.444
25	.463
26	.481
27	.500

APPENDIX K

Retirement's SPSS Regression Output Listings

VOGELBACK COMPUTING CENTER
NORTHWESTERN UNIVERSITY
S P S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES
VERSION 8.0 -- JUNE 18, 1979

RUN NAME
VARIABLE LIST
INPUT MEDIUM
N OF CASES
INPUT FORMAT
VAR LABELS
LIST CASES
REGRESSION
STATISTICS
RETIREMENT PROJECTIONS, 1ST MONTH
ACCOMP.VOL.MAND.TIME
DISK
44
FREEFIELD
ACCOMP.VOL.MAND.TIME
CASES=44/VARIABLES=ACCOMP.VOL.MAND.TIME
METHOD=STEPWISE/VARIABLES=ACCOMP.VOL.MAND.TIME/
REGRESSION=ACCOMP WITH VOL.MAND.TIME/RESIDUALS/
REGRESSION=ACCOMP WITH VOL.MAND/RESIDUALS/
ALL

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

RETIREMENT PROJECTIONS, 1ST MONTH

FILE MONAME (CREATION DATE = 18/14/82)

CASE-NO	ACCOMP	VOL	MAND	TIME
1	221.	193.	24.	1.
2	282.	252.	18.	2.
3	171.	143.	19.	3.
4	268.	210.	16.	4.
5	184.	171.	9.	5.
6	210.	182.	23.	6.
7	204.	174.	23.	7.
8	228.	198.	32.	8.
9	360.	314.	43.	9.
10	697.	484.	208.	10.
11	458.	484.	44.	11.
12	488.	383.	21.	12.
13	282.	251.	23.	13.
14	222.	196.	24.	14.
15	162.	168.	9.	15.
16	219.	203.	11.	16.
17	228.	205.	11.	17.
18	288.	179.	17.	18.
19	187.	175.	18.	19.
20	281.	186.	18.	20.

```

21 299. 283. 14. 21.
22 469. 434. 36. 22.
23 577. 479. 144. 23.
24 426. 412. 12. 24.
25 245. 218. 31. 25.
26 191. 171. 28. 26.
27 147. 123. 21. 27.
28 100. 161. 14. 28.
29 165. 145. 17. 29.
30 111. 116. 6. 30.
31 171. 153. 13. 31.
32 152. 124. 26. 32.
33 184. 168. 15. 33.
34 283. 257. 21. 34.
35 312. 272. 48. 35.
36 193. 164. 28. 36.
37 361. 333. 21. 37.
38 345. 328. 15. 38.
39 207. 187. 22. 39.
40 236. 183. 48. 40.
41 258. 159. 88. 41.
42 185. 166. 16. 42.
43 134. 123. 14. 43.
44 148. 128. 14. 44.

```

IRETIREMENT PROJECTIONS, 1ST MONTH

IRETIREMENT PROJECTIONS, 1ST MONTH

FILE MONAME (CREATION DATE = 18/14/82.)

***** MULTIPLE REGRESSION *****

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	257.5682	128.6955	44
VOL	225.0455	96.6506	44
MAND	28.6321	35.8988	44
TIME	22.5028	12.8452	44

CORRELATION COEFFICIENTS.

A VALUE OF 99.99999 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

	ACCOMP	VOL	MAND	TIME
VOL	.96872			
MAND	.74481	.55689		
TIME	-.28708	-.21378	-.87987	

IRETIREMENT PROJECTIONS, 1ST MONTH

FILE MONAME (CREATION DATE = 18/14/82.)

***** MULTIPLE REGRESSION *****

MEAN RESPONSE 257.56818 STD. DEV. 128.69554

VARIABLE(S) ENTERED ON STEP NUMBER 1.. VOL

18/14/82 21.88.26. PAGE 3

18/14/82 21.88.26. PAGE 4

18/14/82 21.88.26. PAGE 5

MULTIPLE R .96872 ANALYSIS OF VARIANCE DF SUM OF SQUARES MEAN SQUARE F SIGNIFICANC
 R SQUARE .93843 REGRESSION 1. 587829.47365 587829.47365 648.11595 .00
 ADJUSTED R SQUARE .93696 RESIDUAL 42. 38569.32181 918.31719
 STD DEVIATION 38.38375 COEFF OF VARIABILITY 11.0 PCT

----- VARIABLES IN THE EQUATION -----
 VARIABLE B STD ERROR B F SIGNIFICANCE BETA ELASTICITY
 VOL 1.2897251 .47814254E-01 648.11595 .9687244
 (CONSTANT) -14.674962 11.698823 1.5758853 1.85698
 3 .216
 ----- VARIABLES NOT IN THE EQUATION -----
 VARIABLE PARTIAL TOLERANCE F SIGNIFICANCE
 MAND .99552 .69876 4542.7288
 TIME -.88158 .95451 .18262595E-0
 .992

 VARIABLE(S) ENTERED ON STEP NUMBER 2... MAND

MULTIPLE R .99972 ANALYSIS OF VARIANCE DF SUM OF SQUARES MEAN SQUARE F SIGNIFICANC
 R SQUARE .99945 REGRESSION 2. 626553.80511 313826.90255 37281.33927 .00
 ADJUSTED R SQUARE .99942 RESIDUAL 41. 344.99835 8.41448
 STD DEVIATION 2.98876 COEFF OF VARIABILITY 1.1 PCT

----- VARIABLES IN THE EQUATION -----
 VARIABLE B STD ERROR B F SIGNIFICANCE BETA ELASTICITY
 VOL 1.8833228 .55869283E-02 33194.328 .8834414
 MAND .99953677 .14829973E-01 4542.7288 .87663
 (CONSTANT) 3.1291389 1.1497575 7.4868735 .2972218
 .11122
 RETIREMENT PROJECTIONS, 1ST MONTH
 FILE NONAME (CREATION DATE = 18/14/82)
 DEPENDENT VARIABLE... ACCOMP VOL,MAND,TIME
 ----- VARIABLES NOT IN THE EQUATION -----
 VARIABLE PARTIAL TOLERANCE F SIGNIFICANCE
 TIME -.62983 .95225 15.611122
 .888

18/14/82 21.08.25. PAGE 6

***** MULTIPLE REGRESSION *****
 VARIABLE(S) ENTERED ON STEP NUMBER 3... TIME

MULTIPLE R .99988 ANALYSIS OF VARIANCE DF SUM OF SQUARES MEAN SQUARE F SIGNIFICANC
 R SQUARE .99968 REGRESSION 3. 626158.65868 208715.88353 33644.36177 .00

ADJUSTED R SQUARE .9957 RESIDUAL 249.14486 48. 6.28362
STD DEVIATION 2.49871 COEFF OF VARIABILITY 1.8 PCT

----- VARIABLES IN THE EQUATION -----

----- VARIABLES NOT IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F	BETA	VARIABLE	PARTIAL	TOLERANCE	F
			SIGNIFICANCE	ELASTICITY				SIGNIFICANCE
VOL	.99942262	.48383981E-02	42888.747	.8883182				
MAND	1.8819892	.12748726E-01	6177.2113	.87323				
TIME	-.11972608	.38382818E-01	.000	.11149				
(CONSTANT)	6.6384888	1.3266865	24.988168	-.81846				

ALL VARIABLES ARE IN THE EQUATION.

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.8 PCT CONFIDENCE INTERVAL
VOL	.99942262	.48383981E-02	286.98275	.90960883 ; 1.8891852
MAND	1.8819892	.12748726E-01	78.595237	.97222381 ; 1.88277553
TIME	-.11972608	.38382818E-01	-3.9518913	-.18896865 ; -.58483359E-01
CONSTANT	6.6384888	1.3266865	4.9988156	3.942282 ; 9.3115717

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

VOL	.88882		
MAND	-.88883	.88816	
TIME	.88883	-.88812	.88892
	VOL	MAND	TIME

RETIREMENT PROJECTIONS, 1ST MONTH

18/14/82 21.88.26. PAGE 7

FILE MONAME (CREATION DATE = 18/14/82.)

***** MULTIPLE REGRESSION *****

SUMMARY TABLE

STEP	VARIABLE ENTERED	REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	VOL		648.11595	.888	.96872	.93843	.93843	.96872	648.11595	.888
2	MAND		4542.72079	.888	.99972	.99945	.86182	.74481	37281.33927	.888
3	TIME		15.61112	.888	.99968	.99968	.00815	-.28788	33644.36177	.888
	RETIREMENT PROJECTIONS, 1ST MONTH					18/14/82	21.88.26.		PAGE 8	

FILE MONAME (CREATION DATE - 18/14/82) MULTIPLE REGRESSION -2SD +2S
 OBSERVATION Y VALUE Y ESTIMATE RESIDUAL

1.	221.0000	223.4478	-2.4468
2.	282.0338	276.2813	5.74746
3.	171.8058	168.2765	2.773549
4.	268.8700	268.8459	-0.4598698E-01
5.	184.8708	185.9009	-1.958941
6.	218.8338	218.8677	-0.0327121
7.	284.0000	285.7376	-1.732395
8.	228.8508	227.6765	1.173566
9.	367.8000	362.4771	5.322893
10.	697.0000	697.5874	-0.587435
11.	458.3000	453.1677	5.132323
12.	408.0000	409.8143	-1.814325
13.	282.0000	278.9748	3.025289
14.	222.0000	228.8899	-6.889917
15.	162.0000	161.7608	0.239192
16.	219.0000	218.6115	0.388485
17.	220.0000	220.4006	-0.400676
18.	280.8000	280.4058	0.394142
19.	187.0000	189.2745	-2.274457
20.	281.0000	278.1484	2.8516205
21.	299.8000	300.9006	-1.098605
22.	469.8000	473.8175	-4.017456
23.	577.0000	576.9154	0.08450E-01
24.	476.0000	472.5438	3.456162
25.	245.0000	244.5777	0.4223234
26.	191.0000	194.4566	-3.456676
27.	147.0000	147.3086	-0.308578
28.	188.0000	178.2138	9.786162
29.	165.0000	165.1884	-0.1884419
30.	121.0000	124.9836	-3.983579
31.	171.0000	168.8564	2.143586
32.	152.0000	152.7793	-0.7792912
33.	184.0000	185.6173	-1.617288
34.	283.8000	288.4831	-4.683531
35.	313.0000	314.3675	-1.367510
36.	193.0000	194.2813	-1.281278
37.	361.0000	356.8588	4.141414E-01
38.	345.0000	344.9213	0.078687
39.	287.0000	288.8969	-1.896978
40.	286.0000	286.7495	-0.749514
41.	258.0000	248.8849	9.115124
42.	135.0000	183.5379	-49.53791
43.	139.0000	138.4398	0.560602
44.	148.0000	142.3164	5.683688

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
 R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED 44. OR 2.27 PERCENT OF THE TOTAL
 NUMBER OF 2 S.D. OUTLIERS 1. OR 2.27 PERCENT OF THE TOTAL
 IRLTIRCHWY PROJECTIONS, 1ST MONTH

FILE MONAME (CREATION DATE - 18/14/82) MULTIPLE REGRESSION
 VON NEUMANN RATIO 2.85758 DUBIN-WATSON TEST 2.81874

NUMBER OF POSITIVE RESIDUALS 23.
 NUMBER OF NEGATIVE RESIDUALS 24.
 NUMBER OF RUNS OF SIGNS 26.

EXPECTED NUMBER OF RUNS OF SIGNS
 EXPECTED S.D. OF RUN DISTRIBUTION
 UNIT NORMAL DEViate

23.
 3.25817

Z = (EXPECTED-OBSERVED)/S.D.
 PROBABILITY OF OBTAINING .GE. ABS(Z)

1.19283
 .12864

18/14/82 28.27.27. PAGE 1

VOELBACK COMPUTING CENTER
NORTHWESTERN UNIVERSITY

S P S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES
VERSION 8.8 -- JUNE 18, 1979

RUN NAME RETIREMENT PROJECTIONS, 2ND MONTH
VARIABLE LIST ACCOMP.VOL,MAND,TIME
INPUT MEDIUM DISK
N OF CASES 43
INPUT FORMAT INFTTFLD
VAR LABELS ACOMP.VOL,MAND,TIME
LIST CASES CASES-43/VARIABLES-ACOMP.VOL,MAND,TIME/
REGRESSION METHOD-STEPWISE/VARIABLES-ACOMP.VOL,MAND,TIME/
REGRESSION-ACOMP WITH VOL,MAND,TIME/RESIDUALS/
STATISTICS ALL

88854488 CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

18/14/82 28.27.27. PAGE 2

RETIREMENT PROJECTIONS, 2ND MONTH

FILE MONAME (CREATION DATE = 18/14/82)

CASE-NO	ACOMP	VOL	MAND	TIME
1	282.	251.	11.	1.
2	171.	148.	14.	2.
3	268.	237.	8.	3.
4	184.	177.	7.	4.
5	218.	182.	22.	5.
6	284.	169.	18.	6.
7	228.	198.	27.	7.
8	368.	319.	39.	8.
9	697.	483.	282.	9.
10	458.	488.	44.	10.
11	488.	383.	19.	11.
12	282.	254.	16.	12.
13	222.	207.	15.	13.
14	162.	155.	11.	14.
15	219.	289.	4.	15.
16	228.	218.	6.	16.
17	288.	176.	11.	17.
18	187.	171.	8.	18.
19	281.	185.	11.	19.
20	299.	285.	17.	20.

21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	32.	33.	34.	35.	36.	37.	38.	39.	40.	41.	42.	43.
469.	577.	426.	245.	191.	147.	180.	165.	121.	171.	152.	184.	293.	313.	193.	261.	345.	287.	206.	258.	185.	139.	148.
435.	438.	419.	221.	177.	128.	165.	147.	117.	158.	126.	174.	263.	274.	162.	336.	191.	191.	166.	171.	129.	135.	148.
36.	142.	18.	26.	16.	12.	16.	16.	7.	17.	25.	14.	24.	37.	27.	18.	15.	17.	92.	12.	16.	12.	12.

1 RETIREMENT PROJECTIONS, 2ND MONTH

1 RETIREMENT PROJECTIONS, 2ND MONTH

FILE MONAME (CREATION DATE = 18/14/82)

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	258.4186	121.9985	43
VOL	228.0837	98.8188	43
MAND	26.1628	36.2819	43
TIME	22.8888	12.5565	43

CORRELATION COEFFICIENTS.

A VALUE OF 99.99999 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

VOL	ACCOMP	VOL	MAND
.96766	.55787	-.55686	
.74347	-.21787		
-.22788			

1 RETIREMENT PROJECTIONS, 2ND MONTH

FILE MONAME (CREATION DATE = 18/14/82)

DEPENDENT VARIABLE.. ACCOMP VOL,MAND,TIME

MEAN RESPONSE 258.41868 STD. DEV. 121.99848

VARIABLE(S) ENTERED ON STEP NUMBER 1.. VOL

18/14/82 28.27.27. PAGE 3

18/14/82 28.27.27. PAGE 4

MULTIPLE REGRESSION

18/14/82 28.27.27. PAGE 5

MULTIPLE REGRESSION

MULTIPLE R .96766 ANALYSIS OF VARIANCE DF SUM OF SQUARES MEAN SQUARE F SIGNIFICANCE
 R SQUARE .93637 REGRESSION 1. 585257.72142 585257.72142 603.31685
 ADJUSTED R SQUARE .93481 RESIDUAL 41. 39772.74378 970.86692
 STD DEVIATION 31.14538 COEFF OF VARIABILITY 12.1 PCT

----- VARIABLES IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY	VARIABLE	PARTIAL TOLERANCE	F SIGNIFICANCE
VOL	1.2843238	.49820943E-01	603.31685	.9676684	MAND	.97579	796.36262
(CONSTANT)	-17.231319	12.186124	1.9994284	1.86668	TIME	-.86572	.1735667
			.165				.679

----- VARIABLES NOT IN THE EQUATION -----

VARIABLE(S) ENTERED ON STEP NUMBER 2.. MAND

MULTIPLE R .99848 ANALYSIS OF VARIANCE DF SUM OF SQUARES MEAN SQUARE F SIGNIFICANCE
 R SQUARE .99696 REGRESSION 2. 623128.2811 311564.1405 6651.73821
 ADJUSTED R SQUARE .99688 RESIDUAL 40. 1982.17781 47.56443
 STD DEVIATION 6.89597 COEFF OF VARIABILITY 2.7 PCT

----- VARIABLES IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY	VARIABLE	PARTIAL TOLERANCE	F SIGNIFICANCE
VOL	.99802566	.13872015E-01	5838.4865	.8825456	TIME	-.65778	29.738388
MAND	.99658346	.35314921E-01	796.36262	.88467			.888
(CONSTANT)	3.7382655	2.7984924	1.7767788	.2963998			
			.198	.18898			

----- VARIABLES NOT IN THE EQUATION -----

VARIABLE(S) ENTERED ON STEP NUMBER 3.. TIME

FILE MONAME (CREATION DATE = 18/14/82)
 INDEPENDENT VARIABLE... ACCOMP VOL,MAND,TIME
 RETIREMENT PROJECTIONS, 2ND MONTH
 18/14/82 28.27.27. PAGE 6

MULTIPLE R .99914 ANALYSIS OF VARIANCE DF SUM OF SQUARES MEAN SQUARE F SIGNIFICANCE
 R SQUARE .99827 REGRESSION 3. 623951.18278 207983.78998 7514.95981
 ADJUSTED R SQUARE .99814 RESIDUAL 39. 1879.36242 27.67596

STD DEVIATION 5.26879 COEFF OF VARIABILITY 2.8 PCT

----- VARIABLES NOT IN THE EQUATION -----

----- VARIABLES IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY	VARIABLE	PARTIAL TOLERANCE	F SIGNIFICANCE
VOL	.98629583	.18233745E-01	9288.4764	.7924773			
MAND	1.8883114	.27826751E-01	1391.8797	.87357			
TIME	-.36232294	.66458183E-01	29.738388	.18208			
(CONSTANT)	14.262592	2.8798722	24.548974	-.83885			

ALL VARIABLES ARE IN THE EQUATION.

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL
VOL	.98629583	.18233745E-01	96.376742	.96559533 ; 1.8869947
MAND	1.8883114	.27826751E-01	37.387984	.95364466 ; 1.8629782
TIME	-.36232294	.66458183E-01	-5.4525499	-.49673112 ; -.22791476
CONSTANT	14.262592	2.8798722	4.9538847	8.4391185 ; 28.886865

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

VOL	.88818	.88873	
MAND	-.88815	.88814	.87442
TIME			

IRETIREMENT PROJECTIONS, 2ND MONTH

18/14/82 28.27.27. PAGE 7

FILE MONAME (CREATION DATE = 18/14/82)

DEPENDENT VARIABLE.. ACCOMP VOL,MAND,TIME

SUMMARY TABLE

STEP	VARIABLE ENTERED	REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	VOL		683.31605	.8	.96766	.93637	.96766	.96766	683.31605	.8
2	MAND		796.36262	.8	.99848	.99196	.99848	.74347	6551.73821	.8
3	TIME		29.73838	.888	.99914	.99827	.99914	-.22788	7514.95981	.8

IRETIREMENT PROJECTIONS, 2ND MONTH

18/14/82 28.27.27. PAGE 8

FILE MONAME (CREATION DATE = 18/14/82)

DEPENDENT VARIABLE.. ACCOMP VOL,MAND,TIME

OBSERVATION	Y VALUE	Y ESTIMATE	RESIDUAL	-2SD	B.F	+2S
1.	282.0000	272.5517	9.448253		1	
2.	171.0000	165.7356	5.264320		1	
3.	268.0000	254.9948	5.005963		1	
4.	184.0000	194.4457	-10.44570		1	
5.	210.0000	214.1395	-4.139524		1	
6.	204.0000	196.9221	7.077800		1	
7.	228.0000	226.3468	1.653204		1	
8.	368.0000	365.3163	5.316269		1	
9.	697.0000	691.0611	5.938986		1	
10.	458.0000	457.4134	5.865619		1	
11.	408.0000	407.1868	8.813132		1	
12.	242.0000	276.5666	-34.56660		1	
13.	222.0000	228.0481	-6.048136		1	
14.	162.0000	173.1572	-11.15723		1	
15.	219.0000	218.9967	3.45041E-02		1	
16.	220.0000	221.6372	-1.637250		1	
17.	200.0000	192.7825	7.217547		1	
18.	187.0000	184.4637	2.536279		1	
19.	201.0000	200.9345	.0653759E-01		1	
20.	299.0000	305.2515	-6.251511		1	
21.	409.0000	471.9914	-62.991368		1	
22.	577.0000	581.4689	-4.468934		1	
23.	426.0000	429.2699	-3.269897		1	
24.	245.0000	240.7541	4.245859		1	
25.	191.0000	195.9117	-4.911722		1	
26.	147.0000	143.1077	3.892304		1	
27.	180.0000	179.3183	.6817183		1	
28.	165.0000	165.7359	-.735918		1	
29.	171.0000	176.3699	-5.369925		1	
30.	171.0000	168.4785	2.521548		1	
31.	152.0000	152.5115	-.511542		1	
32.	104.0000	100.4005	3.59953		1	
33.	283.0000	285.9818	-2.981802		1	
34.	313.0000	309.4968	3.505032		1	
35.	193.0000	188.5875	4.414588		1	
36.	303.0000	350.7637	-47.76370		1	
37.	345.0000	347.3764	-2.376445		1	
38.	207.0000	206.8158	.184347		1	
39.	206.0000	206.6648	-.664858		1	
40.	250.0000	256.2593	-6.259301		1	
41.	185.0000	188.1635	-3.163561		1	
42.	139.0000	136.3682	2.631818		1	
43.	140.0000	143.9323	-3.932300		1	

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED 43.
NUMBER OF 2 S.D. OUTLIERS 1. OR 2.33 PERCENT OF THE TOTAL
RETIREMENT PROJECTIONS, 2ND MONTH

FILE, MONAME (CREATION DATE - 10/14/82)

VON NEUMANN RATIO 1.65416

NUMBER OF POSITIVE RESIDUALS 23.
NUMBER OF NEGATIVE RESIDUALS 20.
NUMBER OF RUNS OF SIGNS 19.

18/14/82 25.27.27. PAGE 9

MULTIPLE REGRESSION

DURBIN-WATSON TEST 1.61569

EXPECTED NUMBER OF RUNS OF SIGNS 22.
EXPECTED S.D. OF RUN DISTRIBUTION 3.22338
UNIT NORMAL DEViate
Z=(EXPECTED-OBSERVED)/S.D.
PROBABILITY OF OBTAINING .GE. ABS(Z) -.89926
.18452

VOGELBACK COMPUTING CENTER
NORTHWESTERN UNIVERSITY

S P S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 8.0 -- JUNE 18, 1979

18/14/82 28.26.48. PAGE 1

RETIREMENT PROJECTIONS. 3RD MONTH
VARIABLE LIST
INPUT MEDIUM
N OF CASES
INPUT FORMAT
VAR LABELS
LIST CASES
REGRESSION
STATISTICS
ALL
CASES=42/VARIABLES=ACCOMP.VOL.MAND.TIME/
METHOD=STEPWISE/VARIABLES=ACCOMP.VOL.MAND.TIME/
REGRESSION=ACCOMP WITH VOL.MAND.TIME/RESIDUALS/
REGRESSION=ACCOMP WITH VOL.MAND/RESIDUALS/

***** CM NEEDED FOR REGRESSION

OPTION - 1,
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

RETIREMENT PROJECTIONS. 3RD MONTH

FILE NAME (CREATION DATE = 18/14/82)

CASE-NO	ACCOMP	VOL	MAND	TIME
1	171.	129.	12.	1.
2	268.	218.	6.	2.
3	184.	155.	5.	3.
4	718.	157.	28.	4.
5	284.	158.	13.	5.
6	220.	169.	24.	6.
7	368.	292.	36.	7.
8	697.	435.	288.	8.
9	458.	385.	41.	9.
10	488.	351.	16.	10.
11	202.	225.	12.	11.
12	272.	198.	13.	12.
13	162.	138.	18.	13.
14	219.	281.	3.	14.
15	278.	198.	6.	15.
16	288.	167.	18.	16.
17	187.	168.	6.	17.
18	281.	175.	9.	18.
19	299.	271.	14.	19.
20	469.	411.	38.	20.

18/14/82 28.26.48. PAGE 2

21	577.	488.	142.	21.
22	426.	387.	8.	22.
23	245.	284.	27.	23.
24	191.	161.	14.	24.
25	147.	117.	11.	25.
26	188.	152.	11.	26.
27	165.	144.	14.	27.
28	121.	114.	4.	28.
29	171.	145.	13.	29.
30	152.	121.	21.	30.
31	184.	163.	12.	31.
32	283.	249.	28.	32.
33	313.	264.	44.	33.
34	193.	152.	18.	34.
35	361.	324.	14.	35.
36	345.	320.	18.	36.
37	207.	188.	13.	37.
38	200.	179.	22.	38.
39	258.	153.	80.	39.
40	185.	158.	9.	40.
41	139.	115.	8.	41.
42	148.	126.	11.	42.

18/14/82 28.26.48. PAGE 3

18/14/82 28.26.48. PAGE 4

FILE MONAME (CREATION DATE = 18/14/82.)

MULTIPLE REGRESSION

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	257.8571	123.4138	42
VOL	211.4286	92.1886	42
MAND	24.4762	36.7578	42
TIME	21.5888	12.2678	42

CORRELATION COEFFICIENTS.

A VALUE OF 99.9999 IS PRINTED IF A COEFFICIENT CANNOT BE COMPUTED.

VOL	.95803	
MAND	.74703	.54227
TIME	-.72714	-.86853
ACCOMP		
VOL		
MAND		

18/14/82 28.26.48. PAGE 5

FILE MONAME (CREATION DATE = 18/14/82.)

MULTIPLE REGRESSION

DEPENDENT VARIABLE.. ACCOMP VOL,MAND,TIME

MEAN RESPONSE 257.8571 STD. DEV. 123.41296

VARIABLE(S) ENTERED ON STEP NUMBER 1.. VOL

MULTIPLE R	.95803	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE

R SQUARE .91936 REGRESSION 1. 574186.68839 456.85235 .88
 ADJUSTED R SQUARE .91735
 STD DEVIATION 35.48844
 RESIDUAL COEFF OF VARIABILITY 48. 58384.45447 1258.86136
 13.8 PCT

----- VARIABLES IN THE EQUATION -----
 ----- VARIABLES NOT IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F	SIGNIFICANCE	BETA	ELASTICITY	VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
VOL	1.2835924	.68186271E-01	456.85235	.88	.9508344		MAND	.95177	.78594	375.32575	.8
(CONSTANT)	-13.538965	13.837298	.95621368	.334	1.85247		TIME	-.18469	.96648	1.3773472	.248

 VARIABLE(S) ENTERED ON STEP NUMBER 2.. MAND

MULTIPLE R	.99628	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.99241	REGRESSION	2.	619721.33673	309860.66836	2549.59879	.88
ADJUSTED R SQUARE	.99282	RESIDUAL	39.	4739.88613	121.53349		
STD DEVIATION	11.82422	COEFF OF VARIABILITY	4.3 PCT				

----- VARIABLES IN THE EQUATION -----
 ----- VARIABLES NOT IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F	SIGNIFICANCE	BETA	ELASTICITY	VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
VOL	1.8588763	.22227718E-01	2231.7829	.7843995			TIME	-.71797	.96514	48.427625	.888
MAND	1.8088884	.55747180E-01	375.32575	.86188	.3216737						
(CONSTANT)	9.4865269	4.4594665	4.4493112	.18252							

RETIREMENT PROJECTIONS, 3RD MONTH
 FILE MONAME (CREATION DATE = 18/14/82)
 INDEPENDENT VARIABLE.. ACCOMP VOL.MAND.TIME
 ----- MULTIPLE REGRESSION -----
 VARIABLE(S) ENTERED ON STEP NUMBER 3.. TIME
 18/14/82 28.26.48. PAGE 6

MULTIPLE R	.99816	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.99632	REGRESSION	3.	622164.59786	207388.19582	3431.56735	.88
ADJUSTED R SQUARE	.99683	RESIDUAL	38.	2296.54508	60.43542		
STD DEVIATION	7.77482	COEFF OF VARIABILITY	3.8 PCT				

----- VARIABLES NOT IN THE EQUATION -----

VARIABLE PARTIAL TOLERANCE F SIGNIFICANCE

----- VARIABLES IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY
VOL	1.8324587	.15917478E-01	4287.2362	.7712393
MAND	1.8893191	.39338865E-01	766.77265	.84656
TIME	-.64851388	.18873788	48.427625	.18348
(CONSTANT)	26.674538	4.1551115	41.212427	-.85341

ALL VARIABLES ARE IN THE EQUATION.

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL
VOL	1.8324587	.15917478E-01	64.863211	1.8882355 ; 1.8646828
MAND	1.8893191	.39338865E-01	27.698608	1.889565 ; 1.1689565
TIME	-.64851388	.18873788	-5.3582722	-.8444536 ; -.43658223
CONSTANT	26.674538	4.1551115	6.4196986	18.262946 ; 35.886113

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

VOL	.88025	
MAND	-.88834	.88155
TIME	.88028	-.88815

VOL MAND TIME

RETIREMENT PROJECTIONS, 3RD MONTH

18/14/82 28.26.48. PAGE 7

FILE NAME (CREATION DATE = 18/14/82)

DEPENDENT VARIABLE... ACCOMP VOL,MAND,TIME

MULTIPLE REGRESSION

SUMMARY TABLE

STEP	VARIABLE ENTERED	VARIABLE REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLIER R	SIMPLE R	R SQUARE CHANGE	OVERALL F	SIGNIFICANCE
1	VOL		456.85235	.888	.95883	.91936	.91936	456.85235	.888
2	MAND		375.32575	.888	.95883	.99241	.87385	2549.59879	.888
3	TIME		48.42763	.888	.95883	.99632	.88391	3431.56735	.888
RETIREMENT PROJECTIONS, 3RD MONTH									PAGE 8

FILE NAME (CREATION DATE = 18/14/82)

MULTIPLE REGRESSION

OBSERVATION	Y VALUE	Y ESTIMATE	RESIDUAL	-2SD	S.D.	+2S
1.	171.0000	172.2930	-1.293023			
2.	264.0000	257.0854	6.914577			
3.	184.0000	194.2307	-6.230689			
4.	210.0000	207.9949	2.005120			
5.	204.0000	192.5019	11.49808			
6.	224.0000	223.4686	4.531366			
7.	304.0000	302.0044	2.004375			
8.	697.0000	688.5338	8.466199			
9.	450.0000	453.0606	-3.060606			
10.	400.0000	400.0015	7.998484			
11.	202.0000	205.0039	16.99608			
12.	222.0000	229.3167	-7.316674			
13.	162.0000	171.7203	-9.720348			
14.	219.0000	228.4995	-9.499501			
15.	224.0000	219.7699	23.011714			
16.	240.0000	109.4155	10.50448			
17.	187.0000	187.5151	-51.0088			
18.	241.0000	205.6294	-4.67044			
19.	200.0000	309.5516	-10.55155			
20.	464.0000	470.0044	-1.004371			
21.	577.0000	500.0006	3.000055			
22.	426.0000	420.0593	5.140688			
23.	245.0000	251.9759	-6.975913			
24.	191.0000	192.7785	-1.778524			
25.	147.0000	143.4419	3.558132			
26.	100.0000	178.9374	-1.002908			
27.	165.0000	173.3052	-8.305184			
28.	121.0000	130.7977	-9.797717			
29.	171.0000	171.9673	-9.967261			
30.	152.0000	155.5623	-3.562326			
31.	184.0000	185.0038	-1.003831			
32.	203.0000	205.0467	-2.046698			
33.	313.0000	326.0367	-13.03672			
34.	193.0000	101.4385	11.56147			
35.	361.0000	349.0938	11.90619			
36.	345.0000	253.6106	8.610675			
37.	207.0000	207.7792	4.000758			
38.	206.0000	211.1101	-5.110141			
39.	250.0000	255.5008	-5.500764			
40.	105.0000	173.9063	11.01067			
41.	139.0000	127.0600	11.94000			
42.	148.0000	141.0453	6.954547			

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED 42.
NUMBER OF 2 S.D. OUTLIERS 1.
RETIREMENT PROJECTIONS, 3RD MONTH

FILE MONAME (CREATION DATE = 10/14/82)

MULTIPLE REGRESSION

10/14/82 25.26.48. PAGE 9

VON NEUMANN RATIO 1.03164 DURBIN-WATSON TEST 1.70803

NUMBER OF POSITIVE RESIDUALS 10.
NUMBER OF NEGATIVE RESIDUALS 24.
NUMBER OF RUNS OF SIGNS 20.

EXPECTED NUMBER OF RUNS OF SIGNS 22.

EXPECTED S.D. OF RUN DISTRIBUTION 3.13366
UNIT NORMAL DEViate - .34191
Z-(EXPECTED-OBSERVED)/S.D. .36621
PROBABILITY OF OBTAINING .GE. ABS(Z)

VOSELBACK COMPUTING CENTER
NORTHWESTERN UNIVERSITY

S P S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 8.8 -- JUNE 19, 1979

RUN NAME RETIREMENT PROJECTIONS, 4TH MONTH
VARIABLE LIST ACCOMP,VOL,MAND,TIME
INPUT MEDIUM DISK
N OF CASES 41
INPUT FORMAT FREEFIELD
VAR LABELS ACCOMP,VOL,MAND,TIME
LIST LABELS CASES-41/VARIABLES-ACCOMP,VOL,MAND,TIME
REGRESSION METHOD=STEPWISE/VARIABLES-ACCOMP,VOL,MAND,TIME/
REGRESSION-ACCOMP WITH VOL,MAND,TIME/RESIDUALS/
REGRESSION-ACCOMP WITH VOL,MAND/RESIDUALS/
STATISTICS ALL

ENDS448 CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

RETIREMENT PROJECTIONS, 4TH MONTH
FILE NONAME (CREATION DATE = 18/14/82)

CASE-NO	ACCOMP	VOL	MAND	TIME
1	268.	184.	5.	1.
2	184.	122.	5.	2.
3	218.	126.	28.	3.
4	214.	112.	18.	4.
5	228.	142.	19.	5.
6	304.	197.	27.	6.
7	697.	364.	282.	7.
8	458.	289.	44.	8.
9	488.	275.	16.	9.
10	282.	109.	13.	10.
11	222.	154.	15.	11.
12	162.	110.	10.	12.
13	219.	170.	4.	13.
14	228.	158.	5.	14.
15	248.	114.	18.	15.
16	187.	135.	6.	16.
17	281.	127.	9.	17.
18	299.	225.	18.	18.
19	469.	336.	25.	19.
20	577.	342.	143.	20.

21	426.	317.	9.	21.
22	245.	163.	26.	22.
23	191.	138.	14.	23.
24	147.	99.	13.	24.
25	188.	124.	11.	25.
26	165.	124.	14.	26.
27	121.	93.	4.	27.
28	171.	121.	13.	28.
29	152.	182.	22.	29.
30	164.	137.	12.	30.
31	283.	224.	28.	31.
32	313.	238.	46.	32.
33	193.	148.	21.	33.
34	261.	271.	8.	34.
35	345.	284.	18.	35.
36	287.	156.	13.	36.
37	246.	147.	28.	37.
38	258.	128.	94.	38.
39	145.	127.	9.	39.
40	139.	98.	7.	40.
41	148.	148.	11.	41.

IRETIREMENT PROJECTIONS, 4TH MONTH

IRETIREMENT PROJECTIONS, 4TH MONTH

FILE MONAME (CREATION DATE = 18/14/82)

***** MULTIPLE REGRESSION *****

18/14/82 28.23.37. PAGE 3

18/14/82 28.23.37. PAGE 4

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	259.9756	124.1785	41
VOL	175.4146	37.8286	41
MAND	24.4878	11.9791	41
TIME	21.8888		

CORRELATION COEFFICIENTS.

A VALUE OF 99.8888 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

VOL	.95388	
MAND	.72971	.54598
TIME	-.26759	-.87155
ACCOMP	VOL	MAND

IRETIREMENT PROJECTIONS, 4TH MONTH

FILE MONAME (CREATION DATE = 18/14/82)

***** MULTIPLE REGRESSION *****

MEAN RESPONSE 259.97561 STD. DEV. 124.17858

VARIABLE(S) ENTERED ON STEP NUMBER 1.. VOL

MULTIPLE R	.95388	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE

R SQUARE .98980 REGRESSION 1. 561183.97656 393.76393
 ADJUSTED R SQUARE .98767
 STD DEVIATION 37.75653 RESIDUAL COLF OF VARIABILITY 14.8 PCT 56578.99985 1425.18254

----- VARIABLES IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY	VARIABLE	PARTIAL TOLERANCE	F SIGNIFICANCE
VOL	1.5726686	.79253647E-01	393.76393	.9538771	MAND	.93898	84.738984
(CONSTANT)	-15.893488	15.188788	1.1877553	1.96113	TIME	-.36988	5.9925529

----- VARIABLES NOT IN THE EQUATION -----

VARIABLE(S) ENTERED ON STEP NUMBER 2.. MAND

MULTIPLE R .98595 ANALYSIS OF VARIANCE DF SUM OF SQUARES MEAN SQUARE F SIGNIFICANCE
 R SQUARE .97218 REGRESSION 2. 599525.71279 299762.85639 661.98725 .88
 ADJUSTED R SQUARE .97063 RESIDUAL 38. 17287.26282 452.82271
 STD DEVIATION 21.27963 COEFF OF VARIABILITY 8.2 PCT

----- VARIABLES IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY	VARIABLE	PARTIAL TOLERANCE	F SIGNIFICANCE
VOL	1.3847248	.5328325E-01	598.75856	.7913596	TIME	-.69794	35.141828
MAND	.97728985	.18615632	84.738984	.2977874			
(CONSTANT)	7.1782288	9.8734433	.65448086	.89285			

----- VARIABLES NOT IN THE EQUATION -----

RETIREMENT PROJECTIONS, 4TH MONTH

FILE NAME (CREATION DATE = 18/14/82)

DEPENDENT VARIABLE.. ACCOMP VOL,MAND,TIME

VARIABLE(S) ENTERED ON STEP NUMBER 3.. TIME

MULTIPLE R .99282 ANALYSIS OF VARIANCE DF SUM OF SQUARES MEAN SQUARE F SIGNIFICANCE
 R SQUARE .98569 REGRESSION 3. 687987.63981 222635.87994 849.84587
 ADJUSTED R SQUARE .98453 RESIDUAL 37. 8825.33579 238.52259
 STD DEVIATION 15.44418 COEFF OF VARIABILITY 5.9 PCT

----- VARIABLES NOT IN THE EQUATION -----

----- VARIABLES IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F	BETA	VARIABLE	PARTIAL	TOLERANCE	F
			SIGNIFICANCE	ELASTICITY				SIGNIFICANCE

VOL	1.2694742	.39152625E-01	1051.2984	.7699794				
MAND	.98774587	.77065865E-01	164.27305	.85656				
TIME	-1.2257392	.20677160	35.141020	.05304				
(CONSTANT)	38.844848	8.3671523	21.552299	-.09901				

ALL VARIABLES ARE IN THE EQUATION.

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL
VOL	1.2694742	.39152625E-01	32.423732	1.1901435
MAND	.98774587	.77065865E-01	12.816905	1.348850
TIME	-1.2257392	.20677160	-5.9279062	1.1430961
CONSTANT	38.844848	8.3671523	4.642454	-1.6446983
				21.098586
				55.797509

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

VOL	.00153		
MAND	-.00164	.00594	
TIME	.00123	-.00037	.04275

RETIREMENT PROJECTIONS, 4TH MONTH

10/14/82 20.23.37. PAGE 7

FILE MONAME (CREATION DATE - 10/14/82)

DEPENDENT VARIABLE.. ACCOMP VOL.MAND.TIME

SUMMARY TABLE

STEP	VARIABLE ENTERED	REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	VOL		393.76393	.000	.95388	.98988	.98988	.95388	393.76393	.000
2	MAND		84.73896	.000	.98595	.97210	.86222	.72971	661.90725	.000
3	TIME		35.14102	.000	.99202	.98569	.01369	-.26769	849.64587	.000

RETIREMENT PROJECTIONS, 4TH MONTH

10/14/82 20.23.37. PAGE 8

FILE MONAME (CREATION DATE - 10/14/82)

OBSERVATION	Y VALUE	Y ESTIMATE	RESIDUAL	-2SD	RESIDUAL	+2SD

1.	268.8888	277.1288	-17.1288
2.	184.8888	196.2872	-12.2872
3.	214.8888	214.8755	-4.8755
4.	284.8888	185.9997	18.8888
5.	228.8888	231.7479	-3.7479
6.	268.8888	288.2452	51.7583
7.	377.8888	631.8772	5.1288
8.	458.8888	439.3778	18.6238
9.	488.8888	392.7217	15.2782
10.	282.8888	279.3588	2.6428
11.	222.8888	235.6761	-13.6761
12.	162.8888	173.6548	-11.6548
13.	219.8888	242.6718	-23.6718
14.	228.8888	227.1994	-7.1994
15.	200.8888	175.8555	24.9445
16.	187.8888	196.5377	-9.5377
17.	281.8888	280.8142	18.8368
18.	299.8888	312.2899	-13.2899
19.	469.8888	466.7978	2.2899
20.	577.8888	589.7371	-12.7371
21.	426.8888	424.4166	1.5833
22.	245.8888	244.4835	1.5165
23.	191.8888	189.5121	1.4078
24.	147.8888	147.9458	-9.4951
25.	180.8888	176.4086	3.5194
26.	165.8888	178.2181	-13.2181
27.	121.8888	127.7612	-6.7612
28.	171.8888	178.9784	-29.7388
29.	152.8888	154.5144	-2.5144
30.	184.8888	187.8428	-3.8428
31.	283.8888	304.9633	-21.9633
32.	313.8888	337.8358	-24.8358
33.	193.8888	287.8195	-14.8195
34.	361.8888	349.8984	11.9468
35.	345.8888	348.8638	3.8638
36.	287.8888	285.5961	1.4838
37.	286.8888	199.8593	6.1486
38.	258.8888	247.6868	2.3927
39.	185.8888	161.1532	23.8468
40.	139.8888	121.1372	17.8628
41.	148.8888	136.5572	11.4428

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED 41.
NUMBER OF 2 S.D. OUTLIERS 1.
RETIREMENT PROJECTIONS, 4TH MONTH 1.
OR 2.44 PERCENT OF THE TOTAL

FILE NONAME (CREATION DATE = 18/14/82.)

M U L T I P L E R E G R E S S I O N

VON NEUMANN RATIO 1.49762 DURBIN-WATSON TEST 1.46189

NUMBER OF POSITIVE RESIDUALS 21.
NUMBER OF NEGATIVE RESIDUALS 20.
NUMBER OF RUNS OF SIGNS 20.

EXPECTED NUMBER OF RUNS OF SIGNS 21.
EXPECTED S.D. OF RUN DISTRIBUTION 3.15936
UNIT NORMAL DEViate -

Z=(EXPECTED-OBSERVED)/S.D.
PROBABILITY OF OBTAINING .GE. ABS(Z) -.31265
.37727

18/14/82 28.23.37. PAGE 9

VOGELBACK COMPUTING CENTER
NORTHWESTERN UNIVERSITY

S P S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 8.0 -- JUNE 18, 1979

RUN NAME RETIREMENT PROJECTIONS, 5TH MONTH
VARIABLE LIST ACCOMP.VOL.MAND.TIME
INPUT MEDIUM DISK
NOF CASES 48
INPUT FORMAT FREEFIELD
VAR LABELS ACCOMP.VOL.MAND.TIME
LIST CASES CASES-48/VARIABLES-ACCOMP.VOL.MAND.TIME/
METHOD-STEPWISE/VARIABLES-ACCOMP.VOL.MAND.TIME/
REGRESSION-ACCOMP WITH VOL.MAND.TIME/RESIDUALS/
REGRESSION-ACCOMP WITH VOL.MAND/RESIDUALS/
STATISTICS ALL

88754488 CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

RETIREMENT PROJECTIONS, 5TH MONTH

FILE NONAME (CREATION DATE = 18/14/82)

CASE-NO	ACCOMP	VOL	MAND	TIME
1	184.	94.	5.	1.
2	218.	91.	19.	2.
3	284.	84.	18.	3.
4	778.	91.	17.	4.
5	368.	156.	16.	5.
6	697.	228.	217.	6.
7	458.	218.	46.	7.
8	400.	205.	16.	8.
9	282.	145.	13.	9.
10	222.	135.	16.	10.
11	162.	83.	18.	11.
12	719.	136.	4.	12.
13	228.	117.	6.	13.
14	208.	97.	18.	14.
15	187.	99.	6.	15.
16	281.	95.	18.	16.
17	299.	166.	6.	17.
18	469.	288.	17.	18.
19	577.	255.	158.	19.
20	426.	256.	18.	20.

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	259.9750	125.7524	48
VOL	134.8000	57.8681	48
MAND	25.0500	48.1452	48
TIME	24.5000	11.6985	48

RETIREMENT PROJECTIONS, 5TH MONTH

RETIREMENT PROJECTIONS, 5TH MONTH

FILE MONAME (CREATION DATE = 18/14/82)

***** MULTIPLE REGRESSION *****

18/14/82 28.29.23. PAGE 3

18/14/82 28.29.23. PAGE 4

CORRELATION COEFFICIENTS.

A VALUE OF 99.9999 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

VARIABLE	ACCOMP	VOL	MAND
VOL	.89827		
MAND	.75086	.42638	
TIME	-.27168	-.18978	-.88485

RETIREMENT PROJECTIONS, 5TH MONTH

FILE MONAME (CREATION DATE = 18/14/82)

***** MULTIPLE REGRESSION *****

MEAN RESPONSE 259.97500 STD. DEV. 125.75248

VARIABLE(S) ENTERED ON STEP NUMBER 1.. VOL

MULTIPLE R	ANALYSIS OF VARIANCE OF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
.89827	1.	497637.17565	497637.17565		
.88689	REGRESSION				158.78153

ADJUSTED R SQUARE STD DEVIATION	.87181 55.98373	RESIDUAL COEFF OF VARIABILITY	38. 21.8 PCT	119995.79935	3134.89998
----- VARIABLES IN THE EQUATION -----					
VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY	VARIABLE PARTIAL TOLERANCE F SIGNIFICANCE
VOL	1.9522916	.15493327	158.78163	.8982719	MANO .81827 96.436878
(CONSTANT)	-1.6328739	22.569317	.52292912E-02 .943	1.88628	TIME -.41812 .98796 7.4817997 .818
----- VARIABLES NOT IN THE EQUATION -----					
VARIABLE(S) ENTERED ON STEP NUMBER 2.. MANO					
MULTIPLE R	.97286	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE F SIGNIFICANCE
R SQUARE	.94645	REGRESSION	2.	583789.53628	291854.76818 326.99885 .08
ADJUSTED R SQUARE	.94356	RESIDUAL	37.	33823.43888	892.52537
STD DEVIATION	29.87516	COEFF OF VARIABILITY	11.8 PCT		
----- VARIABLES IN THE EQUATION -----					
VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY	VARIABLE PARTIAL TOLERANCE F SIGNIFICANCE
VOL	1.5696577	.91488789E-01	294.92393	.7222176	TIME -.71118 .98619 36.825168
MANO	1.2936518	.13173329	96.436878	.88986	.888
(CONSTANT)	17.234913	12.196315	1.9969218	.4129854	
RETIREMENT PROJECTIONS, 5TH MONTH					
FILE	NONAME	CREATION DATE	18/14/82		
DEPENDENT VARIABLE..	ACCOMP	VOL,MANO,TIME			
----- VARIABLES NOT IN THE EQUATION -----					
VARIABLE(S) ENTERED ON STEP NUMBER 3.. TIME					
MULTIPLE R	.98668	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE F SIGNIFICANCE
R SQUARE	.97353	REGRESSION	3.	628488.34484	208136.11475 441.35151 .08
ADJUSTED R SQUARE	.97132	RESIDUAL	36.	16324.63816	453.46195
STD DEVIATION	21.29465	COEFF OF VARIABILITY	8.2 PCT		

----- VARIABLES IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F	BETA	VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
VOL	1.5372954	.65367255E-01	553.08788	.7873274					
HAND	1.2694957	.93982193E-01	182.46153	.79237					
TIME	-1.7823716	.29371486	36.825168	.12232					
(CONSTANT)	58.715171	11.058875	28.188942	-.14855					

ALL VARIABLES ARE IN THE EQUATION.

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL
VOL	1.5372954	.65367255E-01	23.517828	1.4847244 ; 1.6698663
HAND	1.2694957	.93982193E-01	13.587832	1.0788918 ; 1.4611884
TIME	-1.7823716	.29371486	-6.0683737	-2.3700529 ; -1.1866982
CONSTANT	58.715171	11.058875	5.3893268	36.286733 ; 81.143688

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

VOL	.88427		
HAND	-.00259	.88683	
TIME	.00157	.00117	.88627

RETIREMENT PROJECTIONS. 5TH MONTH

FILE MONAME (CREATION DATE = 10/14/82)
 DEPENDENT VARIABLE. ACCOMP VOL, HAND, TIME

10/14/82 20.29.23. PAGE 7

SUMMARY TABLE

STEP	VARIABLE	ENTERED	REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	VOL			158.78153	.888	.89827	.80609	.80609	.89827	158.78153	.888
2	HAND			96.43688	.888	.97286	.94645	.13916	.72006	326.99005	.888
3	TIME			36.02516	.888	.90668	.97353	.02780	-.27768	441.35151	.888

RETIREMENT PROJECTIONS. 5TH MONTH

FILE MONAME (CREATION DATE = 10/14/82)

MULTIPLE REGRESSION

OBSERVATION Y VALUE Y ESTIMATE RESIDUAL

-2SD

*2S

1.	184.0000	287.7864	-23.7864	
2.	218.0000	219.1647	-9.164724	
3.	204.0000	195.1958	8.804176	
4.	228.0000	213.8618	14.93981	
5.	368.0000	389.9333	58.86668	
6.	697.0000	667.6574	29.34263	
7.	458.0000	439.7658	18.23424	
8.	488.0000	379.9137	28.88632	
9.	282.0000	282.8851	-.859988E-01	
10.	222.0000	268.7383	-46.73826	
11.	162.0000	179.3996	-17.39956	
12.	219.0000	251.4769	-32.47606	
13.	228.0000	215.3384	4.661604	
14.	208.0000	195.5746	4.425423	
15.	187.0000	191.7088	-4.780813	
16.	201.0000	188.9352	12.86476	
17.	299.0000	291.2229	7.777148	
18.	469.0000	478.6566	-9.656613	
19.	577.0000	607.7048	-30.70478	
20.	426.0000	429.3183	-3.318311	
21.	245.0000	256.9474	-11.94744	
22.	191.0000	183.3198	7.680104	
23.	147.0000	152.5958	-5.595812	
24.	188.0000	189.5577	-1.5576528	
25.	165.0000	184.1211	-19.12116	
26.	121.0000	131.2114	-10.21135	
27.	171.0000	148.5489	22.45988	
28.	152.0000	147.4229	4.577861	
29.	184.0000	182.1391	1.860938	
30.	283.0000	316.3831	-33.38388	
31.	313.0000	326.8855	-13.88546	
32.	193.0000	225.1125	-32.11259	
33.	361.0000	344.8468	16.15484	
34.	345.0000	332.3825	12.69748	
35.	207.0000	209.6894	-2.689417	
36.	206.0000	183.9642	22.83578	
37.	250.0000	269.6388	-19.63884	
38.	185.0000	165.8968	19.90398	
39.	139.0000	116.4689	22.53111	
40.	148.0000	138.5176	17.48243	

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED 48.
NUMBER OF 2 S.D. OUTLIERS 2.
MULTIPLE REGRESSION 18/14/82
18/14/82 28.29.23. PAGE 9

FILE NAME (CREATION DATE - 18/14/82)

VON NEUMANN RATIO 1.38367 DURBIN-WATSON TEST 1.27188

NUMBER OF POSITIVE RESIDUALS 28.
NUMBER OF NEGATIVE RESIDUALS 20.
NUMBER OF RUNS OF SIGNS 16.

EXPECTED NUMBER OF RUNS OF SIGNS 21.
EXPECTED S.D. OF RUN DISTRIBUTION 3.12147
UNIT NORMAL DEVIATE -1.44163
2-(EXPECTED-OBSERVED)/S.D. .87478
PROBABILITY OF OBTAINING (C.E. ABS(2))

VOELBACK COMPUTING CENTER
NORTHWESTERN UNIVERSITY

S P S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 8.0 -- JUNE 18, 1979

RUN NAME RETIREMENT PROJECTIONS, 6TH MONTH
VARIABLE LIST ACCOMP, VOL, MAND, TIME
INPUT MEDIUM DISK
N OF CASES 39
INPUT FORMAT FREEFIELD
VAR LABELS ACCOMP, VOL, MAND, TIME
LIST CASES CASES=39/VARIABLES=ACCOMP, VOL, MAND, TIME
REGRESSION METHOD=STEPWISE/VARIABLES=ACCOMP, VOL, MAND, TIME/
REGRESSION=ACCOMP WITH VOL, MAND, TIME/RESIDUALS/
REGRESSION=ACCOMP WITH VOL, MAND/RESIDUALS/
STATISTICS ALL

***** CM NEEDED FOR REGRESSION

OPTION - 1,
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

RETIREMENT PROJECTIONS, 6TH MONTH

FILE NAME (CREATION DATE = 18/14/82)

CASE-NO	ACCOMP	VOL	MAND	TIME
1	218.	73.	28.	1.
2	284.	63.	18.	2.
3	228.	77.	18.	3.
4	364.	110.	13.	4.
5	647.	272.	234.	5.
6	458.	149.	48.	6.
7	400.	172.	17.	7.
8	282.	128.	15.	8.
9	222.	112.	17.	9.
10	162.	68.	18.	10.
11	219.	117.	4.	11.
12	228.	97.	6.	12.
13	200.	87.	18.	13.
14	187.	84.	7.	14.
15	281.	84.	18.	15.
16	299.	132.	7.	16.
17	469.	228.	11.	17.
18	577.	199.	167.	18.
19	426.	197.	12.	19.
20	245.	117.	29.	20.

21	191.	85.	17.	21.
22	147.	64.	13.	22.
23	180.	98.	11.	23.
24	165.	84.	14.	24.
25	121.	57.	4.	25.
26	171.	68.	13.	26.
27	152.	63.	21.	27.
28	184.	79.	12.	28.
29	283.	145.	21.	29.
30	313.	131.	50.	30.
31	193.	118.	21.	31.
32	361.	143.	15.	32.
33	345.	177.	28.	33.
34	287.	107.	8.	34.
35	206.	83.	16.	35.
36	258.	84.	110.	36.
37	185.	92.	18.	37.
38	130.	68.	13.	38.
39	140.	71.	13.	39.

RETIREMENT PROJECTIONS, 6TH MONTH

18/14/82 28.38.24. PAGE 3

RETIREMENT PROJECTIONS, 6TH MONTH

18/14/82 28.38.24. PAGE 4

FILE NAME (CREATION DATE = 18/14/82.)

MULTIPLE REGRESSION

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	261.9231	126.7834	39
VOL	111.8718	49.7887	39
MAND	27.2308	45.2158	39
TIME	20.0000	11.4818	39

CORRELATION COEFFICIENTS.

A VALUE OF 99.9999 IS PRINTED IF A COEFFICIENT CANNOT BE COMPUTED.

VOL	.93671	
MAND	.71917	.57681
TIME	-.31749	-.18487
	ACCOMP	VOL
		MAND

RETIREMENT PROJECTIONS, 6TH MONTH

18/14/82 28.38.24. PAGE 5

FILE NAME (CREATION DATE = 18/14/82.)

MULTIPLE REGRESSION

MEAN RESPONSE 261.92308 STD. DEV. 126.78336

VARIABLE(S) ENTERED ON STEP NUMBER 1.. VOL

MULTIPLE R	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANT
.93671	REGRESSION	1.	835946.97258	835946.97258	264.07447	
.87743						

ADJUSTED R SQUARE .87412 RESIDUAL 74865.79666 2/23.39991
STD DEVIATION 44.98222 COEFF OF VARIABILITY 37.17.2 PCT

----- VARIABLES IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F	BETA	VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
VOL	2.3856592	.14658461	264.87447	.9367137	MAND	.59618	.66821	19.850748	.000
(CONSTANT)	-4.9649838	17.918958	.76848269E-#1	1.81896	TIME	-.42158	.96612	7.7812831	.008

----- VARIABLES NOT IN THE EQUATION -----

VARIABLE(S) ENTERED ON STEP NUMBER 2... MAND

MULTIPLE R .95969 ANALYSIS OF VARIANCE DF SUM OF SQUARES MEAN SQUARE F SIGNIFICANCE
R SQUARE .92188 REGRESSION 2. 562556.14288 281278.87148 289.83669 .00
ADJUSTED R SQUARE .91661 RESIDUAL 48256.62643 1348.46185
STD DEVIATION 36.61232 COEFF OF VARIABILITY 14.8 PCT

----- VARIABLES IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F	BETA	VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
VOL	2.8118855	.14595465	189.85638	.7896397	TIME	-.52444	.96612	13.278494	.001
MAND	.71595365	.16869282	19.850748	.2553317					
(CONSTANT)	17.443369	15.421352	1.2794779	.87443					

RETIREMENT PROJECTIONS, 6TH MONTH

FILE NAME (CREATION DATE - 10/14/82)

DEPENDENT VARIABLE.. ACCOMP VOL.MAND.TIME

----- MULTIPLE REGRESSION -----

VARIABLE(S) ENTERED ON STEP NUMBER 3... TIME

VARIABLE	B	STD ERROR B	F	BETA	VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
MULTIPLE R	.97094				MEAN SQUARE				
R SQUARE	.94273				191942.87419			192.82985	
ADJUSTED R SQUARE	.93782				34984.14667			999.54785	
STD DEVIATION	31.61561								

AD-A124 836

STATISTICAL TECHNIQUES FOR DETERMINING OFFICER
SEPARATION AND RETIREMENT. (U) AIR FORCE INST OF TECH
WRIGHT-PATTERSON AFB OH SCHOOL OF ENGI.. A C DREMSTEDT
DEC 82 AFIT/GOR/OS/82D-2 F/G 12/1

414

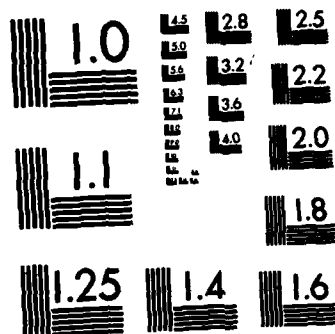
UNCLASSIFIED

NL

END

Cu MSC

11



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

```

ADJUSTED R SQUARE      .87412      RESIDUAL      74865.79668      2823.39991
STD DEVIATION          41.96222      COEFF OF VARIABILITY      37.2 PCT
                                17.2 PCT

----- VARIABLES IN THE EQUATION -----
VARIABLE      B      STD ERROR B      F      BETA      TOLERANCE      F      SIGNIFICANCE
-----
VOL      2.3856592      .14658461      264.87447      .9367137      .66821      19.858748
(CONSTANT) -4.9649838      17.918858      .76848265E-21      1.81896      .96612      7.7812831
                                .783

----- VARIABLES NOT IN THE EQUATION -----
VARIABLE(S) ENTERED ON STEP NUMBER 2.. MAND

MULTIPLE R      .95969      ANALYSIS OF VARIANCE      DF      SUM OF SQUARES      MEAN SQUARE      F      SIGNIFICANCE
R SQUARE      .92188      REGRESSION      2.      562556.14288      281278.87148      289.83669      .88
ADJUSTED R SQUARE      .91661      RESIDUAL      36.      48256.62643      1348.46185
STD DEVIATION      36.61232      COEFF OF VARIABILITY      14.8 PCT

----- VARIABLES IN THE EQUATION -----
VARIABLE      B      STD ERROR B      F      BETA      TOLERANCE      F      SIGNIFICANCE
-----
VOL      2.8118855      .14595465      189.85638      .7896397      .96612      13.278494
MAND      .71595365      .16869282      19.858748      .85897      .881
(CONSTANT) 17.443369      15.421352      1.2794279      .2553317
                                .87443
                                .265

RETIREMENT PROJECTIONS, 6TH MONTH
FILE MONAME (CREATION DATE = 18/14/82)
DEPENDENT VARIABLE.. ACCOMP VOL.MAND.TIME
-----
VARIABLE(S) ENTERED ON STEP NUMBER 3.. TIME

MULTIPLE R      .97894      ANALYSIS OF VARIANCE      DF      SUM OF SQUARES      MEAN SQUARE      F      SIGNIFICANCE
R SQUARE      .94273      REGRESSION      3.      575828.62256      191942.87419      192.82885
ADJUSTED R SQUARE      .93782      RESIDUAL      35.      34984.14667      999.54785
STD DEVIATION      31.61561      COEFF OF VARIABILITY      12.1 PCT

```

----- VARIABLES IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F	BETA	ELASTICITY	VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE

VOL	1.94118158	.12749376	231.78231	.7621273	.82984					
MAND	.71558498	.13876215	26.587846	.2551717	.088					
TIME	-1.6676288	.45763884	13.278494	-.07439	.088					
(CONSTANT)	58.646824	17.469685	11.269868	-.1499788	.081					
			.882	-.12734						

ALL VARIABLES ARE IN THE EQUATION.

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL

VOL	1.94118158	.12749376	15.224399	1.6821897 : 2.1998419
MAND	.71558498	.13876215	5.1563484	.4388275 : .9972875
TIME	-1.6676288	.45763884	-3.6439668	-2.5966778 : -.73856452
CONSTANT	58.646824	17.469685	3.3578624	23.181477 : 94.112171

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

VOL	.81625		
MAND	-.01897	.81925	
TIME	.08888	.08886	.28943

VOL

MAND

TIME

RETIREMENT PROJECTIONS, 6TH MONTH

FILE MONAME (CREATION DATE = 18/14/82)

DEPENDENT VARIABLE.. ACCOMP VOL,MAND,TIME

18/14/82 28.38.24. PAGE 7

SUMMARY TABLE

STEP	VARIABLE ENTERED	REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE

1	VOL		264.87447	.8	.93671	.87743	.87743	.93671	264.87447	.8
2	MAND		19.85875	.888	.93669	.92108	.04356	.71817	289.83669	.888
3	TIME		13.27849	.881	.93694	.94273	.02173	-.31749	192.002905	.8

RETIREMENT PROJECTIONS, 6TH MONTH

FILE MONAME (CREATION DATE = 18/14/82)

OBSERVATION Y VALUE Y ESTIMATE RESIDUAL -2SD

.8.8

*2S

1.	218.8888	212.9835	-2.98453
2.	204.8888	184.7586	19.24937
3.	220.8888	215.9813	12.81873
4.	368.8888	298.3178	65.68223
5.	637.8888	745.6932	-48.69316
6.	458.8888	372.1967	85.88331
7.	488.8888	392.9918	15.88822
8.	202.8888	288.9183	-6.968325
9.	222.8888	273.1956	-51.19559
10.	162.8888	181.1147	-19.11474
11.	213.8888	278.2639	-51.26386
12.	228.8888	231.2869	-11.28694
13.	288.8888	212.9912	-12.99118
14.	187.8888	283.3548	-16.35399
15.	281.8888	196.8688	4.931176
16.	299.8888	293.1875	5.81291
17.	409.8888	408.7194	-11.71942
18.	577.8888	534.3811	4.61889
19.	476.8888	417.9282	8.871883
20.	245.8888	273.1429	-28.14298
21.	191.8888	288.7767	-9.776713
22.	147.8888	155.4857	-8.485741
23.	188.8888	282.8535	-22.85352
24.	165.8888	191.6863	-26.68632
25.	121.8888	138.4562	-9.456224
26.	171.8888	156.5793	14.42868
27.	152.8888	158.9387	1.869348
28.	184.8888	173.8797	15.12825
29.	283.8888	386.7507	-23.75071
30.	313.8888	298.6665	14.33349
31.	193.8888	235.4879	-42.48792
32.	361.8888	293.5808	67.41921
33.	345.8888	361.4852	-16.48523
34.	287.8888	215.3084	-8.368446
35.	286.8888	172.8325	33.16751
36.	258.8888	248.3633	9.636659
37.	185.8888	182.6734	2.326643
38.	139.8888	132.9983	6.889653
39.	148.8888	145.7233	7.276782

NOTE - (°) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED	39.	7.69 PERCENT OF THE TOTAL	2.38458
NUMBER OF 2 S.D. OUTLIERS	3.	DURBIN-WATSON TEST	
VON NEUMANN RATIO	2.41654		
NUMBER OF POSITIVE RESIDUALS	19.		
NUMBER OF NEGATIVE RESIDUALS	28.		
NUMBER OF RUNS OF SIGNS	16.		
RETIREMENT PROJECTIONS, 6TH MONTH			

EXPECTED NUMBER OF RUNS OF SIGNS	28.
EXPECTED S.D. OF RUN DISTRIBUTION	3.87986
UNIT NORMAL DEVIATE	
Z-(EXPECTED-OBSERVED)/S.D.	-1.29493
PROBABILITY OF OBTAINING .GE. ABS(Z)	.89767

VOSELBACK COMPUTING CENTER
NORTHWESTERN UNIVERSITY

S P S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 8.0 -- JUNE 18, 1979

18/14/82 28.31.46.

PAGE 1

RUN NAME RETIREMENT PROJECTIONS, 7TH MONTH
VARIABLE LIST ACCOMP,VOL,MAND,TIME
INPUT MEDIUM DISK
N OF CASES 36
INPUT FORMAT FREEFIELD
VAR LABELS ACCOMP,VOL,MAND,TIME
LIST CASES CASES-36/VARIABLES-ACCOMP,VOL,MAND,TIME
REGRESSION METHOD-STEPWISE/VARIABLES-ACCOMP,VOL,MAND,TIME/
REGRESSION-ACCOMP WITH VOL,MAND,TIME/RESIDUALS/
REGRESSION-ACCOMP WITH VOL,MAND/RESIDUALS/
STATISTICS ALL

ENDS4488 CH NEEDED FOR REGRESSION

OPTION - 1:
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

RETIREMENT PROJECTIONS, 7TH MONTH

FILE RNAME (CREATION DATE = 18/14/82)

CASE-NO	ACCOMP	VOL	MAND	TIME
1	284.	53.	18.	1.
2	228.	56.	19.	2.
3	368.	96.	14.	3.
4	450.	114.	51.	5.
5	408.	116.	22.	6.
6	282.	188.	15.	7.
7	222.	93.	19.	8.
8	162.	69.	18.	9.
9	219.	181.	4.	18.
10	228.	88.	6.	11.
11	288.	78.	5.	12.
12	187.	65.	7.	13.
13	201.	62.	18.	14.
14	297.	113.	7.	15.
15	457.	171.	11.	16.
16	426.	147.	14.	18.
17	285.	93.	29.	19.
18	191.	76.	17.	28.
19	147.	56.	16.	21.
20	188.	77.	11.	22.

18/14/82 28.31.46.

PAGE 2

	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
188.	188.	188.	188.	188.	188.	188.	188.	188.	188.	188.	188.	188.	188.	188.	188.	188.	188.	188.
121.	121.	121.	121.	121.	121.	121.	121.	121.	121.	121.	121.	121.	121.	121.	121.	121.	121.	121.
171.	171.	171.	171.	171.	171.	171.	171.	171.	171.	171.	171.	171.	171.	171.	171.	171.	171.	171.
152.	152.	152.	152.	152.	152.	152.	152.	152.	152.	152.	152.	152.	152.	152.	152.	152.	152.	152.
184.	184.	184.	184.	184.	184.	184.	184.	184.	184.	184.	184.	184.	184.	184.	184.	184.	184.	184.
243.	243.	243.	243.	243.	243.	243.	243.	243.	243.	243.	243.	243.	243.	243.	243.	243.	243.	243.
313.	313.	313.	313.	313.	313.	313.	313.	313.	313.	313.	313.	313.	313.	313.	313.	313.	313.	313.
193.	193.	193.	193.	193.	193.	193.	193.	193.	193.	193.	193.	193.	193.	193.	193.	193.	193.	193.
361.	361.	361.	361.	361.	361.	361.	361.	361.	361.	361.	361.	361.	361.	361.	361.	361.	361.	361.
345.	345.	345.	345.	345.	345.	345.	345.	345.	345.	345.	345.	345.	345.	345.	345.	345.	345.	345.
287.	287.	287.	287.	287.	287.	287.	287.	287.	287.	287.	287.	287.	287.	287.	287.	287.	287.	287.
285.	285.	285.	285.	285.	285.	285.	285.	285.	285.	285.	285.	285.	285.	285.	285.	285.	285.	285.
256.	256.	256.	256.	256.	256.	256.	256.	256.	256.	256.	256.	256.	256.	256.	256.	256.	256.	256.
185.	185.	185.	185.	185.	185.	185.	185.	185.	185.	185.	185.	185.	185.	185.	185.	185.	185.	185.
139.	139.	139.	139.	139.	139.	139.	139.	139.	139.	139.	139.	139.	139.	139.	139.	139.	139.	139.
148.	148.	148.	148.	148.	148.	148.	148.	148.	148.	148.	148.	148.	148.	148.	148.	148.	148.	148.
55.	55.	55.	55.	55.	55.	55.	55.	55.	55.	55.	55.	55.	55.	55.	55.	55.	55.	55.
22.	22.	22.	22.	22.	22.	22.	22.	22.	22.	22.	22.	22.	22.	22.	22.	22.	22.	22.

IRETIREMENT PROJECTIONS, 7TH MONTH

IRETIREMENT PROJECTIONS, 7TH MONTH

FILE MONAME (CREATION DATE = 18/14/82.)

***** MULTIPLE REGRESSION *****

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	242.5278	93.5846	36
VOL	85.3611	29.8418	36
MAND	18.6389	19.6398	36
TIME	28.8888	11.1821	36

CORRELATION COEFFICIENTS.

A VALUE OF 99.9999 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

	ACCOMP	VOL	MAND
VOL	.85718		
MAND	.23561	.86815	
TIME	-.29497	-.13585	.28953

IRETIREMENT PROJECTIONS, 7TH MONTH

FILE MONAME (CREATION DATE = 18/14/82.)

***** MULTIPLE REGRESSION *****

MEAN RESPONSE	242.5278	STD. DEV.	99.58462
VARIABLE(S) ENTERED ON STEP NUMBER 1..	VOL		

MULTIPLE R	.85718	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.73462	REGRESSION	1.	224881.32592	224881.32592	94.11977	.00
ADJUSTED R SQUARE	.72682	RESIDUAL	34.	91287.64638	2388.46819		
STD DEVIATION	48.87188	COEFF OF VARIABILITY	28.2 PCT				

----- VARIABLES IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY	VARIABLE	PARTIAL TOLERANCE	F SIGNIFICANCE
VOL	2.7596482	.28445482	94.119771	.8571817	MAND	.35794	.99638
(CONSTANT)	6.9611489	25.611159	.73875829E-01	.97136	TIME	-.34328	.98176
			.787				.843

----- VARIABLES NOT IN THE EQUATION -----

VARIABLE(S) ENTERED ON STEP NUMBER 2... MAND

MULTIPLE R	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.76862	REGRESSION	2.	235285.96882	117682.98881	54.81262
ADJUSTED R SQUARE	.75468	RESIDUAL	23.	7883.81228	2145.54582	.88
STD DEVIATION	46.32884	COEFF OF VARIABILITY	19.1 PCT			

----- VARIABLES IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY	VARIABLE	PARTIAL TOLERANCE	F SIGNIFICANCE
VOL	2.7238748	.27889184	181.78766	.8459988	TIME	-.46335	.93422
MAND	.87948533	.39937796	4.8494113	.95871			8.7485252
(CONSTANT)	-6.3777648	25.018221	.835	.1847283			.806
			.64986658E-01	.06759			
			.888				

----- VARIABLES NOT IN THE EQUATION -----

RETIREMENT PROJECTIONS, 7TH MONTH

FILE NAME (CREATION DATE - 18/14/82)

DEPENDENT VARIABLE... ACCOMP VOL.MAND.TIME

MULTIPLE REGRESSION *****

VARIABLE(S) ENTERED ON STEP NUMBER 3... TIME

MULTIPLE R	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.98168	REGRESSION	3.	258887.84852	83469.81617	48.83886
ADJUSTED R SQUARE	.88127	RESIDUAL	32.	55681.92378	1737.56812	.88
STD DEVIATION	41.68485	COEFF OF VARIABILITY	17.2 PCT			

----- VARIABLES NOT IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY	VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
VOL	2.6138584	.24588864	113.88158	.8118193				
MAND	1.1192972	.36843751	9.2291888	.91998				
TIME	-1.9421867	.65668723	8.7485252	.88682				
(CONSTANT)	37.386282	26.941824	1.9257343	-.2385938				
			.175	-.16816				

ALL VARIABLES ARE IN THE EQUATION.

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL
VOL	2.6138584	.24588864	10.638228	2.1129916
MAND	1.1192972	.36843751	3.0379567	1.0697798
TIME	-1.9421867	.65668723	-2.9577986	-3.2795718
CONSTANT	37.386282	26.941824	1.3877883	-17.498788
				92.263352

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

VOL	.86846		
MAND	-.88927	.13575	
TIME	.82442	-.85324	.43113
VOL		MAND	TIME

RETIREMENT PROJECTIONS, 7TH MONTH

FILE NAME (CREATION DATE = 18/14/82)

 INDEPENDENT VARIABLE.. ACCOMP VOL,MAND,TIME

18/14/82 28.31.46. PAGE 7

SUMMARY TABLE

STEP	VARIABLE ENTERED	VARIABLE REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	VOL		94.11977	.888	.85718	.73462	.73462	.85718	94.11977	.888
2	MAND		4.84941	.835	.87671	.76862	.03400	.23561	54.81262	.888
3	TIME		8.74853	.886	.98468	.81838	.06630	-.29937	48.83886	.888
						18/14/82	28.31.46.		PAGE 8	
MULTIPLE REGRESSION										
RESIDUAL	-2SD									
1.	284.8888									
2.	228.8888									
3.	368.8888									

4.	450.0000	382.7388	76.26116
5.	480.0000	353.6648	64.43517
6.	282.0000	301.5660	-19.96683
7.	222.0000	286.2842	-64.28416
8.	162.0000	185.3175	-23.31747
9.	219.0000	286.4413	-67.44129
10.	220.0000	252.7577	-32.75773
11.	200.0000	223.5578	-23.55782
12.	187.0000	189.8743	-2.874251
13.	201.0000	191.2900	9.709964
14.	299.0000	311.4549	-12.45486
15.	469.0000	465.5933	3.486748
16.	426.0000	472.3345	-23.66547
17.	245.0000	216.0340	-31.03336
18.	191.0000	216.2748	-25.27483
19.	147.0000	160.0064	-13.00642
20.	180.0000	200.2307	-20.23068
21.	165.0000	196.5852	-31.58522
22.	121.0000	115.4900	5.569922
23.	171.0000	163.9406	7.051351
24.	152.0000	149.3061	2.693944
25.	184.0000	170.5190	13.48016
26.	203.0000	291.4722	-8.472228
27.	313.0000	343.9608	-30.96904
28.	193.0000	263.2628	-74.26285
29.	361.0000	238.1778	122.8222
30.	345.0000	343.7774	1.227648
31.	287.0000	240.2718	-33.27182
32.	286.0000	150.0444	47.95561
33.	250.0000	260.0728	-18.07208
34.	185.0000	159.0256	25.97444
35.	139.0000	118.2445	20.75552
36.	148.0000	131.9725	16.02746

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
 R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED	36.		
NUMBER OF 2 S.D. OUTLIERS	1. OR	2.76 PERCENT OF THE TOTAL	1.61242
VON NEUMANN RATIO	1.55849	DURBIN-WATSON TEST	
NUMBER OF POSITIVE RESIDUALS	18.		
NUMBER OF NEGATIVE RESIDUALS	18.		
NUMBER OF RUNS OF SIGNS	13.		
EXPECTED NUMBER OF RUNS OF SIGNS	19.		
EXPECTED S.D. OF RUN DISTRIBUTION	2.95683		
UNIT NORMAL DEVIATE			
Z=(EXPECTED-OBSERVED)/S.D.	-1.86019		
PROBABILITY OF OBTAINING .GE. ABS(Z)	.03144		

VOGELBACK COMPUTING CENTER
MONTWENSTERN UNIVERSITY

S P S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES
VERSION 8.0 -- JUNE 18, 1979

18/14/82 25.33.46. PAGE 1

RUN NAME RETIREMENT PROJECTIONS, 8TH MONTH
VARIABLE LIST ACCOMP,VOL,MAND,TIME
INPUT MEDIUM DISK
N OF CASES 34
INPUT FORMAT FREEFIELD
VAR LABELS ACCOMP,VOL,MAND,TIME
LIST CASES CASES=34/VARIABLES-ACCOMP,VOL,MAND,TIME
REGRESSION METHOD=STEPWISE/VARIABLES-ACCOMP,VOL,MAND,TIME/
REGRESSION-ACCOMP WITH VOL,MAND,TIME/RESIDUALS/
REGRESSION-ACCOMP WITH VOL,MAND/RESIDUALS/
STATISTICS ALL

***** CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

RETIREMENT PROJECTIONS, 8TH MONTH

FILE NOMEAN (CREATION DATE = 18/14/82)

18/14/82 25.33.46. PAGE 2

CASE-NO	ACCOMP	VOL	MAND	TIME
1	228.	47.	19.	1.
2	368.	81.	15.	2.
3	458.	72.	52.	4.
4	488.	84.	23.	5.
5	282.	75.	15.	6.
6	222.	76.	19.	7.
7	162.	48.	18.	8.
8	219.	93.	7.	9.
9	228.	74.	6.	10.
10	288.	61.	5.	11.
11	187.	61.	7.	12.
12	281.	71.	18.	13.
13	299.	99.	7.	14.
14	469.	139.	11.	15.
15	426.	116.	17.	16.
16	245.	87.	21.	17.
17	191.	64.	18.	18.
18	147.	49.	18.	19.
19	188.	69.	11.	20.
20	165.	64.	15.	21.
21				22.

21 121. 48. 5. 23.
 22 171. 47. 14. 24.
 23 152. 48. 28. 25.
 24 284. 68. 14. 26.
 25 283. 96. 21. 27.
 26 313. 94. 51. 28.
 27 193. 76. 26. 29.
 28 351. 72. 28. 30.
 29 345. 188. 25. 31.
 30 287. 85. 12. 32.
 31 286. 54. 19. 33.
 32 185. 61. 4. 35.
 33 139. 36. 8. 36.
 34 148. 46. 23. 37.

187 REMT PROJECTIONS, 8TH MONTH

188 REMT PROJECTIONS, 8TH MONTH

FILE NAME (CREATION DATE = 18/14/82.)

MULTIPLE REGRESSION *****

18/14/82 28.33.46. PAGE 3
 18/14/82 28.33.46. PAGE 4

VAR.	LE	MEAN	STANDARD DEV	CASES
ACCOMP		246.3824	95.7844	34
VOL		71.7859	22.5866	34
MAND		17.8454	11.8454	34
TIME		19.1176	18.6288	34

CORRELATION COEFFICIENTS.

A VALUE OF .99.8888 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

VOL	.75365	
MAND	.42518	.16653
TIME	-.31971	-.17115
ACCOMP		
VOL		
MAND		

187 RETIREMENT PROJECTIONS, 8TH MONTH

FILE NAME (CREATION DATE = 18/14/82.)

MULTIPLE REGRESSION *****

MEAN RESPONSE 246.38235 STD. DEV. 95.78441
 VARIABLE(S) ENTERED ON STEP NUMBER 1.. VOL

MULTIPLE R	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.75365					
ADJUSTED R SQUARE	.56799					
STD DEVIATION	.55449					
	63.87953					
		1.	171679.88492	171679.88492	42.87286	.88
		32.	138579.82449	4330.62326		
		25.9				

----- VARIABLES IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY	VARIABLE	PARTIAL TOLERANCE	F SIGNIFICANCE
VOL	3.1933858	.49232785	42.872857	.7536499	MAND	.46226	.97227
(CONSTANT)	17.397867	36.963568	.22153597	.32939	TIME	-.29462	.97871
			.641				2.944128
							.896

----- VARIABLES NOT IN THE EQUATION -----

VARIABLE(S) ENTERED ON STEP NUMBER 2.. MAND

MULTIPLE R .81259 ANALYSIS OF VARIANCE DF SUM OF SQUARES MEAN SQUARE F SIGNIFICANCE

R SQUARE .66838 REGRESSION 2. 199581.63977 99798.81988 38.12879 .88

ADJUSTED R SQUARE .63839 RESIDUAL 31. 182676.38964 3312.14168

STD DEVIATION 57.55121 COEFF OF VARIABILITY 23.4 PCT

----- VARIABLES IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY	VARIABLE	PARTIAL TOLERANCE	F SIGNIFICANCE
VOL	2.9759569	.4493688	43.766886	.7823362	TIME	-.36459	.96718
MAND	2.6698865	.91986616	8.4243484	.86611			4.5991847
(CONSTANT)	-12.399332	34.848213	.12668853	.3081348			.848
			.724	.18422			

----- VARIABLES NOT IN THE EQUATION -----

RETIREMENT PROJECTIONS, 8TH MONTH

FILE NAME (CREATION DATE = 18/14/82)

DEPENDENT VARIABLE.. ACCOMP VOL,MAND,TIME

MULTIPLE REGRESSION *****

VARIABLE(S) ENTERED ON STEP NUMBER 3.. TIME

MULTIPLE R .83992 ANALYSIS OF VARIANCE DF SUM OF SQUARES MEAN SQUARE F SIGNIFICANCE

R SQUARE .78546 REGRESSION 3. 213238.16834 71876.72811 23.95895 .88

ADJUSTED R SQUARE .67688 RESIDUAL 38. 89827.86988 2367.59564

STD DEVIATION 54.47564 COEFF OF VARIABILITY 22.1 PCT

----- VARIABLES IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY	VARIABLE	PARTIAL TOLERANCE	F SIGNIFICANCE
VOL	3.1933858	.49232785	42.872857	.7536499	MAND	.46226	.97227
(CONSTANT)	17.397867	36.963568	.22153597	.32939	TIME	-.29462	.97871
			.641				2.944128
							.896

----- VARIABLES NOT IN THE EQUATION -----

SIGNIFICANCE

SIGNIFICANCE	ELASTICITY
VOL	2.8899639
MAND	2.7839267
TIME	-1.9457932
(CONSTANT)	34.763646

ALL VARIABLES ARE IN THE EQUATION.

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL
VOL	2.8899639	.4327744	6.4929878	1.9261287 : 3.6938871
MAND	2.7839267	.8723383	3.1913675	1.0823985 : 4.564629
TIME	-1.9457932	.9873118	-2.1445718	-3.7987699 : -.92816593E-01
CONSTANT	34.763646	39.644798	.87687884	-46.281817 : 115.72911

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

VOL	.18729
MAND	-.86586
TIME	.87823

VOL MAND TIME

RETIREMENT PROJECTIONS, 8TH MONTH

FILE MONAME (CREATION DATE - 18/14/82)

DEPENDENT VARIABLE: ACCOMP VOL,MAND,TIME

18/14/82 28.33.46. PAGE 7

SUMMARY TABLE

STEP	VARIABLE ENTERED	REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	VOL		42.87286	.000	.75365	.56799	.56799	.75365	42.87286	.000
2	MAND		8.42435	.007	.81259	.66838	.09231	.42518	38.12879	.000
3	TIME		4.59918	.048	.83992	.78546	.04516	-.31971	23.95895	.000

RETIREMENT PROJECTIONS, 8TH MONTH

FILE MONAME (CREATION DATE - 18/14/82)

MULTIPLE REGRESSION

-2SD

+2S

OBSERVATION Y VALUE Y ESTIMATE

RESIDUAL

1.	228.8888	217.7888	18.21924
2.	368.8888	388.2388	69.76196
3.	458.8888	374.8621	83.93794
4.	488.8888	325.1878	87.89884
5.	282.8888	275.5951	6.484928

6.	222.0000	287.5950	-68.59496
7.	162.0000	181.9148	-19.91483
8.	219.0000	290.8656	-79.86564
9.	220.0000	239.9466	-19.94660
10.	200.0000	198.6074	1.312648
11.	187.0000	202.3894	-15.38941
12.	201.0000	736.8158	-35.81584
13.	299.0000	305.1965	-6.196455
14.	469.0000	426.7049	42.21588
15.	426.0000	374.9677	51.83227
16.	245.0000	310.8382	-65.83821
17.	191.0000	227.7419	-36.74195
18.	147.0000	183.6467	-36.64669
19.	180.0000	218.4177	-38.41769
20.	165.0000	217.5678	-48.56779
21.	171.0000	116.3306	4.671409
22.	171.0000	159.1079	11.89811
23.	152.0000	176.6756	-24.67562
24.	204.0000	191.7456	32.25417
25.	283.0000	310.4462	-27.44622
26.	313.0000	386.3983	-73.39830
27.	193.0000	264.2750	-71.27499
28.	361.0000	234.3858	126.6142
29.	345.0000	325.8386	19.96139
30.	207.0000	244.7523	-37.75232
31.	206.0000	175.1851	38.61487
32.	185.0000	149.2844	35.79561
33.	139.0000	88.14520	50.85408
34.	148.0000	156.8500	-8.857950

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED	34.	1. OR	2.94 PERCENT OF THE TOTAL
NUMBER OF 2 S.D. OUTLIERS	1.	DURBIN-WATSON TEST	1.55955
VON NEUMANN RATIO	1.6868		
NUMBER OF POSITIVE RESIDUALS	16.		
NUMBER OF NEGATIVE RESIDUALS	18.		
NUMBER OF RUNS OF SIGNS	14.		
EXPECTED NUMBER OF RUNS OF SIGNS	18.		
EXPECTED S.D. OF RUN DISTRIBUTION	2.86872		
UNIT NORMAL DEViate	-1.28291		
Z-(EXPECTED-OBSERVED)/S.D.	.11451		
PROBABILITY OF OBTAINING .GE. ABS(Z)			

Vogelback Computing Center
 Northwestern University
 S P S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES
 VERSION 9.8 -- JUNE 18, 1979

RUN NAME RETIREMENT PROJECTIONS. 9TH MONTH
 VARIABLE LIST ACCOMP.VOL.MAND.TIME
 INPUT MEDIUM DISK
 N OF CASES 33
 INPUT FORMAT FREEFIELD
 VAR LABELS ACCOMP.VOL.MAND.TIME
 LIST CASES CASES=33/VARIABLES=ACCOMP.VOL.MAND.TIME
 REGRESSION METHOD=STEPWISE/VARIABLES=ACCOMP.VOL.MAND.TIME/
 REGRESSION=ACCOMP WITH VOL.MAND.TIME/RESIDUALS/
 REGRESSION=ACCOMP WITH VOL.MAND.TIME/RESIDUALS/
 STATISTICS ALL

00054488 CM NEEDED FOR REGRESSION

OPTION - 1.
 IGNORE MISSING VALUE INDICATORS
 (NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

RETIREMENT PROJECTIONS. 9TH MONTH

CASE-NO	ACCOMP	VOL	MAND	TIME
1	368.	78.	16.	1.
2	458.	67.	53.	3.
3	488.	62.	23.	4.
4	282.	58.	15.	5.
5	222.	63.	21.	6.
6	162.	43.	18.	7.
7	219.	83.	7.	8.
8	228.	67.	6.	9.
9	288.	53.	5.	10.
10	187.	56.	8.	11.
11	281.	58.	11.	12.
12	299.	81.	7.	13.
13	453.	125.	11.	14.
14	456.	87.	17.	16.
15	245.	78.	34.	17.
16	191.	55.	28.	18.
17	147.	44.	19.	19.
18	188.	66.	13.	20.
19	185.	55.	17.	21.
20	121.	36.	6.	22.

21	171.	42.	16.	23.
22	152.	43.	20.	24.
23	181.	49.	14.	25.
24	283.	39.	21.	26.
25	313.	87.	52.	27.
26	193.	61.	27.	28.
27	361.	61.	28.	29.
28	345.	72.	25.	30.
29	287.	72.	12.	31.
30	285.	41.	19.	32.
31	185.	55.	11.	34.
32	139.	31.	11.	35.
33	148.	41.	20.	33.

IRETIREMENT PROJECTIONS, 9TH MONTH

IRETIREMENT PROJECTIONS, 9TH MONTH

FILE NAME (CREATION DATE = 10/14/82)

MULTIPLE REGRESSION

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	243.9091	97.4992	33
VOL	68.6667	19.3191	33
MAND	17.4848	11.4758	33
TIME	18.5758	10.1459	33

CORRELATION COEFFICIENTS.

A VALUE OF 99.9999 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

VOL	.78319		
MAND	.41228	-.14185	
TIME	-.36877	-.31538	.81551
ACCOMP			
VOL			
MAND			

IRETIREMENT PROJECTIONS, 9TH MONTH

FILE NAME (CREATION DATE = 10/14/82)

DEPENDENT VARIABLE... ACCOMP VOL,MAND,TIME

MEAN RESPONSE 243.9099 STD. DEV. 97.49916

VARIABLE(S) ENTERED ON STEP NUMBER 1.. VOL

MULTIPLE R	.78319	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.49448	REGRESSION	1.	158417.65769	158417.65769	38.32277	.88
ADJUSTED R SQUARE	.47817	RESIDUAL	31.	153777.80950	4960.58863		
STD DEVIATION	78.43118	COEFF OF VARIABILITY	28.9 PCT				

----- VARIABLES IN THE EQUATION -----

----- VARIABLES NOT IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY	VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
VOL	3.5488418	.64448928	38.322774	.7831914	MAND	.44486	.97988	7.3687874
(CONSTANT)	28.612691	48.975884	.48761573	.88269	TIME	-.28689	.98859	1.3387378
			.458					.258

VARIABLE(S) ENTERED ON STEP NUMBER 2.. MAND

MULTIPLE R		ANALYSIS OF VARIANCE		DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.77882	REGRESSION	2.	188741.18788	98370.55354	21.96861		.88
ADJUSTED R SQUARE	.56711	RESIDUAL	38.	123453.62828	4115.12867			
STD DEVIATION	64.14921	COEFF OF VARIABILITY	26.3 PCT					

VARIABLES IN THE EQUATION

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY	VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
VOL	3.3285136	.59298291	31.356398	.5579489	TIME	-.26233	.89688	2.1432249
MAND	2.7898372	.99826358	7.3687874	.82598				.154
(CONSTANT)	-4.9164928	39.311257	.15641448E-01	.3189533				
			.981	.19426				

RETIREMENT PROJECTIONS, 9TH MONTH

FILE NAME (CREATION DATE = 10/14/82)

DEPENDENT VARIABLE.. ACCOMP VOL,MAND,TIME

VARIABLE(S) ENTERED ON STEP NUMBER 3.. TIME

10/14/82 28.34.43. PAGE 6

MULTIPLE R

MULTIPLE R		ANALYSIS OF VARIANCE		DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.78873	REGRESSION	3.	189236.97961	63078.99328	15.91272		.88
ADJUSTED R SQUARE	.62289	RESIDUAL	29.	114957.74766	3964.86826			
STD DEVIATION	62.96878	COEFF OF VARIABILITY	25.8 PCT					

VARIABLES IN THE EQUATION

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY	VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
VOL	3.3285136	.59298291	31.356398	.5579489	TIME	-.26233	.89688	2.1432249
MAND	2.7898372	.99826358	7.3687874	.82598				.154
(CONSTANT)	-4.9164928	39.311257	.15641448E-01	.3189533				
			.981	.19426				

VOL	3.8319477	.61447827	24.346787	.6887786
MAND	2.8819983	.98179818	8.1451379	.3258889
TIME	-1.6987831	1.1883418	2.1432249	.28886
(CONSTANT)	42.478871	58.366153	.71132548	-1.12915

ALL VARIABLES ARE IN THE EQUATION.

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL
VOL	3.8319477	.61447827	4.9342464	1.7752149 ; 4.2866805
MAND	2.8819983	.98179818	2.8339688	.79481289 ; 4.8899845
TIME	-1.6987831	1.1883418	-1.4633757	-4.8480555 ; .67325838
CONSTANT	42.478871	58.366153	.84348114	-68.531479 ; 145.48922

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

VOL	.37757	.96391
MAND	-.89129	.87292
TIME	.22832	1.34175

RETIREMENT PROJECTIONS, 9TH MONTH

FILE MONAME (CREATION DATE = 18/14/82)

DEPENDENT VARIABLE.. ACCOMP VOL,MAND,TIME

18/14/82 28.34.43. PAGE 7

SUMMARY TABLE

STEP	VARIABLE ENTERED	REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	VOL		38.32277	.888	.78319	.49448	.49448	.78319	38.32277	.888
2	MAND		7.36879	.411	.77882	.58416	.89958	.41228	21.90861	.088
3	TIME		2.14322	.154	.78873	.62289	.82793	-.36677	19.91272	.588

RETIREMENT PROJECTIONS, 9TH MONTH

FILE MONAME (CREATION DATE = 18/14/82)

OBSERVATION Y VALUE Y ESTIMATE RESIDUAL

1.	368.8888	313.8111	46.9886
2.	458.8888	385.8379	68.9527
3.	488.8888	288.1225	119.8775
4.	282.8888	251.8829	38.11718
5.	222.8888	282.1588	-68.15884
6.	162.8888	189.8821	-27.88212

7. 219.0000
 8. 220.0000
 9. 221.0000
 10. 222.0000
 11. 223.0000
 12. 224.0000
 13. 225.0000
 14. 226.0000
 15. 227.0000
 16. 228.0000
 17. 229.0000
 18. 230.0000
 19. 231.0000
 20. 232.0000
 21. 233.0000
 22. 234.0000
 23. 235.0000
 24. 236.0000
 25. 237.0000
 26. 238.0000
 27. 239.0000
 28. 240.0000
 29. 241.0000
 30. 242.0000
 31. 243.0000
 32. 244.0000
 33. 245.0000

308.1783
 247.1693
 248.2243
 216.8303
 228.8044
 285.6354
 448.6811
 326.7598
 321.1548
 234.7519
 196.9027
 245.8577
 221.2585
 131.1337
 175.6496
 188.1938
 187.8777
 175.4764
 486.1761
 255.5597
 234.2899
 279.9556
 241.8338
 165.7616
 154.3014
 187.9388
 166.0678

-81.17825
 -27.16931
 -224.597
 -25.83031
 -27.80442
 13.36456
 28.31886
 99.24824
 -76.15484
 -43.75186
 -49.90266
 -65.89773
 -56.25852
 -18.13375
 -4.649635
 -36.19379
 -3.877786
 187.5236
 -93.17609
 -62.59971
 126.7181
 65.84443
 -34.83381
 48.20037
 30.61063
 31.86118
 -10.86785

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
 R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED 33.
 NUMBER OF 2 S.D. OUTLIERS 1. OR 3.83 PERCENT OF THE TOTAL
 VON NEUMANN RATIO 1.63769 DURBIN-WATSON TEST 1.58886
 NUMBER OF POSITIVE RESIDUALS 13.
 NUMBER OF NEGATIVE RESIDUALS 20.
 NUMBER OF RUNS OF SIGNS 18.

EXPECTED NUMBER OF RUNS OF SIGNS 17.
 EXPECTED S.D. OF RUN DISTRIBUTION 2.69574
 UNIT NORMAL DEViate
 Z-(EXPECTED-OBSERVED)/S.D. -2.32129
 PROBABILITY OF OBTAINING .GE. ABS(Z) .01014
 187.9388 PROJECTION, 9TH MONTH

FILE NAME (CREATION DATE - 18/14/82)
 INDEPENDENT VARIABLE... ACCOMP VOL,MAND,TIME

MEAN RESPONSE 243.98989 STD. DEV. 97.49916
 VARIABLE(S) ENTERED ON STEP NUMBER 1... VOL

MULTIPLE R .78319 ANALYSIS OF VARIANCE DF SUM OF SQUARES MEAN SQUARE F SIGNIFICANCE
 R SQUARE .49448 REGRESSION 1. 188417.65769 188417.65769 38.32277 .00
 ADJUSTED R SQUARE .47817 RESIDUAL 31. 153777.86958 4968.55863
 STD DEVIATION 78.43118 COEFF OF VARIABILITY 28.9 PCT

VARIABLES IN THE EQUATION				VARIABLES NOT IN THE EQUATION			
VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY	VARIABLE	PARTIAL TOLERANCE	F SIGNIFICANCE
VOL	3.8488418	.64446928	28.322274	.7871914	MAND	.44486	.97988
(CONSTANT)	28.612691	48.975884	.48761573	.88269			7.3687874
			.498				.811

 VARIABLES ENTERED ON STEP NUMBER 2... MAND

 MULTIPLE R .77882 ANALYSIS OF VARIANCE DF SUM OF SQUARES MEAN SQUARE F SIGNIFICANCE
 R SQUARE .59416 REGRESSION 2. 188741.18788 98378.55354 21.96861 .88
 ADJUSTED R SQUARE .56711 RESIDUAL 38. 123453.62828 4115.12867
 STD DEVIATION 64.14921 COEFF OF VARIABILITY 26.3 PCT

VARIABLES IN THE EQUATION				VARIABLES NOT IN THE EQUATION			
VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY	VARIABLE	PARTIAL TOLERANCE	F SIGNIFICANCE
VOL	3.3288136	.59288291	31.356398	.6879489			
MAND	2.7898372	.99826358	7.3687874	.82598			
(CONSTANT)	-4.9164928	39.311257	.1564140E-01	.3189533			
			.811	.19426			
			.981				

ALL VARIABLES ARE IN THE EQUATION.
 RETIREMENT PROJECTIONS, 9TH MONTH
 FILE MNAME (CREATION DATE = 18/14/82)
 INDEPENDENT VARIABLE.. ACCOMP VOL,MAND,TIME
 MULTIPLE REGRESSION
 18/14/82 28.34.43. PAGE 18

COEFFICIENTS AND CONFIDENCE INTERVALS.			
VARIABLE	B	STD ERROR B	T
VOL	3.3288136	.59288291	5.5986784
MAND	2.7898372	.99826358	2.7145511
CONSTANT	-4.9164928	39.311257	-.12586577
			95.0 PCT CONFIDENCE INTERVAL
			2.1894889 ; 4.5315462
			.67111117 ; 4.7485633
			-.05.288791 ; 75.367886

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

VOL
NAME
35163
- .99653
VOL MAND

IRETIREMENT PROJECTIONS, 9TH MONTH

18/14/82 25.34.43. PAGE 11

FILE NAME (CREATION DATE = 18/14/82)
DEPENDENT VARIABLE.. ACCOMP VOL.MAND.TIME

SUMMARY TABLE

STEP	VARIABLE ENTERED	REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	VOL		38.32277	.000	.78319	.49448	.49448	.78319	38.32277	.000
2	MAND		7.36879	.011	.77882	.59416	.09968	.41228	21.96861	.000

IRETIREMENT PROJECTIONS, 9TH MONTH

18/14/82 25.34.43. PAGE 12

FILE NAME (CREATION DATE = 18/14/82)

MULTIPLE REGRESSION

OBSERVATION Y VALUE Y ESTIMATE RESIDUAL

1.	368.8000	287.4794	72.3206	
2.	458.8000	361.1793	97.6207	
3.	488.8000	283.2816	144.5184	
4.	282.8000	228.3289	54.4711	
5.	272.8000	261.1824	-39.3824	
6.	16.0000	164.9644	-148.9644	
7.	219.8000	289.6550	-67.8550	
8.	228.8000	233.8169	-105.0169	
9.	208.8000	184.6199	124.1801	
10.	187.8000	282.7118	-94.9118	
11.	281.8000	217.4815	64.3185	
12.	299.8000	283.8148	15.9852	
13.	469.8000	453.2368	16.5632	
14.	476.8000	338.8354	137.9646	
15.	245.8000	319.6539	-63.8539	
16.	191.8000	231.9885	-40.1885	
17.	147.8000	192.6738	-44.8738	
18.	186.8000	249.4653	-62.6653	
19.	165.8000	223.7790	-57.9790	
20.	171.8000	138.8018	32.9982	
21.	171.8000	177.9025	-6.1025	
22.	152.8000	192.8623	-40.0623	
23.	184.8000	195.7264	-10.9264	
24.	283.8000	181.4981	102.3019	
25.	313.8000	424.8757	-111.0757	
26.	173.8000	270.8004	-97.0004	
27.	361.8000	251.8316	109.9684	
28.	345.8000	381.9064	-36.1064	
29.	287.8000	266.6785	21.1215	
30.	281.8000	183.7115	98.0885	
31.	185.8000	186.4216	-1.6216	
32.	139.8000	127.8276	11.9724	
33.	148.8000	185.4213	-37.6213	

NOTE - (1) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED	33.	OR	3.83 PERCENT OF THE TOTAL
NUMBER OF 2 S.D. OUTLIERS	1.		
VON NEUMANN RATIO	1.6822	DURBIN-WATSON TEST	1.55949
NUMBER OF POSITIVE RESIDUALS	14.		
NUMBER OF NEGATIVE RESIDUALS	19.		
NUMBER OF RUNS OF SIGNS	12.		
EXPECTED NUMBER OF RUNS OF SIGNS	17.		
EXPECTED S.D. OF RUN DISTRIBUTION	2.76895		
UNIT NORMAL DEViate			
/(EXPLICIT-UNIT)RVID/S.D.	-1.67432		
PROBABILITY OF OBTAINING .GE. ABS(Z)	.04783		
RETIREMENT PROJECTIONS, 9TH MONTH			

CPU TIME REQUIRED.. .2368 SECONDS

FINISH

TOTAL CPU TIME USED.. .2778 SECONDS

RUN COMPLETED

NUMBER OF CONTROL CARDS READ 12
NUMBER OF ERRORS DETECTED 0

18/14/82 28.34.43. PAGE 13

18/14/82 28.35.34. PAGE 1

VOGELBACK COMPUTING CENTER
NORTHWESTERN UNIVERSITY

S P S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 8.8 -- JUNE 18, 1979

RUN NAME RETIREMENT PROJECTIONS. 18TH MONTH
VARIABLE LIST ACCOMP.VOL.MAND.TIME
INPUT MEDIUM DISK
N OF CASES 32
INPUT FORMAT FRTTFLD
VAR LABELS ACCOMP.VOL.MAND.TIME
LIST CASES CATHS-37/VARIABLES-ACCOMP.VOL.MAND.TIME
REGRESSION METHOD-STEPWISE/VARIABLES-ACCOMP.VOL.MAND.TIME/
REGRESSION-ACCOMP WITH VOL.MAND.TIME/RESIDUALS/
STATISTICS ALL

***** CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

18/14/82 28.35.34. PAGE 2

RETIREMENT PROJECTIONS. 18TH MONTH

FILE MONAME (CREATION DATE = 18/14/82)

CASE-NO	ACCOMP	VOL	MAND	TIME
1	458.	59.	55.	2.
2	488.	57.	23.	3.
3	282.	51.	16.	4.
4	222.	55.	21.	5.
5	162.	39.	12.	6.
6	219.	77.	8.	7.
7	228.	58.	5.	8.
8	208.	58.	6.	9.
9	187.	49.	8.	10.
10	281.	56.	12.	11.
11	299.	75.	7.	12.
12	469.	111.	11.	13.
13	426.	68.	10.	14.
14	245.	51.	39.	15.
15	191.	47.	22.	16.
16	147.	48.	28.	17.
17	108.	56.	15.	18.
18	165.	47.	17.	19.
19	111.	31.	6.	20.
20	171.	48.	19.	21.
21				22.

21 152. 42. 21. 23.
 22 184. 45. 14. 24.
 23 283. 75. 22. 25.
 24 313. 73. 55. 26.
 25 193. 56. 27. 27.
 26 361. 47. 21. 28.
 27 345. 68. 25. 29.
 28 287. 68. 13. 30.
 29 286. 33. 28. 31.
 30 185. 47. 6. 32.
 31 135. 26. 11. 33.
 32 148. 33. 21. 34.
 33 148. 33. 21. 35.

RETIREMENT PROJECTIONS, 18TH MONTH

RETIREMENT PROJECTIONS, 18TH MONTH

FILE MONAME (CREATION DATE = 18/14/82)

***** MULTIPLE REGRESSION *****

18/14/82 28.36.34. PAGE 3
 18/14/82 28.36.34. PAGE 4

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	248.2813	96.7698	32
VOL	53.6258	16.6341	32
MAND	18.6875	12.1728	32
TIME	18.2188	9.9474	32

CORRELATION COEFFICIENTS.

A VALUE OF 99.9999 IS PRINTED
 IF A COEFFICIENT CANNOT BE COMPUTED.

VOL	.68269	
MAND	.48968	.89388
TIME	-.37147	-.31668
ACCOMP		.82118
	VOL	MAND

RETIREMENT PROJECTIONS, 18TH MONTH

FILE MONAME (CREATION DATE = 18/14/82)

***** MULTIPLE REGRESSION *****

DEPENDENT VARIABLE.. ACCOMP VOL.MAND.TIME

MEAN RESPONSE 248.28125 STD. DEV. 96.76984

VARIABLE(S) ENTERED ON STEP NUMBER 1.. VOL

MULTIPLE R	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.46687	REGRESSION	1.	135297.91963	135297.91963	.88
ADJUSTED R SQUARE	.44827	RESIDUAL	30.	184998.64912	6166.61838	26.18694
STD DEVIATION	71.67919	COEFF OF VARIABILITY	29.9 PCT			

----- VARIABLES IN THE EQUATION -----

----- VARIABLES NOT IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY	VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
VOL	3.9715972	.77610919	26.186939	.6826918	MAND	.47368	.99119	9.3898826
(CONSTANT)	27.384358	43.515353	.39371281	.88637	TIME	-.15198	.89972	.68489761
			.535					.415

VARIABLE(S) ENTERED ON STEP NUMBER 2.. MAND

MULTIPLE R .76542 ANALYSIS OF VARIANCE DF SUM OF SQUARES MEAN SQUARE F SIGNIFICANCE

R SQUARE .58587 REGRESSION 2. 178875.33435 85837.66718 28.61297 .00

ADJUSTED R SQUARE .55731 RESIDUAL 29. 128221.13448 4145.55636

STD DEVIATION 64.38688 COEFF OF VARIABILITY 26.8 PCT

VARIABLES IN THE EQUATION

VARIABLE B STD ERROR B F SIGNIFICANCE BETA ELASTICITY

VOL 3.7817223 .69828688 29.338838 .6588535

MAND 2.7639484 .95427836 8.3898826 .04399

(CONSTANT) -14.164745 41.525337 .11635664 .3476563

RETIREMENT PROJECTIONS, 18TH MONTH .21496

FILE _NONAME_ (CREATION DATE = 18/14/82)

DEPENDENT VARIABLE.. ACCOMP VOL,MAND,TIME

VARIABLE(S) ENTERED ON STEP NUMBER 3.. TIME

18/14/82 28.36.34. PAGE 6

VARIABLES NOT IN THE EQUATION

VARIABLE B STD ERROR B F SIGNIFICANCE BETA ELASTICITY

VOL 3.7817223 .69828688 29.338838 .6588535

MAND 2.7639484 .95427836 8.3898826 .04399

(CONSTANT) -14.164745 41.525337 .11635664 .3476563

RETIREMENT PROJECTIONS, 18TH MONTH .21496

FILE _NONAME_ (CREATION DATE = 18/14/82)

DEPENDENT VARIABLE.. ACCOMP VOL,MAND,TIME

VARIABLE(S) ENTERED ON STEP NUMBER 3.. TIME

18/14/82 28.36.34. PAGE 6

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY	VARIABLE	PARTIAL	TOLERANCE	F SIGNIFICANCE
VOL	3.9715972	.77610919	26.186939	.6826918	MAND	.47368	.99119	9.3898826
(CONSTANT)	27.384358	43.515353	.39371281	.88637	TIME	-.15198	.89972	.68489761
			.535					.415

VOL	3.5253987	.73478658	23.824421	.6859332
MAND	2.8198128	.95257978	8.7625994	.78678
TIME	-1.3332469	1.2234283	1.1875835	.21931
(CONSTANT)	22.826584	53.538294	.18183714	-.18189

ALL VARIABLES ARE IN THE EQUATION.

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL
VOL	3.5253987	.73478658	4.798769	2.8284287 ; 6.8383768
MAND	2.8198128	.95257978	2.961857	.86854174 ; 4.7718839
TIME	-1.3332469	1.2234283	-1.0897638	-3.8393261 ; 1.1728323
CONSTANT	22.826584	53.538294	.42642366	-86.825253 ; 132.47842

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

VOL	.53979
MAND	-.87422
TIME	.28776

RETIREMENT PROJECTIONS, 18TH MONTH

FILE MONAME (CREATION DATE = 18/14/82)
 INDEPENDENT VARIABLE.. ACCOMP VOL,MAND,TIME

18/14/82 28.36.34. PAGE 7

SUMMARY TABLE

STEP	VARIABLE ENTERED	REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	VOL		26.18694	.888	.68269	.45687	.45687	.68269	26.18694	.888
2	MAND		8.38998	.887	.76542	.58587	.11988	.48668	28.51297	.888
3	TIME		1.18758	.285	.77635	.68272	.81685	-.32147	14.15963	.888
RETIREMENT PROJECTIONS, 18TH MONTH										
FILE MONAME (CREATION DATE = 18/14/82)										
OBSERVATION Y VALUE Y ESTIMATE Y RESIDUAL										
1.	458.8888	386.8681	71.93187							
2.	488.0000	284.6383	123.3697							
3.	282.8888	242.4859	39.59486							
4.	222.0000	269.2733	-47.27335							
5.	162.0000	186.1554	-24.15541							
6.	219.8888	387.5881	-88.58886							
7.	228.8888	233.5526	-13.55261							

8. 288.8888
 9. 187.8888
 10. 281.8888
 11. 239.4289
 12. 298.9712
 13. 427.8316
 14. 283.3116
 15. 291.7677
 16. 227.8918
 17. 196.2483
 18. 217.2144
 19. 289.7922
 20. 124.5688
 21. 188.8075
 22. 195.4447
 23. 197.4744
 24. 315.9362
 25. 406.6868
 26. 268.3862
 27. 218.4855
 28. 266.1017
 29. 231.8187
 30. 154.2783
 31. 161.4421
 32. 168.1745
 151.7172

-4.816174
 -17.79715
 -38.42895
 8.828786
 41.16843
 132.6884
 -46.26267
 -36.89181
 -49.24034
 -57.21441
 -44.79228
 -3.568935
 -17.80754
 -47.44472
 -8.474379
 -32.93628
 -87.68598
 -67.38619
 158.5945
 78.81833
 -24.81867
 51.76966
 23.55795
 38.82558
 -3.717178

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
 R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED 32.
 NUMBER OF 2 S.D. OUTLIERS 2. OR 6.25 PERCENT OF THE TOTAL
 VON NEUMANN RATIO 1.36465 DURBIN-WATSON TEST 1.32288
 NUMBER OF POSITIVE RESIDUALS 11.
 NUMBER OF NEGATIVE RESIDUALS 21.
 NUMBER OF RUNS OF SIGNS 8.

EXPECTED NUMBER OF RUNS OF SIGNS 15.
 EXPECTED S.D. OF RUN DISTRIBUTION 2.58164
 UNIT NORMAL DEVIATE
 Z=((EXPECTED-OBSERVED))/S.D.
 PROBABILITY OF OBTAINING .GE. ABS(Z)
 RETIREMENT PROJECTIONS. 18TH MONTH .85278

FILE NAME (CREATION DATE = 18/14/82)
 MULTIPLE REGRESSION
 DEPENDENT VARIABLE.. ACCOMP VOL.MAND.TIME
 MEAN RESPONSE 248.28125 STD. DEV. 96.76984
 VARIABLE(S) ENTERED ON STEP NUMBER 1... VOL

MULTIPLE R .68269 ANALYSIS OF VARIANCE DF SUM OF SQUARES MEAN SQUARE F SIGNIFICANC
 R SQUARE .46687 REGRESSION 1. 135297.91963 135297.91963 26.18694 .88
 ADJUSTED R SQUARE .44827 RESIDUAL 38. 154998.54912 5166.61838
 STD DEVIATION 71.87919 COEFF OF VARIABILITY 29.9 PCT

----- VARIABLES IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F	BETA	PARTIAL	TOLERANCE	F	SIGNIFICANCE
VOL	3.9715972	.77618919	26.186939	.6826918				
(CONSTANT)	27.386358	43.615353	.39371281	.88637	.47368	.99119	8.3898026	.007

VARIABLE(S) ENTERED ON STEP NUMBER 2.. MAND

MULTIPLE R	.76542	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.58587	REGRESSION	2.	178875.33435	89437.66718	28.51297	.00
ADJUSTED R SQUARE	.55731	RESIDUAL	29.	128221.13448	4421.55636		
STD DEVIATION	64.38688	COEFF OF VARIABILITY	26.8 PCT				

----- VARIABLES NOT IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F	BETA	PARTIAL	TOLERANCE	F	SIGNIFICANCE
VOL	3.7817223	.69828688	29.338838	.658535				
MAND	2.7639484	.95427836	8.3898026	.84399				
(CONSTANT)	-14.164745	41.525337	.11635664	.21496				

ALL VARIABLES ARE IN THE EQUATION.
RETIREMENT PROJECTIONS, 18TH MONTH

18/14/82 28.36.34. PAGE 18

FILE MONAME (CREATION DATE = 18/14/82)
DEPENDENT VARIABLE.. ACCOMP VOL.MAND.TIME

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL
VOL	3.7817223	.69828688	5.4157286	2.3835659
MAND	2.7639484	.95427836	2.8963913	5.2898777
CONSTANT	-14.164745	41.525337	-.34111889	-1223833
				4.7156424
				99.893556
				78.764187

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

VOL .48768
 MAND -.86256 .91863
 VOL MAND

IRETIREMENT PROJECTIONS, 18TH MONTH

18/14/82 28.36.34. PAGE 11

FILE MONAME (CREATION DATE - 18/14/82.)

DEPENDENT VARIABLE... ACCOMP VOL.MAND.TIME

MULTIPLE REGRESSION

SUMMARY TABLE

STEP	VARIABLE ENTERED	REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	VOL		26.18694	.887	.68269	.45687	.45687	.68269	26.18694	.887
2	MAND		8.38988	.887	.76542	.68587	.11988	.48868	28.61297	.887
IRETIREMENT PROJECTIONS, 18TH MONTH						18/14/82	28.36.34.	PAGE 12		

FILE MONAME (CREATION DATE - 18/14/82.)

DEPENDENT VARIABLE... ACCOMP VOL.MAND.TIME

MULTIPLE REGRESSION

+2S

-2SD

RESIDUAL

Y ESTIMATE

Y VALUE

OBSERVATION

1.	458.8008	363.7375	94.26247
2.	488.0008	264.9541	143.8359
3.	282.0008	222.9761	59.87306
4.	222.0008	251.8727	-29.87273
5.	162.0008	166.4837	-4.489718
6.	219.8008	299.1394	-88.13948
7.	278.8008	221.7588	-1.750792
8.	288.8008	191.5458	8.49487
9.	187.8008	193.2512	-6.251172
10.	241.8008	238.7758	-29.77899
11.	293.8008	288.8128	18.18799
12.	469.8008	436.8098	32.98822
13.	426.8008	292.7433	133.2507
14.	245.0008	286.4968	-41.49677
15.	191.8008	224.3829	-33.38289
16.	147.0008	192.3828	-45.38286
17.	108.8008	239.8788	-59.87881
18.	155.8008	218.5632	-45.56319
19.	121.8008	123.4348	-2.434812
20.	171.8008	189.6198	-18.61981
21.	152.8008	202.7183	-50.71834
22.	104.8008	198.4896	-14.48965
23.	283.8008	338.2711	-47.27112
24.	313.8008	413.9177	-188.9177
25.	193.8008	272.2381	-79.23889
26.	361.8008	221.6198	139.3818
27.	345.8008	281.8371	63.16298
28.	287.8008	248.6698	-41.66982
29.	286.8008	165.9189	48.88918
30.	185.8008	188.1598	4.848154
31.	139.8008	114.5634	24.43652
32.	148.8008	168.6788	-28.67884

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
 R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED	32.	3. OR	9.38 PERCENT OF THE TOTAL
NUMBER OF 2 S.D. OUTLIERS			
VON NEUMANN RATIO	1.35528		DURBIN-WATSON TEST 1.31293
NUMBER OF POSITIVE RESIDUALS	12.		
NUMBER OF NEGATIVE RESIDUALS	28.		
NUMBER OF RUNS OF SIGNS	18.		
EXPECTED NUMBER OF RUNS OF SIGNS			16.
EXPLICIT S.D. OF RUN DISTRIBUTION			2.68273
UNIT NORMAL DEViate-			
Z=(EXPECTED-OBSERVED)/S.D.			-2.11317
PROBABILITY OF OBTAINING .GE. ABS(Z)			.01729
RETIREMENT PROJECTIONS, 18TH MONTH			
CPU TIME REQUIRED..	.2368	SECONDS	
FINISH			
TOTAL CPU TIME USED..	.2768	SECONDS	
RUN COMPLETED			
NUMBER OF CONTROL CARDS READ	12		
NUMBER OF ERRORS DETECTED	0		

18/14/82 28.36.34. PAGE '13

VOSELBACK COMPUTING CENTER
NORTHWESTERN UNIVERSITY

S P S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES
VERSION 8.8 -- JUNE 18, 1979

18/14/82 28.41.16. PAGE 1

RUN NAME RETIREMENT PROJECTIONS. 11TH MONTH
VARIABLE LIST ACCOMP.VOL.MAND.TIME
INPUT MEDIUM DISK
N OF CASES 32
INPUT FORMAT FREEFIELD
VAR LABELS ACCOMP.VOL.MAND.TIME
LIST CASES CASES-32/VARIABLES-ACCOMP.VOL.MAND.TIME/
REGRESSION METHOD-STEPWISE/VARIABLES-ACCOMP.VOL.MAND.TIME/
REGRESSION-ACCOMP WITH VOL.MAND.TIME/RESIDUALS/
REGRESSION-ACCOMP WITH VOL.MAND/RESIDUALS/
STATISTICS ALL

88854488 CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

RETIREMENT PROJECTIONS. 11TH MONTH
FILE NAME (CREATION DATE = 18/14/82)

18/14/82 28.41.16. PAGE 2

CASE-NO	ACCOMP	VOL	MAND	TIME
1	458.	52.	57.	1.
2	498.	46.	23.	2.
3	282.	48.	16.	3.
4	222.	41.	22.	4.
5	162.	33.	12.	5.
6	219.	62.	2.	6.
7	228.	46.	5.	7.
8	288.	43.	7.	8.
9	187.	42.	8.	9.
10	281.	53.	12.	10.
11	299.	59.	7.	11.
12	469.	85.	11.	12.
13	426.	58.	19.	13.
14	245.	41.	29.	14.
15	191.	35.	23.	15.
16	147.	37.	22.	16.
17	188.	58.	16.	17.
18	165.	41.	21.	18.
19	121.	29.	8.	19.
20	171.	36.	28.	20.
21				21.

RETIREMENT PROJECTIONS, 11TH MONTH

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	248.2813	96.7608	32
VOL	44.5313	12.4384	32
MAND	19.1875	12.1534	32
TIME	17.2188	9.9474	32

RETIREMENT PROJECTIONS, 11TH MONTH

FILE NAME (CREATION DATE 18/14/92)

18/14/92 28.41.16. PAGE 3

18/14/92 28.41.16. PAGE 4

MULTIPLE REGRESSION

CORRELATION COEFFICIENTS.

A VALUE OF 99.99999 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

VOL .67918
MAND .39534
TIME -.32147

ACCOMP VOL MAND

RETIREMENT PROJECTIONS, 11TH MONTH

FILE NAME (CREATION DATE 18/14/92)

18/14/92 28.41.16. PAGE 5

MEAN RESPONSE 248.28125 STD. DEV. 96.76984

VARIABLE(S) ENTERED ON STEP NUMBER 1.. VOL

MULTIPLE R	.67918	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANC
R SQUARE	.46117	REGRESSION	1.	133876.74144	133876.74144	25.67644	.00
ADJUSTED R SQUARE	.44321	RESIDUAL	30.	156419.72731	5213.99091		
STD DEVIATION	72.20757	COEFF OF VARIABILITY	30.1 PCT				

----- VARIABLES IN THE EQUATION -----

----- VARIABLES NOT IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY	PARTIAL TOLERANCE	F SIGNIFICANCE
VOL	8.286719B	1.843323B	25.676443	.679B968	.47713	.99531
(CONSTANT)	4.857845B	48.102885	.18161857E-01	.97975	-.18952	.86818
			.928			.3528967
						.558

VARIABLE(S) ENTERED ON STEP NUMBER 2.. MAND

MULTIPLE R		ANALYSIS OF VARIANCE		DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.76489	REGRESSION	2.	169486.81291	84743.48646	28.34248		
ADJUSTED R SQUARE	.58384	RESIDUAL	29.	12889.65584	4165.85828			
STD DEVIATION	.55514	COEFF OF VARIABILITY	26.9 PCT					

VARIABLE(S) ENTERED ON STEP NUMBER 3.. TIME

MULTIPLE R		ANALYSIS OF VARIANCE		DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.76967	REGRESSION	3.	171978.86257	57323.62886	13.56478		
ADJUSTED R SQUARE	.59248	RESIDUAL	28.	118325.68618	4225.91451			
STD DEVIATION	.54873	COEFF OF VARIABILITY	27.1 PCT					

FILE NAME (CREATION DATE = 18/14/82)

DEPENDENT VARIABLE... ACCOMP VOL.MAND.TIME

18/14/82 28.41.16. PAGE 6

VARIABLE(S) ENTERED ON STEP NUMBER 3.. TIME

MULTIPLE R		ANALYSIS OF VARIANCE		DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.76967	REGRESSION	3.	171978.86257	57323.62886	13.56478		
ADJUSTED R SQUARE	.59248	RESIDUAL	28.	118325.68618	4225.91451			
STD DEVIATION	.54873	COEFF OF VARIABILITY	27.1 PCT					

8.	288.8888	287.4363	-7.436333
9.	197.8888	284.4737	-17.47367
10.	281.8888	267.7774	-66.77742
11.	299.8888	281.6096	17.39844
12.	412.8888	417.1686	51.83136
13.	4.6.8888	387.7471	118.2579
14.	245.8888	281.3089	-36.38887
15.	191.8888	286.3088	-15.38879
16.	147.8888	212.1477	-65.14774
17.	188.8888	256.8783	-76.87838
18.	165.8888	226.6624	-61.66236
19.	121.8888	131.2223	-18.22233
20.	171.8888	197.8718	-26.87379
21.	152.8888	185.2771	-33.22788
22.	104.8888	295.8775	-31.87754
23.	241.8888	338.9917	-37.99166
24.	111.8888	191.8411	-88.84189
25.	193.8888	232.8851	-39.88518
26.	361.8888	284.4883	156.5197
27.	345.8888	262.9671	82.83792
28.	297.8888	247.4781	-48.42811
29.	286.8888	153.4118	52.58898
30.	185.8888	138.8696	46.93845
31.	139.8888	112.6786	26.32937
32.	148.8888	153.5381	-5.538138

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED 32.
NUMBER OF 2 S.D. OUTLIERS 2. OR 6.25 PERCENT OF THE TOTAL
VON NEUMANN RATIO 1.32692 DURBIN-WATSON TEST 1.28546

NUMBER OF POSITIVE RESIDUALS 11.
NUMBER OF NEGATIVE RESIDUALS 21.
NUMBER OF RUNS OF SIGNS 8.

EXPECTED NUMBER OF RUNS OF SIGNS 15.
EXPECTED S.D. OF RUN DISTRIBUTION 2.58164
UNIT NORMAL DEVIATE
Z=(EXPECTED-OBSERVED)/S.D. -2.77318
PROBABILITY OF OBTAINING .GE. ABS(Z) .00278
1 RETIREMENT PROJECTIONS, 11TH MONTH

FILE NAME (CREATION DATE = 18/14/82)
DEPENDENT VARIABLE.. ACCOMP VOL,MAND,TIME

MEAN RESPONSE 248.28125 STD. DEV. 96.76984
VARIABLE(S) ENTERED ON STEP NUMBER 1.. VOL

MULTIPLE R .67918
R SQUARE .46117
ADJUSTED R SQUARE .44321
STD DEVIATION 72.28797

ANALYSIS OF VARIANCE
REGRESSION 1.
RESIDUAL 38.
COEFF OF VARIABILITY 38.1 PCT

SUM OF SQUARES
133876.74144
186019.72731

MEAN SQUARE
133876.74144
5213.99091

F SIGNIFICANC
26.67644 .00

18/14/82 28.41.16. PAGE 9

----- VARIABLES IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY	VARIABLE	PARTIAL TOLERANCE	F SIGNIFICANCE
VOL	5.286719B	1.843323B	25.676443 .000	.6798968 .97979	MAND	.47713	.99531 9.5488922 .007
(CONSTANT)	4.857845B	48.182885	.18161857E-01 .92B				

----- VARIABLES NOT IN THE EQUATION -----

.....

VARIABLE(S) ENTERED ON STEP NUMBER 2.. MAND

.....

MULTIPLE R	.76489	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.58384	REGRESSION	2.	169486.81291	94743.48646	28.3424B	.00
ADJUSTED R SQUARE	.55514	RESIDUAL	29.	128889.65584	4155.8582B		
STD DEVIATION	64.5434B	COEFF OF VARIABILITY	26.9 PCT				

----- VARIABLES IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY	VARIABLE	PARTIAL TOLERANCE	F SIGNIFICANCE
VOL	5.8995812	.93477451	29.76868B .000	.6558481 .94589			
MAND	2.7952999	.95687986	8.5488922 .007	.3518645 .22322			
(CONSTANT)	-4B.448731	45.769776	.78869325 .384				

----- VARIABLES NOT IN THE EQUATION -----

ALL VARIABLES ARE IN THE EQUATION.
RETIREMENT PROJECTIONS, 11TH MONTH

FILE MONAME (CREATION DATE = 18/14/82)

----- MULTIPLE REGRESSION -----

DEPENDENT VARIABLE.. ACCOMP VOL.MAND.TIME

18/14/82 28.41.16. PAGE 18

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL
VOL	5.8995812	.93477451	5.4553277	3.1876727 : 7.8113298
MAND	2.7952999	.95687986	2.9237121	.8398963 : 4.7587811
CONSTANT	-4B.448731	45.769776	-.88356947	-134.85844 : 83.168973

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

VOL
MANG
-07388
-06122 .91489
VOL MANG

IRETIREMENT PROJECTIONS, 11TH MONTH

FILE MONAME ICREATION DATE = 18/14/82)
DEPENDENT VARIABLE.. ACCOMP VOL.MANG.TIME

18/14/82 28.41.16. PAGE 11

SUMMARY TABLE

STEP	VARIABLE ENTERED	REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	VOL		25.67644	.888	.67918	.46117	.46117	.67918	25.67644	.888
2	MANG		8.54889	.887	.76489	.12267	.12267	.39594	28.34248	.888

IRETIREMENT PROJECTIONS, 11TH MONTH

FILE MONAME ICREATION DATE = 18/14/82)

MULTIPLE REGRESSION

-2SD

RESIDUAL

Y ESTIMATE

Y VALUE

OBSERVATION

1.

1.	458.0000	384.8654	73.93457
2.	498.0000	258.4282	149.5718
3.	282.0000	243.8081	37.93987
4.	277.0000	238.1354	-8.135417
5.	162.0000	161.3864	.6135917
6.	219.0000	385.8868	-81.08684
7.	224.0000	216.9781	9.091875
8.	200.0000	198.4049	1.595079
9.	107.0000	106.1007	-9.100778
10.	201.0000	263.3764	-67.37643
11.	299.0000	279.9969	19.99966
12.	469.0000	423.7652	45.23483
13.	426.0000	388.4418	117.5598
14.	245.0000	277.6545	-32.65552
15.	191.0000	207.3147	-11.3371
16.	147.0000	209.7374	-62.73741
17.	100.0000	259.2591	-79.25913
18.	165.0000	277.3991	-62.39912
19.	121.0000	129.8072	-8.807284
20.	171.0000	199.8473	-28.84731
21.	152.0000	186.5441	-34.54411
22.	104.0000	210.5683	-26.56832
23.	203.0000	332.1254	-49.12544
24.	313.0000	403.9723	-98.97233
25.	193.0000	239.8174	-46.81742
26.	361.0000	212.8416	148.9884
27.	345.0000	274.2178	78.78217
28.	207.0000	261.8722	-54.87223
29.	206.0000	161.8466	44.95348
30.	105.0000	149.7141	35.28589
31.	139.0000	122.8946	16.18548
32.	140.0000	165.6558	-17.65588

NOTE - (R) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED 32. OR 6.25 PERCENT OF THE TOTAL
 NUMBER OF 2 S.D. OUTLIERS 2. OR
 VON NEUMANN RATIO 1.33887 BURBIN-WATSON TEST 1.29697
 NUMBER OF POSITIVE RESIDUALS 14.
 NUMBER OF NEGATIVE RESIDUALS 18.
 NUMBER OF RUNS OF SIGNS 12.
 EXPECTED NUMBER OF RUNS OF SIGNS 17.
 EXPECTED S.D. OF RUN DISTRIBUTION 2.73751
 UNIT NORMAL DEVIATE -1.55251
 Z-(EXPECTED-OBSERVED)/S.D. .8527
 PROBABILITY OF OBTAINING GE. ABS(Z)
 RETINEMENT PROJECTIONS, 11TH MONTH

18/14/82 28.41.16. PAGE 13

CPU TIME REQUIRED.. .221/ SECONDS

FINISH

TOTAL CPU TIME USED.. .264/ SECONDS

RUN COMPLETED

NUMBER OF CONTROL CARDS READ 12
 NUMBER OF ERRORS DETECTED 0

VOGELBACK COMPUTING CENTER
NORTHWESTERN UNIVERSITY

S P S S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 8.0 -- JUNE 18, 1979

18/14/82 28.39.39.

PAGE 1

RUN NAME RETIREMENT PROJECTIONS, 12TH MONTH
VARIABLE LIST ACCOMP.VOL.MAND.TIME
INPUT MEDIUM DISK
N OF CASES 38
INPUT FORMAT FREEFIELD
VAR LABELS ACCOMP.VOL.MAND.TIME
LIST CASES CASTS=38/VARIABLES=ACCOMP.VOL.MAND.TIME
REGRESSION METHOD=STEPWISE/VARIABLES=ACCOMP.VOL.MAND.TIME/
REGRESSION=ACCOMP WITH VOL.MAND.TIME/RESIDUALS/
STATISTICS ALL

88854488 CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

RETIREMENT PROJECTIONS, 12TH MONTH

FILE MONAME (CREATION DATE = 18/14/82)

CASE-NO	ACCOMP	VOL	MAND	TIME
1	488.	38.	25.	1.
2	222.	36.	22.	3.
3	162.	26.	13.	4.
4	219.	53.	18.	5.
5	228.	36.	7.	6.
6	289.	36.	7.	7.
7	187.	35.	9.	8.
8	281.	49.	14.	9.
9	299.	59.	7.	18.
10	469.	67.	11.	11.
11	426.	36.	19.	13.
12	245.	33.	42.	14.
13	191.	29.	28.	15.
14	147.	25.	22.	16.
15	188.	34.	17.	17.
16	165.	33.	23.	18.
17	121.	22.	8.	19.
18	171.	38.	21.	28.
19	152.	26.	22.	21.
20	184.	26.	16.	22.

18/14/82

28.39.39.

PAGE 2

21 283. 49. 22. 23.
 22 313. 33. 69. 24.
 23 193. 30. 27. 25.
 24 361. 27. 23. 26.
 25 345. 33. 76. 27.
 26 707. 40. 13. 28.
 27 206. 25. 22. 29.
 28 185. 25. 6. 31.
 29 139. 22. 12. 32.
 30 148. 23. 21. 33.

RETIREMENT PROJECTIONS, 12TH MONTH
 RETIREMENT PROJECTIONS, 12TH MONTH

FILE MONAME (CREATION DATE = 18/14/82.)

MULTIPLE REGRESSION *****

18/14/82 28.39.39. PAGE 3
 18/14/82 28.39.39. PAGE 4

VARIABLE	MEAN	STANDARD DEV	CASES
ACCOMP	231.6133	98.7651	38
VOL	34.5133	11.8477	38
MAND	19.1333	11.8244	38
TIME	17.2333	9.4164	38

CORRELATION COEFFICIENTS.

A VALUE OF 99.9999 IS PRINTED IF A COEFFICIENT CANNOT BE COMPUTED.

VOL	.55998	
MAND	.20778	-.28863
TIME	-.21882	-.46563
	ACCOMP	-.21894
	VOL	
	MAND	

RETIREMENT PROJECTIONS, 12TH MONTH

FILE MONAME (CREATION DATE = 18/14/82.)

MULTIPLE REGRESSION *****

18/14/82 28.39.39. PAGE 5

MEAN RESPONSE 231.6333 STD. DEV. 98.76513
 VARIABLE(S) ENTERED ON STEP NUMBER 1.. VOL

MULTIPLE R	.55998	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.31357	REGRESSION	1.	74916.46819	74916.46819	12.79184	.00
ADJUSTED R SQUARE	.28986	RESIDUAL	28.	163994.50648	5856.94666		
STD DEVIATION	76.53869	COEFF OF VARIABILITY	33.8 PCT				

----- VARIABLES IN THE EQUATION -----

----- VARIABLES NOT IN THE EQUATION -----

VARIABLE	B	STD ERROR B	F	BETA	VARIABLE	PARTIAL	TOLERANCE	F

	SIGNIFICANCE	ELASTICITY	MAND	SIGNIFICANCE
VOL	4.686558	12.791844	.6599778	4.9718948
(CONSTANT)	72.757365	46.568348	.68589	.734
			.129	.12984926
				.721

VARIABLE(S) ENTERED ON STEP NUMBER 2.. MAND

	MULTIPLE R	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
F	.64831	REGRESSION	2.	188415.58846	58287.75823	9.70811	.88
I	.47831	RESIDUAL	27.	138495.45621	5129.46171		
	.37736	COEFF OF VARIABILITY	38.9 PCT				
	71.62826						

VARIABLES IN THE EQUATION

VARIABLE	B	STD ERROR B	F	BETA	ELASTICITY	VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
VOL	8.1583417	1.2288211	17.566806	.6268836		TIME	.81728	.76888	.77645531E-8	.938
MAND	2.7282359	1.2236463	4.9718948	.76784						
(CONSTANT)	1.5746228	54.823571	.84954658E-83	.3334767	.22536					
			.977							

F-LEVEL OR TOLERANCE-LEVEL INSUFFICIENT FOR FURTHER COMPUTATION.
1 RETIREMENT PROJECTIONS, 12TH MONTH

FILE NAME (CREATION DATE = 18/14/82)
MULTIPLE REGRESSION
INDEPENDENT VARIABLE.. ACCOMP VOL,MAND,TIME

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.8 PCT CONFIDENCE INTERVAL
VOL	8.1583417	1.2288211	4.1912869	2.6298891 ; 7.6716742
MAND	2.7282359	1.2236463	2.295952	.21752188 ; 5.2389586
CONSTANT	1.5746228	54.823581	.29145982E-81	-189.27245 ; 112.42169

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

VOL	1.51888
MAND	.38168 1.49731

VOL MAND

IRETIREMENT PROJECTIONS, 12TH MONTH

18/14/82 28.39.39. PAGE 7

FILE NAME (CREATION DATE - 18/14/82)
 MULTIPLE REGRESSION *****
 INDEPENDENT VARIABLE.. ACCOMP VOL.MAND.TIME

SUMMARY TABLE

STEP	VARIABLE ENTERED	ENTER OR REMOVE	F TO REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	OVERALL F	SIGNIFICANCE
1	VOL		12.79184	.881	.55998	.31357	.31357	.55998	12.79184	.881
2	MAND		4.97189	.634	.64831	.42831	.19673	.28778	9.78811	.601

IRETIREMENT PROJECTIONS, 12TH MONTH

18/14/82 28.39.39. PAGE 8

FILE NAME (CREATION DATE - 18/14/82)
 MULTIPLE REGRESSION *****

OBSERVATION	Y VALUE	Y ESTIMATE	RESIDUAL	-2SD	RESIDUAL	+2SD
1.	488.8888	265.4935	142.5865			
2.	222.8888	247.8081	-25.8081			
3.	162.8888	178.9586	-8.9586			
4.	219.8888	381.8251	-82.8251			
5.	278.8888	286.8846	-13.9154			
6.	208.8888	286.8846	-6.8846			
7.	187.8888	286.8846	-19.3907			
8.	281.8888	292.1367	-11.1367			
9.	469.8888	324.5424	145.3464			
10.	426.8888	376.6581	49.2307			
11.	245.8888	238.8234	107.0654			
12.	191.8888	227.3251	-35.4363			
13.	147.8888	190.3344	-42.4456			
14.	188.8888	223.8662	-35.8774			
15.	165.8888	234.2853	-68.3965			
16.	171.8888	136.7888	35.0990			
17.	171.8888	213.3778	-41.4890			
18.	152.8888	195.5847	-42.6959			
19.	184.8888	179.1353	5.7535			
20.	283.8888	313.9626	-30.0738			
21.	313.8888	332.5818	-19.5818			
22.	193.8888	229.7472	-36.7472			
23.	361.8888	283.3833	78.5055			
24.	345.8888	247.4700	98.4188			
25.	287.8888	243.8554	44.0334			
26.	286.8888	198.3544	88.5344			
27.	185.8888	146.7826	39.1062			
28.	135.8888	147.6218	-11.7330			
29.	148.8888	177.3254	-29.4366			

NOTE - (*) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
 R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED 38.
 NUMBER OF 2 S.D. OUTLIERS 2. OR 6.67 PERCENT OF THE TOTAL
 VON NEUMANN RATIO 1.51183 DUBIN-WATSON TEST 1.46143

NUMBER OF POSITIVE RESIDUALS 9.
NUMBER OF NEGATIVE RESIDUALS 21.
NUMBER OF RUNS OF SIGNS 12.

NORMAL APPROXIMATION TO SIGN DISTRIBUTION IMPOSSIBLE.
USE A TABLE FOR EXPECTED VALUES.

APPENDIX L
RET4 Residual Analysis

RET4 Residual Analysis

SPSS Output

As mentioned before, RET4's Durbin-Watson statistic indicated the possibility of positive autocorrelation. For 32 observations and three variables, D is 1.24 and D is 1.65. Because RET4's Durbin-Watson statistic was calculated to be 1.45, this test was inconclusive. Therefore, supplementary evaluation techniques were required. These additional techniques involved time series analysis, residual plot analysis, and a runs test statistic. The results from each analysis are discussed below.

Runs Test. In addition to the Durbin-Watson statistic, SPSS also provides a Runs Test statistic on the residuals. The SPSS output concerning this statistic follows:

NUMBER OF POSITIVE RESIDUALS	16
NUMBER OF NEGATIVE RESIDUALS	16
NUMBER OF RUNS OF SIGNS	11
EXPECTED NUMBER OF RUNS OF SIGNS	17
PROBABILITY OF OBSERVED RUNS	2.4%

As with the Durbin-Watson Statistic, this nonparametric test also indicated the existence of positive autocorrelation among the residuals. Therefore, positive

autocorrelation could not be ruled out, and additional weight had to be placed upon the other validation techniques.

Residual Plot Analysis

Although Residual Plot Analysis cannot by itself prove or disprove autocorrelation, it can provide insight concerning the existence of additional variables or polynomial terms. Therefore, in hopes of discovering a reason for the possible autocorrelation, residual plots were made of:

1. Time vs. Residuals
2. Accomplished Retirements vs. Residuals
3. Voluntary Retirements vs. Residuals
4. Mandatory Retirements vs. Residuals

These plots are displayed in Figures L-1 through L-4.

Since only the Time vs. Residuals scattergram was found to contain a discernible pattern to the residuals, it was concluded that a polynomial containing a variable currently in the equation was not indicated. Therefore, the Time vs. Residuals scattergram was examined more closely in hopes of discovering a systematic pattern that could be explained by the introduction of another variable. However, due to the limited size of the data base, the validity of additional variables is questionable.

Time vs. Residuals. If the residuals are broken down by fiscal year, a pattern emerges. Figure L-5, displays these

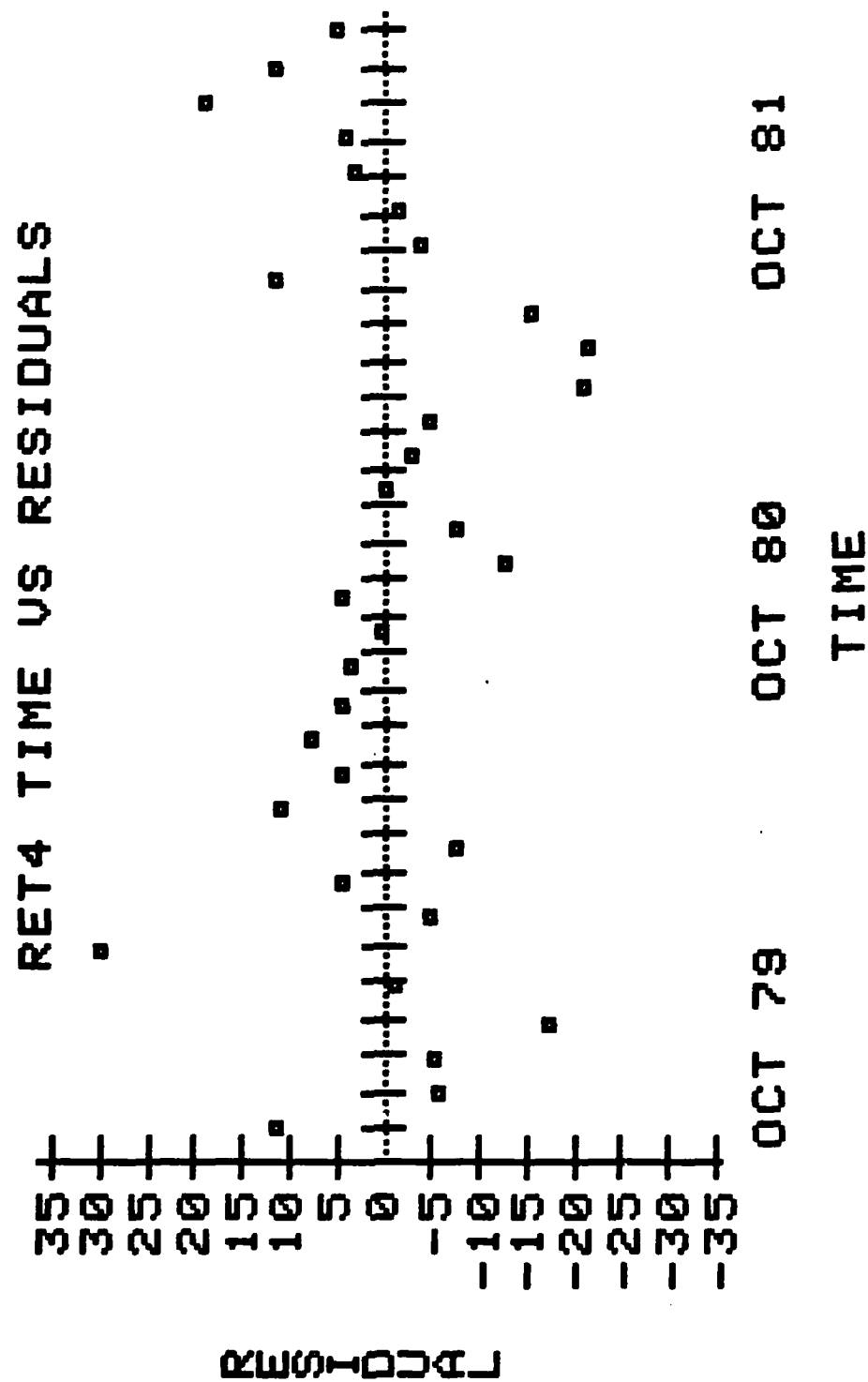


FIGURE L-1. RET4 Time vs Residuals

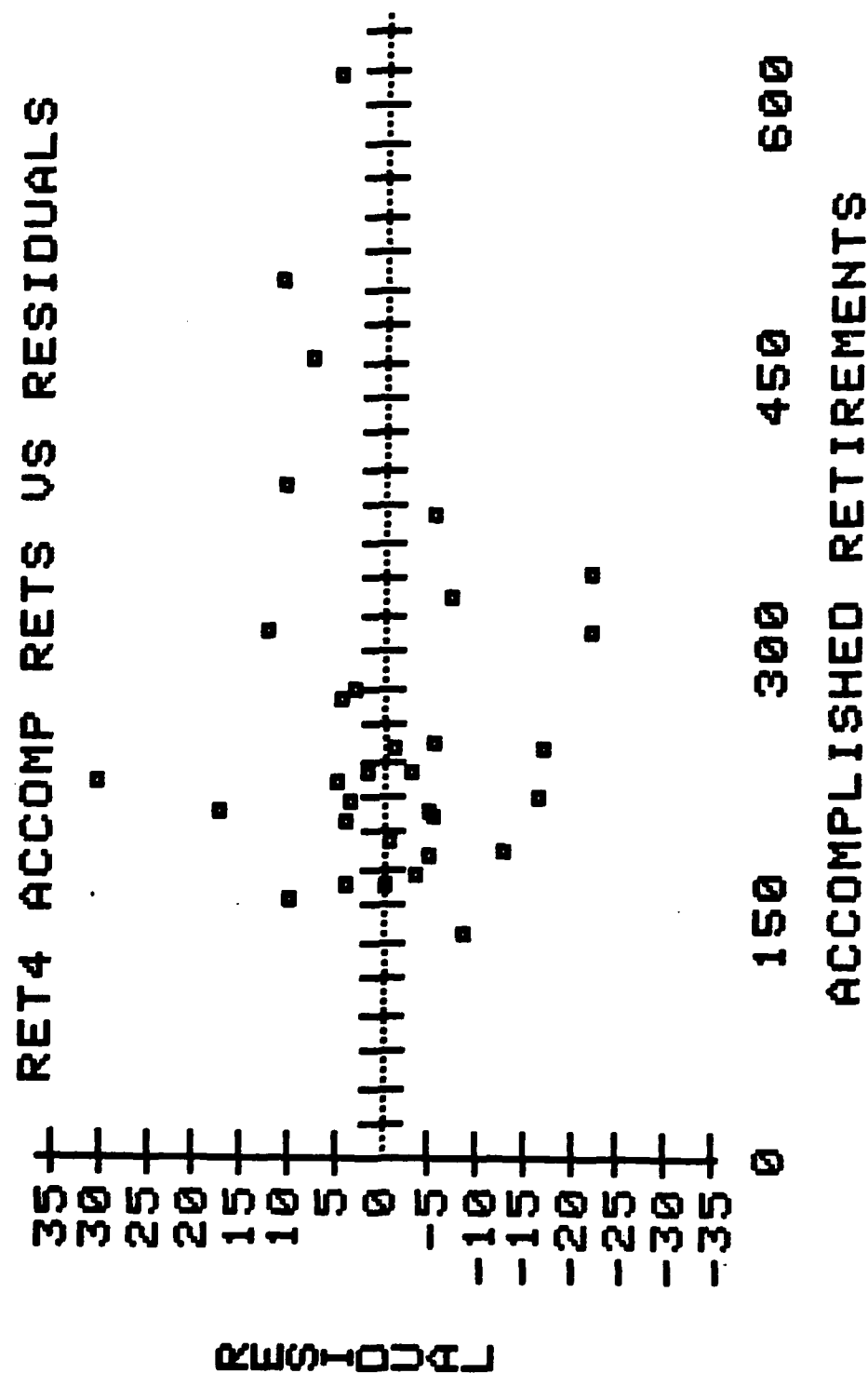


FIGURE L-2. RET4 Accomplished Retirements vs Residuals

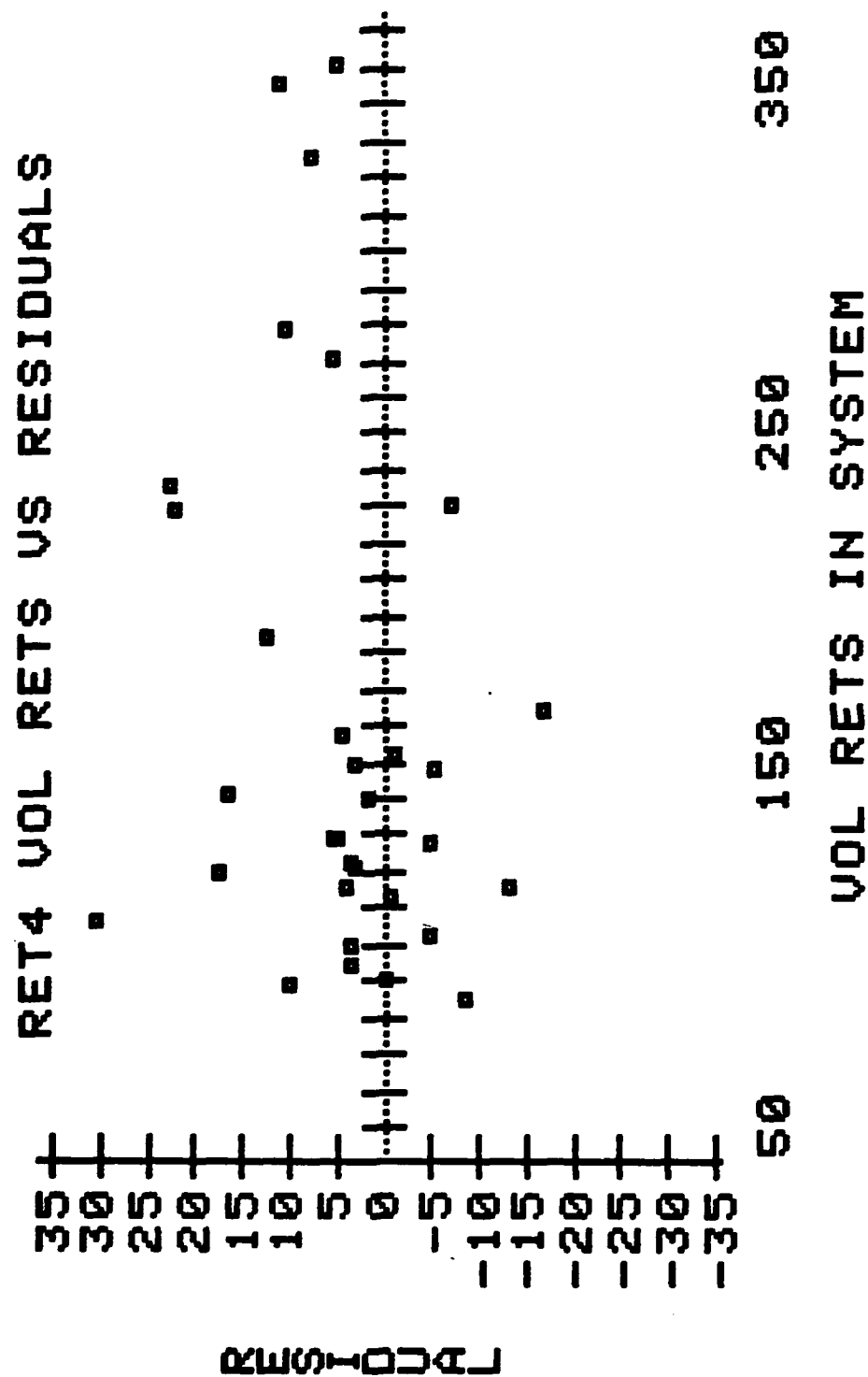


FIGURE L-3. RET4 Voluntary Retirements vs Residuals

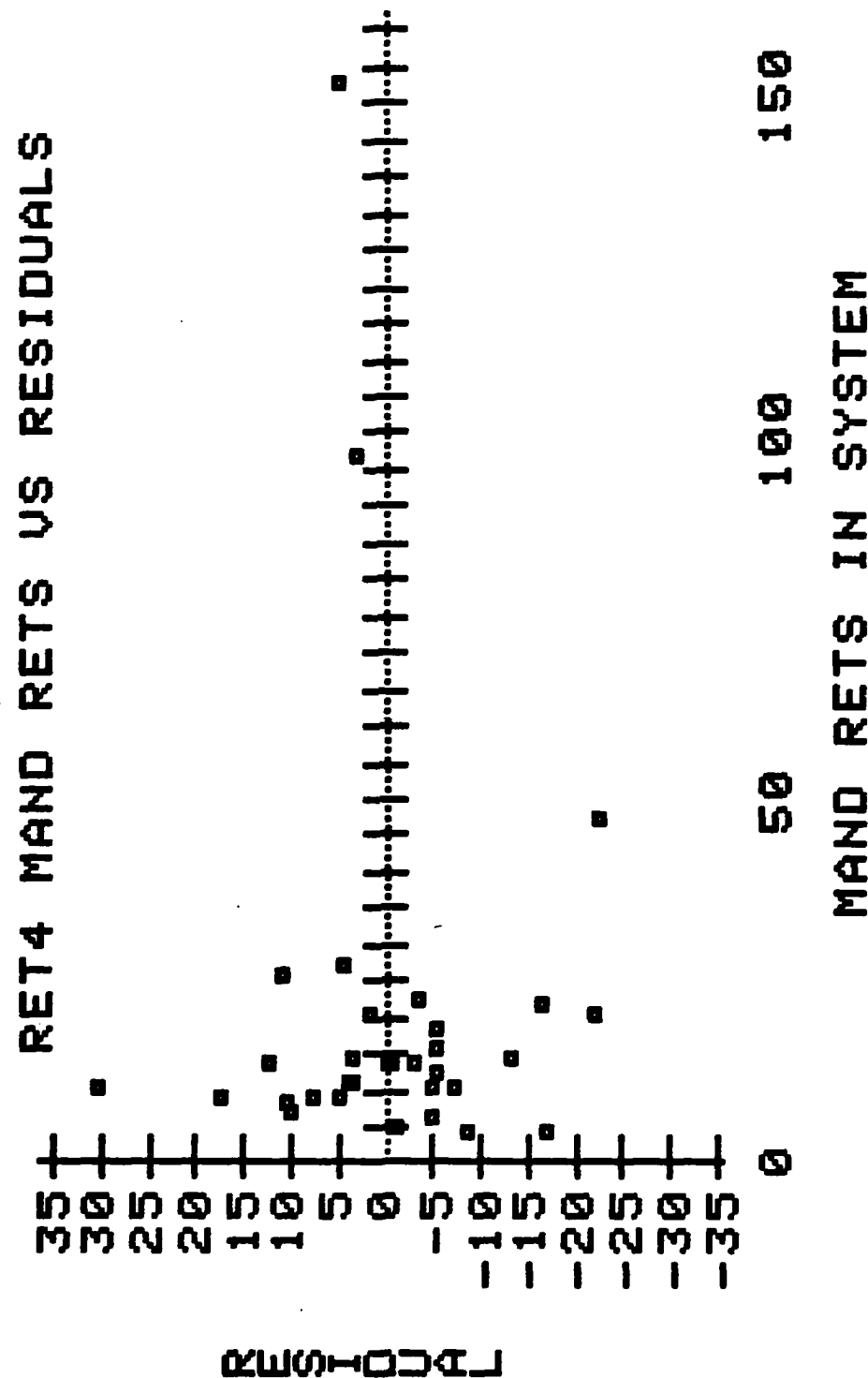


FIGURE L-4. RET4 Mandatory Retirements vs Residuals

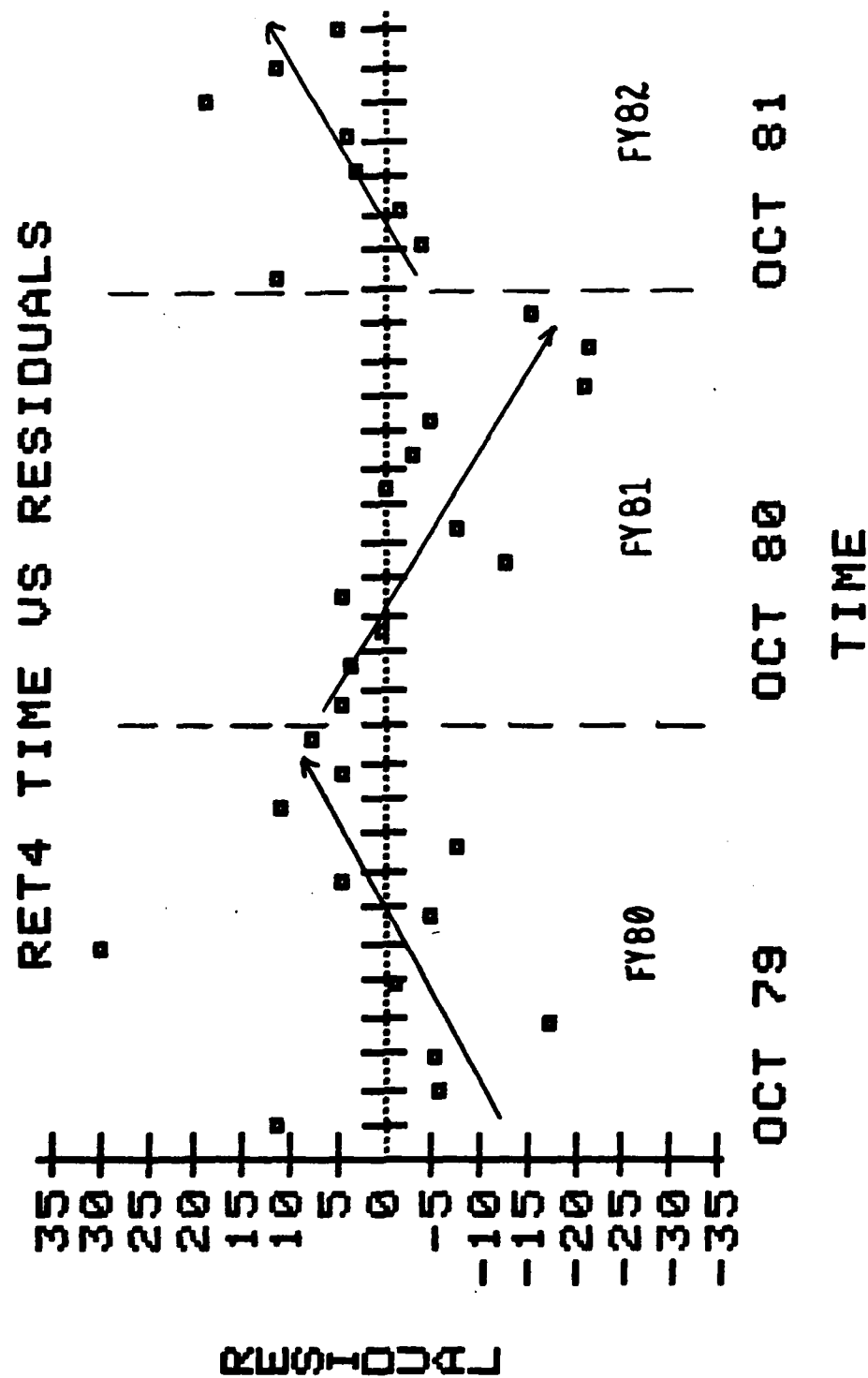


FIGURE I-5. RET4 Time vs Residuals Separated by Fiscal Years

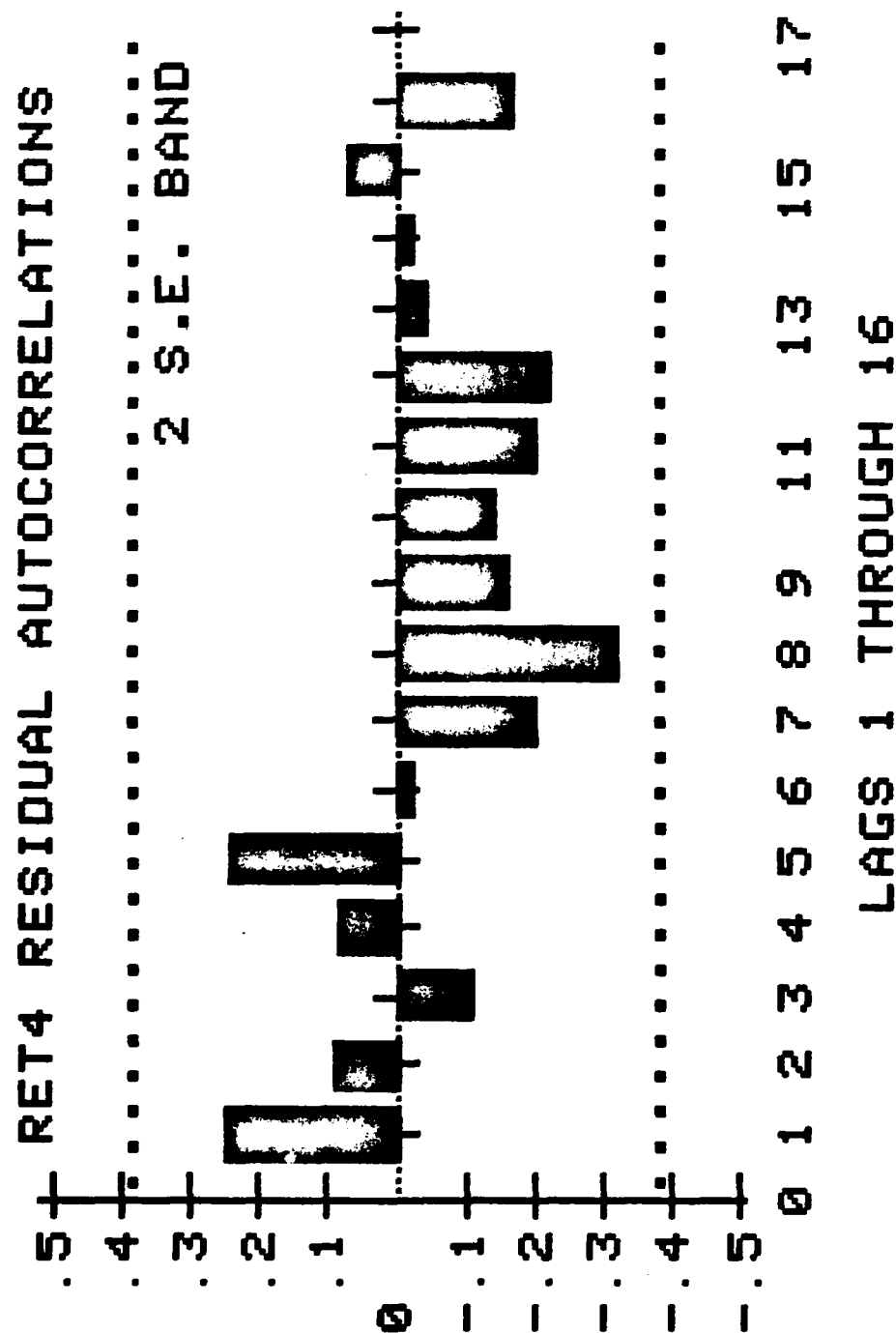
residuals with each fiscal year annotated. As can be seen, FY 80's residuals tend to increase in magnitude as time passes, FY 81's residuals decrease across its time spectrum, and FY 82's residuals are again increasing as the fiscal year progresses.

As mentioned above, hypothesizing a possible explanation as to this occurrence, would be just that, only a hypothesis. However, if one considers the fact that in October 1981 the Armed Services received a 14.3% pay raise (very large in comparison to previous years' pay caps), a possible explanation emerges. That is, those individuals who would have normally submitted their retirement application in late spring, may have delayed their retirement until after the 1 October pay raise or until the following summer in order to capitalize the large pay increase. Therefore, this hypothesis could explain the model's overprediction for July, August, and September 1981, and its underestimate of the October 1981 retirements, as well as the overall shift in the residual pattern which occurred in FY 81. However, it must be remembered that this is merely speculation and cannot be validated statistically. Therefore, no further attempt was made to rectify this residual pattern.

Time Series Analysis. Finally, so that the positive autocorrelation issue could be resolved, a time series analysis using Box and Jenkin's technique was performed.

First, simple and partial autocorrelations for lags one through sixteen were calculated. Figures L-6 and L-7 display these results. As expected, based upon previous work, all autocorrelations fall well within an approximated 2-standard-error band as calculated using Bartlett's approximation (Ref 2:36-37). Therefore, positive autocorrelation could possibly be ruled out since no significant autocorrelations of the residuals exists.

RET4 Residual Analysis Conclusions. Although the Durbin-Watson statistic implies the possibility of positive autocorrelation, all attempts at either proving or correcting the residual pattern proved fruitless. However, one must remember that, since it could not be completely disproved that positive autocorrelation exists, all associated confidence intervals must be used with an added degree of uncertainty concerning their validity. Since positive autocorrelation destroys the ability to accurately determine the variance associated with the model, any confidence interval associated with predictions may be incorrect. Also, because of the detected residual pattern associated with fiscal years, future use of this methodology should contain an analysis of out-years residual patterns. An additional variable could possibly be added to counteract the increasing or decreasing residual pattern associated with a fiscal year. A copy of the SPSS output associated with this analysis can be found in Appendix M.



AUTOCORRELATION

FIGURE L-6. RET4 Residual Autocorrelation Plot

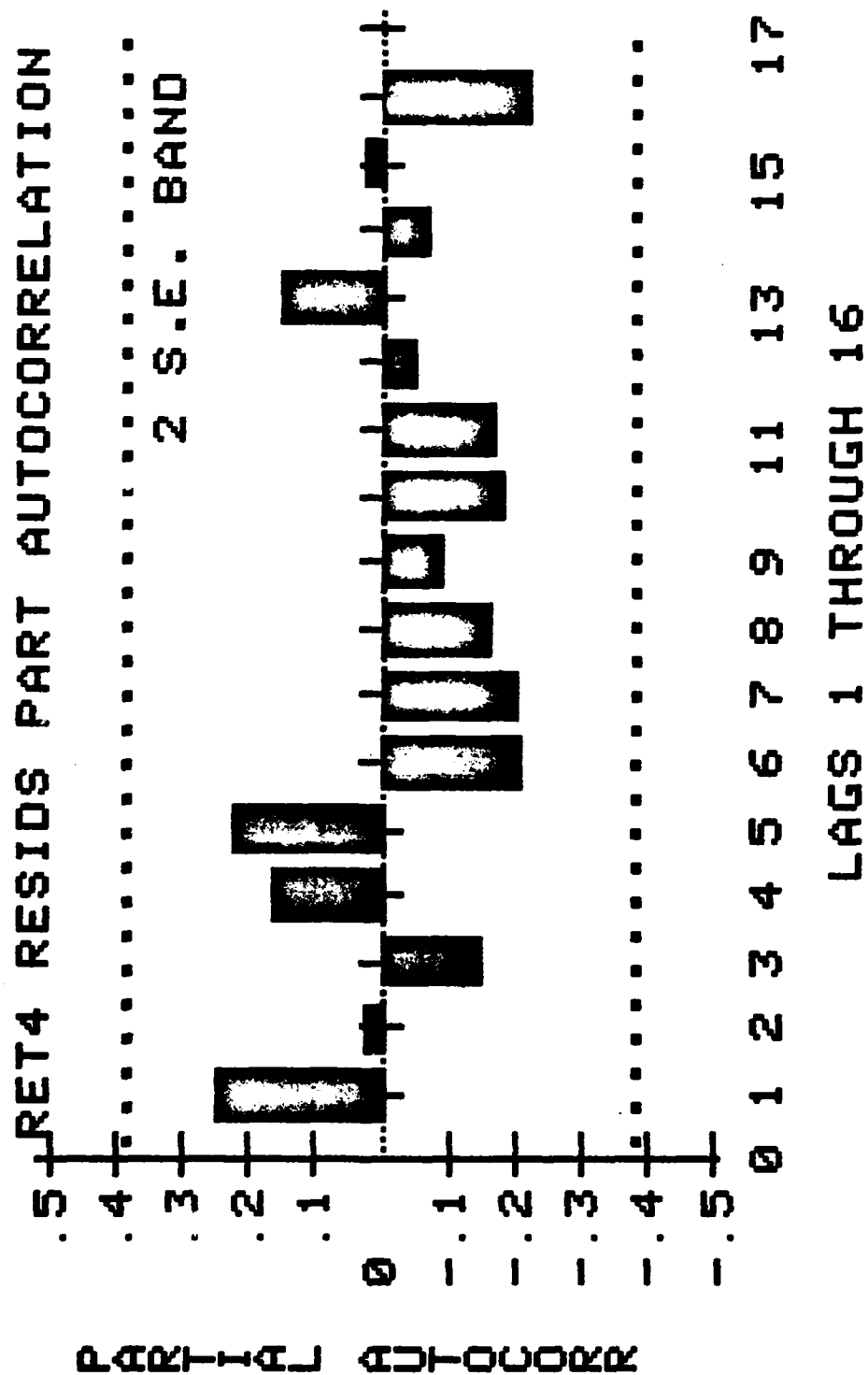


FIGURE L-7. RET4 Residual Partial Autocorrelation Plot

APPENDIX M

RET4's SPSS Regression Output Listing

09/02/12 12.76.59. "10" 1

VOELBACK COMPUTING CENTER
NORTHWESTERN UNIVERSITY
S P S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES
VERSION 8.0 -- JUNE 18, 1979

RTN NAME RETIREMENT PROJECTIONS, 4TH MONTH
VARIABLE LIST ACCOMP,VOL,MAND,TIME
INPUT MEDIUM DISK
N OF CASES 32
INPUT FORMAT FREEFIELD
VAR LABELS ACCOMP,VOL,MAND,TIME
LIST CASES CASES=32/VARIABLES=ACCOMP,VOL,MAND,TIME/
REGRESSION METHOD=STEPWISE/VARIABLES=ACCOMP,VOL,MAND,TIME/
REGRESSION=ACCOMP WITH VOL,MAND,TIME/RESIDUALS/
REGRESSION=ACCOMP WITH VOL,MAND/RESIDUALS/
STATISTICS ALL

00054400 CM NEEDED FOR REGRESSION

OPTION - 1
IGNORE MISSING VALUE INDICATORS
(NO MISSING VALUES DEFINED...OPTION : J15 FORCED)

RETIREMENT PROJECTIONS, 4TH MONTH

FILE MONAME (CREATION DATE = 08/02/02)

CASE-NO	ACCOMP	VOL	MAND	TIME
1	282.	181.	13.	10.
2	222.	159.	15.	11.
3	162.	118.	18.	12.
4	219.	178.	4.	13.
5	228.	154.	5.	14.
6	200.	114.	18.	15.
7	147.	135.	6.	16.
8	201.	137.	9.	17.
9	294.	225.	18.	18.
10	469.	336.	25.	19.
11	577.	302.	103.	20.
12	426.	311.	9.	21.
13	245.	163.	26.	22.
14	191.	130.	14.	23.
15	197.	99.	13.	24.
16	198.	124.	11.	25.
17	165.	124.	14.	26.
18	171.	93.	4.	27.
19	171.	121.	13.	28.
20	152.	102.	22.	29.
21	184.	137.	12.	30.
22	283.	224.	20.	31.
23	313.	230.	46.	32.
24	193.	140.	21.	33.
25	361.	271.	8.	34.
26	345.	264.	18.	35.
27	207.	150.	13.	36.
28	286.	147.	20.	37.
29	250.	124.	94.	38.
30	185.	127.	9.	39.
31	139.	94.	7.	40.
32	108.	104.	11.	41.

NO. 5-8337-147

CASES **32**
32
32
32

CORRELATION COEFFICIENTS.

A VALUE OF 99.0000 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

• 96.837			
• 39.065	• 39704		
• 15061	• 12074		
			• 09753
ACCOMP	VOL		MAND

RETIREMENT PROJECTIONS: 4TH MONTH

FILE NAME: CREATION DATE = 04/02/82

DEPENDENT VARIABLE: ACCOMP VOL, MAND, TIME

MEAN RESPONSE 239.06250 STD. DEV. 102.89235

VARIABLE(S) ENTERED ON STEP NUMBER 1: VOL

MULTIPLE R .96837 ANALYSIS OF VARIANCE OF SUP OF SQUARES MEAN SQUARE F SIGNIFICANCE
R SQUARE .93774 REGRESSION 1. 307759.98958 307759.98958 451.84192
ADJUSTED R SQUARE .93567 RESIDUAL 30. 20431.08542 681.05245
STD DEVIATION 26.09710 COEFF OF VARIABILITY 10.9 PCT

VARIABLES IN THE EQUATION

VARIABLE	B	STD ERROR B	F	BETA	ELASTICITY	PARTIAL TOLERENCE	F	SIGNIFICANCE
VOL	1.4052731	.66107121E-01	451.84192	.9683719	.98007	.45640	.34232	74.34631
(CONSTANT)	2.7570462	12.035610	.5247032E-01	.020		-.13711	.00343	.5162799

VARIABLE(S) ENTERED ON STEP NUMBER 2: MAND

MULTIPLE R .99167 ANALYSIS OF VARIANCE OF SUP OF SQUARES MEAN SQUARE F SIGNIFICANCE
R SQUARE .98300 REGRESSION 2. 322745.10705 161372.55352 454.18.17
ADJUSTED R SQUARE .98226 RESIDUAL 29. 5406.76795 187.41951
STD DEVIATION 13.70073 COEFF OF VARIABILITY 5.7 PCT

VARIABLES IN THE EQUATION

VARIABLE	B	STD ERROR B	F	BETA	ELASTICITY	PARTIAL TOLERENCE	F	SIGNIFICANCE
VOL	1.2711000	.37825731E-01	1129.2504	.8759187	.89010	-.54742	.95440	12.005134
MAND	.06508691	.96850186E-01	79.704634	.2328244	.07407			.002
(CONSTANT)	7.6104945	6.3437171	1.4372562	.200				

RETIREMENT PROJECTIONS, 4TH MONTH

FILE NO NAME CREATION DATE = 08/02/82 1

..... MULTIPLE REGRESSION

DEPENDENT VARIABLE.. ACCOMP VOL,MAND,TIME

VARIABLE(S) ENTERED ON STEP NUMBER 3.. TIME

MULTIPLE R .9918 ANALYSIS OF VARIANCE OF SUM OF SQUARES MEAN SQUARE F SIGNIFICANCE
R SQUARE .9838 REGRESSION 3. 320379.69361 100126.56007 794.1761 0
ADJUSTED R SQUARE .98716 RESIDUAL 28. 3012.10159 136.10730
STD DEVIATION 11.66431 COEFF OF VARIABILITY 4.9 PCT

----- VARIABLES IN THE EQUATION -----
VARIABLE B STD ERROR B F SIGNIFICANCE ELASTICITY
VOL 1.2501094 .3276607E-01 1055.0025 .0615039
MAND .91304136 .0361225E-01 119.24522 .0457307
TIME -.79108639 .22002672 12.005634 .00721609
(CONSTANT) 30.329426 0.4949004 12.747111 .001

----- VARIABLES NOT IN THE EQUATION -----
VARIABLE PARTIAL TOLERANCE F SIGNIFICANCE

ALL VARIABLES ARE IN THE EQUATION.

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE B STD ERROR B T 95.0 PCT CONFIDENCE INTERVAL
VOL 1.2501094 .3276607E-01 36.154790 1.1430711 1.3173077
MAND .91304136 .0361225E-01 10.919946 .74176941 1.0843133
TIME -.79108639 .22002672 -3.4649435 -1.2593477 -3.2357505
CONSTANT 30.329426 0.4949004 3.5703097 12.929411 47.730440

VARIANCE/COVARIANCE MATRIX OF THE UNNORMALIZED REGRESSION COEFFICIENTS.

VOL MAND TIME
VOL .80107
MAND -.00114 .00497
TIME .00130 -.00316 .05218

VOL MAND TIME

RETIREMENT PROJECTIONS, 4TH MONTH

FILE NAME: CREATION DATE = 00/02/82

..... MULTIPLE REGRESSION

DEPENDENT VARIABLE: ACCOMP VOL, HAND, TIME

00/02/82 12.26.55. PAGE 7

SUMMARY TABLE

STEP	VARIABLE ENTERED	REMOVED	F TO ENTER OR REMOVE	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE CHANGE	SIMPLE R	ADJUSTED R SQUARE	SIGNIFICANCE
1	VOL		451.80192	0	.96837	.93774	.93774	.96937	451.80192	0
2	HAND		79.78464	0	.99167	.98348	.04566	.9865	859.14117	.000
3	TIME		12.80513	.002	.99418	.98838	.00498	-.15451	770.17612	.0

REFINEMENT PROJECTIONS, 4TH MONTH

08/02/42 12-24-57. PAGE 4

FILE NAME (CREATION DATE = 08/02/42)

OBSERVATION	Y VALUE	Y ESTIMATE	RESIDUAL	-2SD	0.0	+2SD
1.	202.0000	270.5699	11.43010		1	
2.	222.0000	227.0479	-5.44764		1	
3.	162.0000	167.0424	-5.04237		1	
4.	210.0000	236.5245	-17.22447		1	
5.	220.0000	221.3437	-1.34370		1	
6.	200.0000	170.1091	29.89046		1	
7.	147.0000	191.9175	-4.91941		1	
8.	201.0000	196.3675	4.63232		1	
9.	201.0000	306.5057	-7.50570		1	
10.	467.0000	458.1807	10.81914		1	
11.	577.0000	572.6244	4.37061		1	
12.	450.0000	418.2356	7.764375		1	
13.	245.0000	240.4367	4.56327		1	
14.	101.0000	187.4324	3.56750		1	
15.	147.0000	146.9720	.02795097		1	
16.	140.0000	175.6092	-4.39073		1	
17.	165.0000	177.5568	-12.55644		1	
18.	121.0000	120.4791	-7.07073		1	
19.	171.0000	171.5103	-3102622		1	
20.	152.0000	154.5525	-2.55253		1	
21.	149.0000	188.8173	-4.81727		1	
22.	273.0000	304.0966	-21.09660		1	
23.	313.0000	334.5453	-21.54533		1	
24.	143.0000	204.9123	-15.91228		1	
25.	361.0000	347.5245	13.47545		1	
26.	345.0000	349.1121	-4.11219		1	
27.	207.0000	208.7350	-1.73500		1	
28.	200.0000	203.0431	2.916301		1	
29.	270.0000	246.1031	3.896326		1	
30.	105.0000	166.4529	18.54712		1	
31.	137.0000	127.5750	11.42018		1	
32.	140.0000	142.3424	5.057606		1	

NOTE - (.) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
R INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED	32.	
NUMBER OF 2 S.D. OUTLIERS	1. OR	3.15 PERCENT OF THE TOTAL
VON NEUMANN RATIO	1.49637	DURBIN-WATSON TEST 1.44961
NUMBER OF POSITIVE RESIDUALS	16.	
NUMBER OF NEGATIVE RESIDUALS	16.	
NUMBER OF RUNS OF SIGNS	11.	
EXPECTED NUMBER OF RUNS OF SIGNS	17.	
EXPECTED S.D. OF RUN DISTRIBUTION	2.78243	
UNIT NORMAL DEVIATE		
Z=1/(EXPECTED-OBSERVED)/S.D.	-1.97669	
PROBABILITY OF OBTAINING .05. AREA	.02464	

RETIREMENT PROJECTIONS, 4TH MONTH 09/02/82 12.26.59. PAGE: 10

FILE NAME (CREATION DATE: 08/02/82)

DEPENDENT VARIABLE.. ACCOMP VOL,MANO,TIME

DEPENDENT VARIABLE.. ACCOMP VOL,MANO,TIME

DEPENDENT VARIABLE.. ACCOMP VOL,MANO,TIME

DEPENDENT VARIABLE.. ACCOMP VOL,MANO,TIME

DEPENDENT VARIABLE.. ACCOMP VOL,MANO,TIME

DEPENDENT VARIABLE.. ACCOMP VOL,MANO,TIME

DEPENDENT VARIABLE.. ACCOMP VOL,MANO,TIME

DEPENDENT VARIABLE.. ACCOMP VOL,MANO,TIME

DEPENDENT VARIABLE.. ACCOMP VOL,MANO,TIME

DEPENDENT VARIABLE.. ACCOMP VOL,MANO,TIME

DEPENDENT VARIABLE.. ACCOMP VOL,MANO,TIME

DEPENDENT VARIABLE.. ACCOMP VOL,MANO,TIME

DEPENDENT VARIABLE.. ACCOMP VOL,MANO,TIME

DEPENDENT VARIABLE.. ACCOMP VOL,MANO,TIME

DEPENDENT VARIABLE.. ACCOMP VOL,MANO,TIME

DEPENDENT VARIABLE.. ACCOMP VOL,MANO,TIME

DEPENDENT VARIABLE.. ACCOMP VOL,MANO,TIME

DEPENDENT VARIABLE.. ACCOMP VOL,MANO,TIME

DEPENDENT VARIABLE.. ACCOMP VOL,MANO,TIME

DEPENDENT VARIABLE.. ACCOMP VOL,MANO,TIME

DEPENDENT VARIABLE.. ACCOMP VOL,MANO,TIME

RETIREMENT PROJECTIONS, 9TH NORTH

06/02/02 12:26:59. PAGE 11

FILE NAME (CREATION DATE = 06/02/02)

..... MULTIPLE REGRESSION
DEPENDENT VARIABLE.. ACCOMP VOL, HANO, TIME

SUMMARY TABLE

STEP	VARIABLE	F TO	SIGNIFICANCE	MULTIPLE R	R SQUARE	R SQUARE	CHANG	SIMPLE R	OVERALL F	STRATIFICATION
1	ENTERED	79.78064	0	.96837	.93770	.93770	.96837	.96837	431.88102	0
2	REMOVED	79.78064	0	.99167	.98340	.98340	.98340	.54355	859.14017	.000

RETIREMENT PROJECTIONS, 4TH MONTH

FILE NAME: CREATION DATE = 08/02/82

08/02/82 12.26.57. PAGE 12

MULTIPLE REGRESSION			
OBSERVATION	Y VALUE	Y ESTIMATE	RESIDUAL
1.	202.0000	259.0960	22.90376
2.	222.0000	216.3379	5.662567
3.	162.0000	156.0432	6.916754
4.	212.0000	227.1512	-8.159205
5.	220.0000	212.7710	7.227004
6.	200.0000	161.1677	38.83232
7.	147.0000	144.4006	2.597401
8.	201.0000	189.5341	11.46192
9.	250.0000	302.2607	-32.26067
10.	967.0000	456.3308	12.67084
11.	577.0000	566.0369	10.96314
12.	426.0000	418.3375	7.662483
13.	240.0000	237.2736	7.706339
14.	151.0000	184.5654	6.034246
15.	147.0000	144.6763	2.303581
16.	100.0000	174.7434	5.256155
17.	165.0000	177.3371	-12.33711
18.	121.0000	129.2839	-8.293449
19.	171.0000	172.4677	-1.660595
20.	152.0000	154.2754	-4.275425
21.	144.0000	152.1333	-8.133336
22.	203.0000	309.6404	-26.64043
23.	313.0000	337.7573	-26.75734
24.	103.0000	213.7813	-28.08131
25.	301.0000	359.0015	-1.998534
26.	345.0000	358.7546	-13.75457
27.	207.0000	217.1495	-10.14940
28.	206.0000	211.7631	-5.765112
29.	250.0000	251.6305	-1.630441
30.	150.0000	176.4270	8.173004
31.	130.0000	138.2397	-7.633104
32.	144.0000	154.4061	-6.406117

NOTE - (1) INDICATES ESTIMATE CALCULATED WITH MEANS SUBSTITUTED
 (2) INDICATES POINT OUT OF RANGE OF PLOT

NUMBER OF CASES PLOTTED	32.	
NUMBER OF 2 S.D. OUTLIERS	1. OR	3.13 PERCENT OF THE TOTAL
VON NEUMANN RATIO	1.02811	DURBIN-WATSON TEST .99590
NUMBER OF POSITIVE RESIDUALS	17.	
NUMBER OF NEGATIVE RESIDUALS	15.	
NUMBER OF RUNS OF SIGNS	18.	
EXPECTED NUMBER OF RUNS OF SIGNS	17.	
EXPECTED S.D. OF RUN DISTRIBUTION	2.77120	
UNIT NORMAL DEVIATE		
Z-EXPECTED-OBSERVED/S.D.	-2.32300	
PROBABILITY OF OBTAINING .CC. ABS(2)	.01009	

APPENDIX N

Retirement's Time Series Computer Output

HOW LONG IS THE TIME SERIES?69
 ENTER TITLE SET ANALYSIS
 DO YOU WANT TO DIFFERENCE OR TRANSFORM (Y/N)?N
 RET ANALYSIS
 MEAN = 2.243768115942 VARIANCE = .882814534761

DO YOU WANT TO SEE THE FT AUTO OUTPUT (Y/N)?Y
 LAG AUTOCORRELATION PARTIAL AUTOCORRELATION
 1 .715554
 2 -.353619
 3 -.192018
 4 -.054247
 5 -.126723
 6 -.014266
 7 -.225190
 8 -.244189
 9 -.097942
 10 .261487
 11 .472051
 12 .500233
 13 .465496
 14 .249224
 15 -.005050
 16 -.191569
 17 .307048
 18 .220189
 19 .339523
 20 .297519
 21 .184629
 22 .002175
 23 .193830
 24 .315242
 25 .251550
 26 .069928
 27 .082033
 28 .200908
 29 .274423
 30 .281797
 31 .265483
 32 .230077
 33 .129375
 34 .019205

THE APPROXIMATED 2 S.E. BAND IS +/- .2408

X-DENOTES AUTOCORRELATION OUTSIDE 2 S.E. BAND

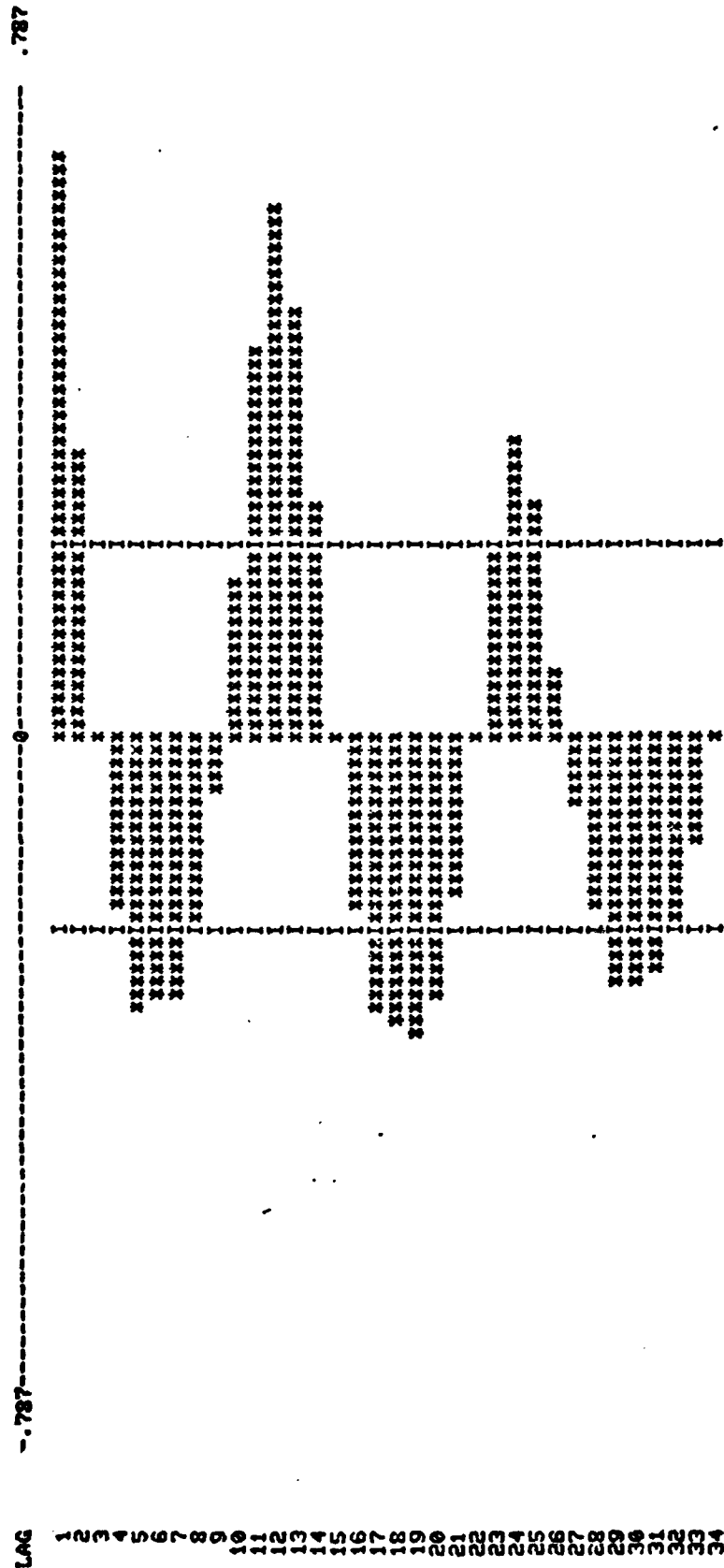
LU- 65
 HOW MANY INTENSITY VALUES DO YOU WANT TO SEE?
 0 - DEFAULT OF 45; N .LT. LU/2 -->34
 I FQ P
 1 .014 69.000
 2 .029 34.500
 3 .043 23.000
 4 .058 17.250
 5 .072 13.800
 6 .087 11.500
 7 .101 9.857
 8 .116 8.825
 9 .130 7.667
 10 .145 6.900
 11 .159 6.273
 12 .174 5.750
 13 .188 5.308
 14 .203 4.929
 15 .217 4.600
 16 .232 4.313
 17 .246 4.059
 18 .261 3.833
 19 .275 3.632
 20 .290 3.450
 21 .304 3.286
 22 .319 3.136
 23 .333 3.000
 24 .348 2.875
 25 .362 2.760
 26 .377 2.654
 27 .391 2.556
 28 .406 2.464
 29 .420 2.379
 30 .435 2.300
 31 .449 2.225
 32 .464 2.156
 33 .478 2.091
 34 .493 2.029

AVERAGE INTENSITY.

1.8026888315

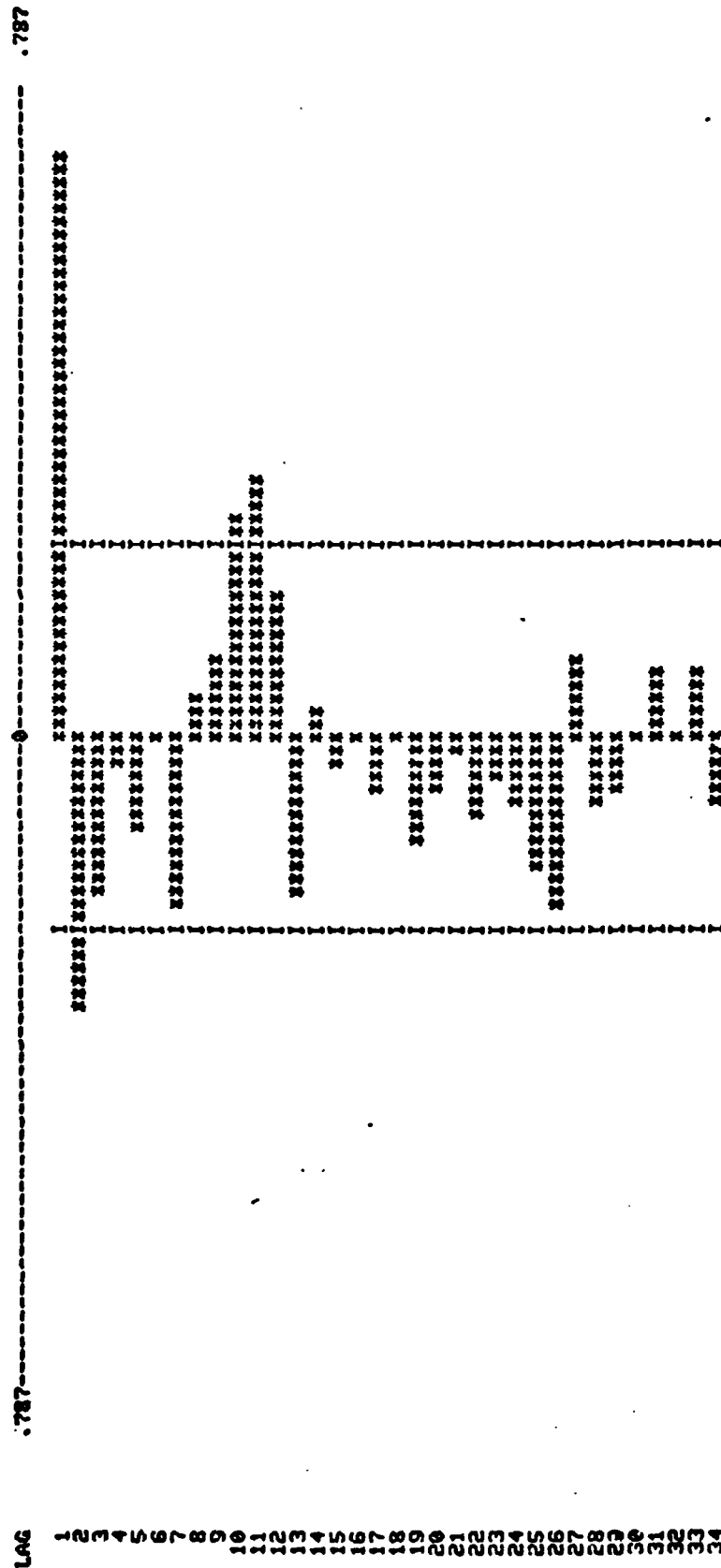
RET ANALYSIS

AUTOCORRELATION PLOT



RET ANALYSIS

PARTIAL AUTOCORRELATION PLOT



FIRST LINE VAR(R(K)), SECOND LINE STD(R(K))

	1	2	3	4	5	6	7	8	9	10
FIRST LINE VAR(R(K))	.014534	.023800	.025701	.030932	.051911	.065613	.048851	.038384	.040449	.038605
SECOND LINE STD(R(K))	.120971	.154274	.160595	.175874	.227839	.256151	.221022	.195918	.201119	.196482

DO YOU WANT TO DIFFERENCE OR TRANSFORM (Y/N)?Y
 WHAT IS THE ORDER OF THE NON-SEASONAL DIFFERENCING?ID1>=00
 WHAT IS THE ORDER OF THE SEASONAL DIFFERENCING?ID2>=01
 TRANSFORMATION COEFF: IP=0 (LN),IP>0(2(1)-2(1)XIP)1
 LENGTH OF SEASON: IS>=012
 MEAN = .A4596491228069 VARIANCE = .5049556478916

DO YOU WANT TO SEE THE FTAUTO OUTPUT (Y/N)?Y
 LAG AUTO-COVARIANCE AUTOCORRELATION PARTIAL AUTOCORRELATION
 1 .310075 .614186
 2 .168447 .333551
 3 .095505 .189174
 4 .072312 .143233
 5 .067372 .133449
 6 .076573 .151674
 7 .059526 .179311
 8 .069718 .138095
 9 .014810 .029334
 10 .024897 .049296
 11 .049856 .096791
 12 .004352 .005550
 13 .040799 .080812
 14 .087472 .173262
 15 .042373 .085119
 16 .012776 .025307
 17 .029457 .058247
 18 .022392 .044353
 19 .031996 .063377
 20 .026634 .024640
 21 .045843 .090803
 22 .065532 .171339
 23 .164156 .325233
 24 .183297 .323454
 25 .102556 .203932
 26 .114062 .235931
 27 .066500 .131721
 28 .038272 .075808

THE APPROXIMATED 2 S.E. BAND IS +/- .2649
 2-DENOTES AUTOCORRELATION OUTSIDE 2 S.E. BAND

HOW MANY INTENSITY VALUES DO YOU WANT TO SEE?
 0 = DEFAULT OF 45; M .LT. LW/2 -->28
 1 INTENSITY
 1 .018 57.000
 2 .035 28.500
 3 .053 19.000
 4 .070 14.250
 5 .088 11.400
 6 .105 9.500
 7 .123 8.143
 8 .140 7.125
 9 .158 6.333
 10 .175 5.700
 11 .193 5.182
 12 .211 4.750
 13 .228 4.385
 14 .246 4.071
 15 .263 3.800
 16 .281 3.563
 17 .298 3.353
 18 .316 3.167
 19 .333 3.000
 20 .351 2.850
 21 .368 2.714
 22 .386 2.591
 23 .404 2.478
 24 .421 2.375
 25 .439 2.280
 26 .456 2.192
 27 .474 2.111
 28 .491 2.036
 AVERAGE INTENSITY = 1.0277418546

(F(M) = ((-1)^(M+1)) * AC(F(M)))

R-ARRAY

K	1	2	3	4	5	6	7	8	9	10
(-15)	-.0851	-.0896	-.0939	-.0974	-.1008	-.1034	-.1053	-.1067	-.1077	-.1082
(-14)	-.1733	-.1822	-.1909	-.1991	-.2066	-.2134	-.2194	-.2246	-.2291	-.2329
(-13)	-.0698	-.0755	-.0812	-.0865	-.0913	-.0956	-.0994	-.1027	-.1055	-.1078
(-12)	-.0936	-.1028	-.1118	-.1203	-.1282	-.1355	-.1421	-.1480	-.1532	-.1578
(-11)	-.0658	-.0728	-.0797	-.0862	-.0922	-.0976	-.1024	-.1066	-.1102	-.1133
(-10)	-.0493	-.0575	-.0656	-.0732	-.0802	-.0865	-.0921	-.0969	-.1010	-.1045
(-9)	-.1381	-.1488	-.1593	-.1694	-.1789	-.1878	-.1961	-.2037	-.2107	-.2171
(-8)	-.1793	-.1922	-.2048	-.2169	-.2284	-.2393	-.2495	-.2591	-.2681	-.2765
(-7)	-.1517	-.1668	-.1815	-.1956	-.2091	-.2219	-.2341	-.2457	-.2567	-.2671
(-6)	-.1334	-.1508	-.1677	-.1840	-.1996	-.2145	-.2287	-.2422	-.2550	-.2671
(-5)	-.1432	-.1632	-.1827	-.2016	-.2198	-.2372	-.2538	-.2696	-.2846	-.2988
(-4)	-.1392	-.1614	-.1831	-.2042	-.2245	-.2440	-.2626	-.2803	-.2971	-.3130
(-3)	-.3337	-.3658	-.3975	-.4287	-.4593	-.4893	-.5187	-.5475	-.5757	-.6032
(-2)	-.6142	-.6460	-.6775	-.7087	-.7395	-.7698	-.7996	-.8289	-.8576	-.8857
(-1)	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
(0)	-.6142	-.6460	-.6775	-.7087	-.7395	-.7698	-.7996	-.8289	-.8576	-.8857
(1)	-.3337	-.3658	-.3975	-.4287	-.4593	-.4893	-.5187	-.5475	-.5757	-.6032
(2)	-.1392	-.1614	-.1831	-.2042	-.2245	-.2440	-.2626	-.2803	-.2971	-.3130
(3)	-.1432	-.1632	-.1827	-.2016	-.2198	-.2372	-.2538	-.2696	-.2846	-.2988
(4)	-.1334	-.1508	-.1677	-.1840	-.1996	-.2145	-.2287	-.2422	-.2550	-.2671
(5)	-.1517	-.1668	-.1815	-.1956	-.2091	-.2219	-.2341	-.2457	-.2567	-.2671
(6)	-.1793	-.1922	-.2048	-.2169	-.2284	-.2393	-.2495	-.2591	-.2681	-.2765
(7)	-.1517	-.1668	-.1815	-.1956	-.2091	-.2219	-.2341	-.2457	-.2567	-.2671
(8)	-.1381	-.1488	-.1593	-.1694	-.1789	-.1878	-.1961	-.2037	-.2107	-.2171
(9)	-.1334	-.1508	-.1677	-.1840	-.1996	-.2145	-.2287	-.2422	-.2550	-.2671
(10)	-.0698	-.0755	-.0812	-.0865	-.0913	-.0956	-.0994	-.1027	-.1055	-.1078
(11)	-.0936	-.1028	-.1118	-.1203	-.1282	-.1355	-.1421	-.1480	-.1532	-.1578
(12)	-.1733	-.1822	-.1909	-.1991	-.2066	-.2134	-.2194	-.2246	-.2291	-.2329
(13)	-.0658	-.0728	-.0797	-.0862	-.0922	-.0976	-.1024	-.1066	-.1102	-.1133
(14)	-.1733	-.1822	-.1909	-.1991	-.2066	-.2134	-.2194	-.2246	-.2291	-.2329
(15)	-.0851	-.0896	-.0939	-.0974	-.1008	-.1034	-.1053	-.1067	-.1077	-.1082
(16)	-.0253	-.0266	-.0278	-.0289	-.0299	-.0308	-.0316	-.0323	-.0329	-.0334

$(1,0)$

9-APP-01

347

APPENDIX D

Residual Analysis of Retirement Data
using an ARIMA(1,0,0)*(0,1,0)₁₂ Model

22 .388
23 .484
24 .421
25 .439
26 .456
27 .474
28 .491
1.000

.825
.856
.871
.904
.950
.978

THIS PROGRAM GENERATES THE RESIDUALS FOR RET ANALYSIS
MODEL CHOSEN IS ARIMA(1,0,0)(0,1,0)₁₂

MEAN = .000766450360114 VARIANCE = .3138221058134

LAG	AUTOCOV.	AUTOCORR.	PART. AUTOCORR.
1	.014387	.045527	.045527
2	-.018476	-.053875	-.061074
3	-.018545	-.052222	-.047312
4	-.006259	-.000325	.000267
5	.001398	.004453	-.001421
6	.006608	.021694	.019178
7	.035374	.112721	.111987
8	.031444	.103197	.094731
9	-.038032	.121191	-.117184
10	-.006633	-.021153	.010872
11	.051673	.180314	.184888
12	-.057812	-.167582	-.231431
13	.002920	.005334	.050095
14	.067202	.214139	.236371
15	.010759	.034331	-.061044
16	-.023074	-.085457	-.083775
17	.005516	-.065760	.034073
18	-.010939	.024763	-.033678
19	.001648	-.034828	-.000803
20	.063316	.035252	.124523
21	.011189	.025395	-.074159
22	-.071160	.035354	-.087448
23	-.061566	-.233124	-.055534
24	.028179	-.198244	-.235325
25	-.051090	.089792	.019278
26	.001449	-.162798	-.131257
27	.001982	.004618	.002340
28		.006315	-.071740

UNCONDITIONAL SUM OF SQUARES FOR A = 17.895858(1026
UNCONDITIONAL SUM OF SQUARES FOR E = 17.895858(1026

PORTANTENAU LACK OF FIT TEST = 17.3104688707

THE ASSOCIATED CUMULATIVE PERIODOGRAM VALUES ARE

1	.018	.079
2	.035	.087
3	.053	.108
4	.070	.154
5	.088	.167
6	.105	.215
7	.123	.226
8	.140	.316
9	.158	.363
10	.175	.394
11	.193	.431
12	.211	.480
13	.228	.509
14	.246	.519
15	.263	.530
16	.281	.682
17	.298	.695
18	.316	.697
19	.333	.701
20	.351	.722
21	.368	.818

APPENDIX P

Copy of TS (Time Series) Analysis Program

```

PROGRAM TS(INPUT,OUTPUT,TAPES=INPUT,TAPES=OUTPUT,TAPE1)
COMMON AC(51)
COMMON LU
COMMON NAC
INTEGER NAC,NPAC
CHARACTER IUK(80),IUMAT
CHARACTER TITL:EX20
REAL R(40,40),S(40,40),Z(368),ACU(50),PACU(50)
REAL UK(50)
CHARACTER A(-50:50)
CHARACTER BX1
REAL N
REAL CC
CC=0.0
IFLG=1
PRINT 1, 'HOW LONG IS THE TIME SERIES?'
89 READ(5,1) LZ
LU=LZ
DO 1 I=1,LZ
1 READ(1,1) Z(I)
1 CONTINUE
88 PRINT 1, 'ENTER TITLE'
READ(5,102) TITLE
N=0.0
CC=0.0
102 FORMAT(A20)
PRINT 1, 'DO YOU WANT TO DIFFERENCE OR TRANSFORM (Y/N)?'
READ(5,100) IUMAT
FORMAT(I41)
IF(IUMAT.EQ.'Y') THEN
PRINT 1, 'WHAT IS THE ORDER OF THE NON-SEASONAL DIFFERENCE:ID1)=0'
READ(5,1) ID1
PRINT 1, 'WHAT IS THE ORDER OF THE SEASONAL DIFFERENCING:ID2)=0'
READ(5,1) ID2
PRINT 1, 'TRANSFORMATION COEFF: IP=0 (LN), IP=0(Z(1)-Z(1))XIP)'
READ(5,1) IP
PRINT 1, 'LENGTH OF SEASON: IS)=0'
READ(5,1) IS
LZA=LU
CALL FTRDIF(ID1,ID2,IP,IS,LZA,Z,SHIFT,LU,IER)
WRITE (7, '(A50)') 'DIFFERENCED DATA'
WRITE (7, '(1X,F20.10)')(Z(I),I=1,LU)
ENDIF
NAC=LU/2
IF (NAC.GT.45) NAC=45
NPAC=LU/2
IF (NPAC.GT.45) NPAC=45
C
CALL FTAUTO(Z,LU,NAC,NPAC,7,AMEAN,VAR,ACU,AC,PACU,UK)
WRITE(6,162) TITLE
WRITE(7,103) TITLE
103 FORMAT(1H1,1X,A20)
PRINT 1, 'MEAN = ',AMEAN, ' VARIANCE = ',VAR
PRINT 1,

```

```

101 PRINT, ' ' ANEAM, VAR
    WRITE(7,101) ANEAM, VAR
    FORMAT(1, ' ANEAM =', F12.6, ' VARIANCE =', F12.6, /)
    PRINT, 'DO YOU WANT TO SEE THE FTAUTO OUTPUT (Y/N)?'
    READ(5,100) IUKAT
    IF (IUKAT.EQ. 'Y') THEN
        PRINT, 'LAG AUTOCOVARIANCE AUTOCORRELATION PARTIAL AUTOCORRELATI
        10N'
        IF (NAC.GT.45) NAC=45
        X1=2.0*(SORT(REAL(LU)))
        DO 2 I=1,NAC
            IF (ABS(AC(I)).GT.ABS(CC)) CC=AC(I)
            IF (ABS(AC(I)).GT.ABS(X1)) THEN
                B=X1
            ELSE
                B=X1
            ENDIF
        ENDIF
        PRINT 7, I, ACU(I), AC(I), B, PACU(I)
        WRITE (7,7) I, ACU(I), AC(I), B, PACU(I)
        CONTINUE
        PRINT 1, 'THE APPROXIMATED 2 S.E. BAND IS +/-', X1
        WRITE (1,500) 'THE APPROXIMATED 2 S.E. BAND IS +/-', X1
        FORMAT (1X,A35,F10.4)
        PRINT 1, '2-DENOTES AUTOCORRELATION OUTSIDE 2 S.E. BAND'
        PRINT 1, 'CLEAR SCREEN, THEN INPUT ANY CHARACTER FOR AUTOCORRELATI
        10N PLOT'
        READ (1,2100) B
        FORMAT(A1)
        PRINT 1, ' '
        PRINT 1, 'TITLE'
        PRINT 1, ' '
        AUTOCORRELATION PLOT'
        PRINT 1, ' '
        IF (X1.GT.ABS(CC)) CC=X1
        N=ABS(CC)*2.1
        X1=ABS(X1)*50/N
        WRITE (1,501) 'LAG', ABS(CC)*(-1.1), '-----
        1-----', ABS(CC)*1.1
        FORMAT (1X,A3,5X,F6.3,A101,F5.3)
        DO 200 I=1,NAC
            DO 201 J=-50.50
                A(I,J)=X1
            CONTINUE
            CC=AC(I)*50.0/N
            CC=CC*5
            ICC=INT(CC)
            IF (ICC.LT.0.) THEN
                DO 600 J=-50,ICC-1
                    A(I,J)=X1
                CONTINUE
                DO 601 J=-1,50

```



```

ELSE IF (ICC.EQ.0.) THEN
  DO 612 J=-50,-1
    A(J),=0.
  CONTINUE
  DO 613 J=-1,50
    A(J),=0.
  CONTINUE
ELSE IF (ICC.GT.0.) THEN
  DO 614 J=-50,-1
    A(J),=0.
  CONTINUE
  DO 615 J=ICC+1,50
    A(J),=0.
  CONTINUE
ENDIF
ENDIF
A(-X1-.5)=-1.
A(X1+.5)=1.
WRITE (1,2000) 1,(A(J),J=-50,50)
CONTINUE
PRINT *,

208 IF (IFLG.EQ.1) CALL BARTLT
ENDIF
FOURIER DECOMPOSITION
PRINT*, DO YOU WANT THE PERIODOGRAM?
READ(5,100) IUMAT
IF (IUMAT.EQ.'Y') CALL PGRAM(2,LU)
PRINT*,

C DO R AND S
C DO 4 I=51,2*-1
  AC(1)=AC(I-1)
CONTINUE
AC(1)=1.0
MXROU=40
PROU=32
IF (LU.LT.32) PROU=LU
NEG=15
IF (LU.LT.30) NEG=LU/2
KOL=10
CONTINUE
PRINT*, ENTER THE VALUE OF IRHO (0:HIGH FREQ,-1:LOW) ,
READ(5,*) IRHO
IRS=0
CALL RANDS(MXROU,PROU,NEG,KOL,IRHO,AC,R,S,IUK,IRS)
PRINT*, DO YOU WANT ANOTHER 4 AND 5 ARRAY?
READ(5,100) IUMAT
IF (IUMAT.EQ.'Y') GO TO 44
PRINT*, DO YOU WANT THE D STATISTIC? ,

```

```

      READ(5,100) IUHAT
5489 IF (IUHAT.EQ..V.) THEN
      PRINT*, 'ENTER THE MAX OR ORDER '
      READ(5,8) IP
      PRINT*, 'ENTER THE MAX OR ORDER '
      READ(5,8) IS
      PRINT*, 'DO YOU WANT TO SEE THE D STAT?'
      PRINT*, 'YES, 1-NO-0'
      READ(5,8) IENT
      CALL DSTAT(MXRO, NROU, NEG, R, S, IP, IQ, IPNT)
      ENDF
      PRINT*, 'DO YOU WANT ANOTHER D STATISTIC? '
      READ(5,100) IUHAT
      IF (IUHAT.EQ..V.) GOTO 5489
      PRINT*, 'DO YOU WANT FTXL?'
      READ(5,100) IUHAT
      IF (IUHAT.EQ..V.) CALL OURNXL(Z, LU)
      PRINT*, 'DO YOU WANT ANOTHER FTXL?'
      READ(5,100) IUHAT
      IF (IUHAT.EQ..V.) GOTO 5490
      PRINT*, 'DO YOU WANT ANOTHER RUN?'
      READ(5,100) IUHAT
      IF (IUHAT.EQ..V.) STOP
      PRINT*, 'WHICH DATA? 0-ORIGINAL, 1-CURRENT-0'
      READ(5,8) IANS
      IF (IANS.EQ.0) GOTO 89
      IF (IANS.NE.0) GOTO 88
      STOP
      END
5490

```

```

SUBROUTINE BARTLT
REAL R(-10:50), UR(10), STD(10)
INTEGER U
COMMON AC(S1)
COMMON LU
DO 1 I=-10,0
  R(I)=0.0
CONTINUE
DO 2 I=1, NAC
  R(I)=AC(I)
CONTINUE
DO 3 I=NAC+1, 60
  R(I)=0.0
CONTINUE
REMEMBER R(0)=1
R(0)=1.0

```

```

BY BARTLETT'S APPROXIMATION, EQU 2.1.11
DO 5 K=1,10
  X=0.0
  DO 6 U=0, NAC
    X=X+R(U)*X2+R(U+K)*R(U-K)-4*R(K)*R(U)*R(U-K)+2*R(U)*R(K)*R(K)

```

357


```

75 IF (IR.EQ.0) RETURN
   FORMAT(A1)
   PRINT, 'THE 4 AND S ARRAYS HAVE BEEN CRUNCHED.'
   PRINT, 'DO YOU ACTUALLY WANT TO SEE THEM?'
   READ(5,75) ICHAT
   IF (ICHAT.EQ.'Y') RETURN
   IF (IPHO.EQ.0) GOT080
   WRITE(6,200)
   WRITE(7,200)
   GOT090
80 WRITE(6,210)
   WRITE(7,210)
90 WRITE(6,220) (IC,IC-1,KOL)
   WRITE(7,220) (IC,IC-1,KOL)
   DO 110 IR=1,MROU
   IRN=IR-NEG-1
   DO 120 IC=1,KOL
   IUK(IC)=1BLK
100 IF (IR.EQ.NEG+2-IC) IUK(IC)=ISTR
   WRITE(6,230) IRN,(R(IR,K),IUK(K),K-1,KOL)
   WRITE(7,230) IRN,(R(IR,K),IUK(K),K-1,KOL)
110 CONTINUE
   PRINT, 'TYPE ANY CHARACTER TO CONTINUE--'
   READ(5,75) ICHAT
   WRITE(6,240) IZRO,(IC,IC-1,KOLM1)
   WRITE(7,240) IZRO,(IC,IC-1,KOLM1)
   GO 130 IR=1,MROU
   IRN=IR-NEG-1
   DO 120 IC=1,KOL
   IUK(IC)=1BLK
   IF (IR.EQ.NEG+2-IC) IUK(IC)=ISTR
120 IF (IR.EQ.NEG+3-IC) IUK(IC)=ISTR
   WRITE(6,230) IRN,(S(IR,K),IUK(K),K-1,KOL)
   WRITE(7,230) IRN,(S(IR,K),IUK(K),K-1,KOL)
130 CONTINUE
   RETURN
200 FORMAT(/20X,27H( F(M) = ((-1)**M)*ACF(M) ))
210 FORMAT(/25X,17H( F(M) = ACF(M) ))
220 FORMAT(/30X,7HARRAY//3H K,11(9X,12))
230 FORMAT(2H (,13,1H),11(1X,F9.4,A1))
240 FORMAT(/30X,7H5-ARRAY//3H K,11(9X,12))
   END
   SUBROUTINE DSTAT(MXROU,MROU,NEG,R,S,IP,IQ,IPNT)

```

```

C .....
C DESCRIPTION OF PARAMETERS
C MXROU - ROW DIMENSION OF R AND S ARRAYS IN CALLING PROGRAM
C (INPUT)
C MROU - NUMBER OF ROWS TO WHICH R AND S WERE CALCULATED (INPUT)
C NEG - NUMBER OF ROWS OF NEGATIVE LAG IN R AND S ARRAYS (INPUT)
C R - R ARRAY, DIMENSIONED MXROU BY K IN CALLING PROGRAM,
C WHERE K IS GREATER THAN OR EQUAL TO KOL (INPUT)
C S - S ARRAY, DIMENSIONED AS R ARRAY IN CALLING PROGRAM.

```

IP - (INPUT) MAXIMUM ORDER OF AUTOREGRESSION PERMITTED.
 IQ - (OUTPUT) ORDER OF AUTOREGRESSION SELECTED.
 IO - (INPUT) MAXIMUM ORDER OF SLIDING AVERAGE PERMITTED.
 IO - (OUTPUT) ORDER OF AUTOREGRESSION SELECTED.
 IMPAT - PRINT CONTROL PARAMETERS (INPUT)
 IPNT - 0 NO STAT VALUES ARE PRINTED
 IPNT NE 0 PRINTING IS SUPPRESSED.
 WITH IPNT = 0 THE WRITE STATEMENTS REQUIRE THE INPUT VALUE
 OF IO TO BE LESS THAN TEN.

NOTE

NEG MUST BE GREATER THAN OR EQUAL TO IP+IQ*3. FOR IP AND IQ THEIR INPUT VALUES. FURTHERMORE NEG MUST BE GREATER THAN OR EQUAL TO NEG-IP+Q*4, FOR IP AND IQ EQUAL TO THEIR INPUT VALUES. IF IP-1*(IQ+1) IS GREATER THAN 50*(HERE IP AND IQ ARE AT THEIR INPUT VALUES) THEN THE DIMENSION OF STAT MUST BE CHANGED ACCORDINGLY.

```

DIMENSION R(MXROW,1),S(MXROW,1),STAT(50)

```

```
DATA IPP/6',12R0/0'
JPP-IP+1
100-10+1
100F-JPPJ00
00 40 I-1,JPP
JP-I-1
00 40 J-1,J00
10-J-1
JK-J00(I-1)-J
JSUB2-NEG-JP+J0+2
ISUB1-ISUB2-1
IP1-IP+1
IM1-I-1
1)BOT/15(1SUB2,1)+S(1SUB1,IP1))X22
GO TO 20
00 10 J1-1,3
NEG-M-NEG-JP-J0-J1+1
NEG-M-NEG-JP+J0+J1+1
1)BOT-BOT+R(NEG-M,1)X2+R(NEG-P,1)X22
GO TO 35
1SUB3-1SUB2+1
1)BOT-BOT/15(1SUB3,IM1)+S(1SUB2,1))X22
00 30 J1-1,3
NEG-M-NEG-JP-J0-J1+1
NEG-M-NEG-JP+J0+J1+1
NEG-M1-NEG+1
NEG-M1-NEG+1
1)BOT-BOT+R(NEG-M,1)+R(NEG-P,1)X2+R(NEG-P,1)X22
NEG0-NEG-JP-J0
NEG1-NEG0+1
```

10
20
30
35

```

40 ARG=SIGN(0,IP1)/(NOTS(NEG1,I))
   STAT(JK)=ABS(XARG)
   IMX=1
   XMX=STAT(1)
   DO 50 I=1,10P
   IF(STAT(I).LT.XMX) GO TO 50
   IMX=I
   XMX=STAT(I)
   CONTINUE
   IP=(IMX-1)/100
   IQ=IMX-(IP*100)-1
   IF(IP.NE.0) RETURN
   WRITE(IPR,100)
   WRITE(7,100)
   100=100-1
   WRITE(7,110) I*20 (I=1,100)
   WRITE(IPR,110) I*20 (I=1,100)
   DO 60 J=1,JPP
   JM1=J-1
   IST=JM1*(J03+1)+1
   IEND=IST+100
   WRITE(7,120) JM1, (STAT(I), I=IST, IEND)
   WRITE(IPR,120) JM1, (STAT(I), I=IST, IEND)
   WRITE(7,130) IP, IQ
   WRITE(IPR,130) IP, IQ
   RETURN
100 FORMAT('///50X, 'D, STATISTIC'///29X, 'ORDER OF RM')
110 FORMAT(' ORDER OF AR ',10(4X,13.4X))
120 FORMAT('4X,12.6X,10(1X,E10.4))
130 FORMAT(' ORDER OF AUTOREGRESSION SELECTED ',14/
C' ORDER OF MOVING AVERAGE SELECTED ',14)
END

SUBROUTINE PCRAM(Z,LU)
  DIMENSION Z(1368)
  REAL INTNCTY
  SINT=0.0
  PI=3.141592654
  PRINT*, LU, LU
  PRINT*, 'HOW MANY INTENSITY VALUES DO YOU WANT TO SEE?'
  PRINT*, 0 - DEFAULT OF 45; N=LT. LU/2 ->
  READ(5,X) N
  IF (N.EQ.0) N=45
  IF (N.GT.LU-1) N=45
  WRITE(6,78)
  WRITE(7,78)
  DO 20 I=1,N
  A=0.
  B=0.
  DO 10 IT=1,LU
  XARG=2.0*PI*FLOAT(I)*FLOAT(IT)/FLOAT(LU)
  A=A + Z(IT)*COS(XARG)
  B=B + Z(IT)*SIN(XARG)
10 CONTINUE

```

```

      A=2.0/FLOAT(LU)
      B=2.0/FLOAT(LU)
      INTCV=FLOAT(LU)/2.0*(ASA + B10)
      FO=1.0/LU
      P=1.0/FO
      WRITE(6,77) 1,FO,P,INTCTV
      WRITE(7,77) 1,FO,P,INTCTV
      SINT=SINT+INTCTV
20 CONTINUE
77 FORMAT(1X,3,2X,F5.3,2X,F7.3,2X,F18.3)
78 FORMAT(2X,1,5X,FO,6X,P,15X,INTCTV)
      PRINT,
      WRITE(6,2631) SINT/N
      WRITE(7,2631) SINT/N
      FORMAT(1X,AVERAGE INTENSITY=,F20.10)
2631 RETURN
      END

      SUBROUTINE OURFXL(Z,LJ)
      DIMENSION Z(368)
      INTEGER IND(8),IER
      REAL ARPS(6),PRAS(6),GR(24),AA(740)
      CHARACTER IUMAT
      IND(1)=LU
      IND(5)=500
      IND(6)=4
      IND(7)=0
      IND(8)=5
      PRINT, INPUT P, ORDER OF AR=
      READ(5,*) IP
      IND(2)=IP
      PRINT, INPUT Q, ORDER OF MA=
      READ(5,*) IQ
      IND(3)=IQ
      PRINT, INPUT D, ORDER OF DIFF=
      READ(5,*) ID
      IND(4)=ID
      PRINT, INPUT S, NUMBER OF SIGNIFICANT DIGITS REQUIRED=
      READ(5,*) IS
      IND(6)=IS
      PRINT, INPUT I, ITERATIONS REQUIRED U/O CHANGE TO DIGITS=
      READ(5,*) II
      IND(8)=II
      PRINT, DO YOU WANT TO INPUT ESTIMATIONS FOR THE COEFFICIENTS?
      READ(5,100) IUMAT
      IF(IUMAT.EQ.'Y') THEN
        IND(7)=1
        IF(IP.EQ.0) GO TO 152
        PRINT, INPUT AR ESTIMATES INDIVIDUALLY
        DO 151 1=1,IP
          PRINT, ?
          READ(5,*) ARPS(1)
151 CONTINUE
152 IF(10.EQ.0) GO TO 154

```

```

PRINT*, ' INPUT NA ESTIMATES INDIVIDUALLY'
DO 153 I=1,10
  PRINT*, I
  READ(S,*) PHAS(I)
  CONTINUE
153 CONTINUE
154 ENDIF
155 FORMAT(111)
156 CALL FTAKL(2, IND, ARPS, PHAS, PHAC, UNV, GR, AA, IER)
1001 FORMAT(11, ' IND(S)', '13', 'SER', '13',
  'UNV', 'FB.2', 'PHAC', 'F12.6)
1002 FORMAT(11, ' ARPS VALUES')
1003 FORMAT(11, ' PHAS VALUES')
WRITE(6,1001) IND(S), IER, UNV, PHAC
WRITE(6,1002)
WRITE(6,1003)
DO 20 I=1,10
  WRITE(6,*) ARPS(I)
  WRITE(7,*) ARPS(I)
20 CONTINUE
WRITE(6,1003)
WRITE(7,1003)
DO 40 I=1,10
  WRITE(6,*) PHAS(I)
  WRITE(7,*) PHAS(I)
40 CONTINUE
RETURN
END

```

VITA

Albert Craig Dremstedt was born in Evansville, Indiana, on 10 April 1954 and graduated from Mt. Vernon Senior High School in Mt. Vernon, Indiana, in May 1972. Following two quarters of study at the University of Evansville, he enlisted in the Air Force on 10 April 1973 and was subsequently stationed at Hickam AFB, Hawaii, as a General Accounting Specialist. In August 1975, he was accepted into the Airman Education and Commissioning Program (AECP) and was subsequently discharged in September of the same year so that he could continue his undergraduate studies at the University of Evansville. Following graduation in February 1978 with a BS in Computer Science, he was commissioned as a 2nd Lt and assigned to the Air Force Manpower and Personnel Center at Randolph AFB, Texas, where he served as both a personnel and an operations research analyst. In 1981, he was selected to attend the Air Force Institute of Technology at Wright-Patterson AFB, Ohio.

He is married to the former Sandra S. Weyer of Mt. Vernon, Indiana, and has one daughter, Angela.

Permanent address: R.R.#1 Box 66
Mt. Vernon, Indiana 47620

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER AFIT/GOR/OS/82D-2	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) STATISTICAL TECHNIQUES FOR DETERMINING OFFICER SEPARATION AND RETIREMENT TRENDS IN THE UNITED STATES AIR FORCE		5. TYPE OF REPORT & PERIOD CODE MS Thesis
7. AUTHOR(s) Albert C. Dremstedt Captain USAF		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS Air Force Institute of Technology (AFIT-EN) Wright-Patterson AFB, Ohio 45433		8. CONTRACT OR GRANT NUMBER(s)
11. CONTROLLING OFFICE NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
13. NUMBER OF PAGES 375		12. REPORT DATE December 1982
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES Approved for public release; IAW AFR 190-17. <i>John E. Wolaver</i> John E. WOLAVER Deputy for Research and Professional Development, Air Force Institute of Technology (ATC), Wright-Patterson AFB OH 45433		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Regression R and S Array Analysis Time Series Analysis Box and Jenkins Separation Rate Retirement Rate		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This thesis develops statistical techniques for determining Air Force officer separations and retirements. The analysis techniques used were linear regression and Box and Jenkins' time series. The regression models developed for both separation and retirement predictions were very accurate. The FY81 separation prediction was in error by only 1.8% and the FY82 separation and retirement predictions were in error by 16.9% and 2.1% respectively. Moreover, a modified update procedure was in error by only 9.6% for the FY82 separation prediction. This compares to errors in loss predictions of 1.7% to 79.9% for		

DD FORM 1 JAN 73 1473

EDITION OF 1 NOV 65 IS OBSOLETE

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

the currently used models. The independent variables used were separation and retirement application approved and in-system. The R^2 ranged from .75 to .99 for all data bases used in the research. Although time domain time series models were developed which adequately fit both separation and retirement patterns, both failed to accurately predict either short or long term trends.

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

END

```

PROGRAM TS(INPUT, OUTPUT, TAPES=INPUT, TAPES=OUTPUT, TAPES)
COMMON AC(51)
COMMON LU
COMMON NAC
INTEGER NAC, NPAC
CHARACTER IUK(80), IUMAT
CHARACTER TITL(20)
REAL R(40,40), S(40,40), Z(368), ACU(50), PACU(50)
REAL UK(50)
CHARACTER A(-50:50)
CHARACTER BX1
REAL N
REAL CC
CC=0.0
IFLG=1
PRINT *, 'HOW LONG IS THE TIME SERIES?'
89 READ(5,*) LZ
LU=LZ
DO 1 I=1,LZ
  READ(1,*) Z(I)
1 CONTINUE
88 PRINT*, 'ENTER TITLE'
  READ(5,102) TITL
  N=0.0
  CC=0.0
102 FORMAT(A20)
  PRINT *, 'DO YOU WANT TO DIFFERENCE OR TRANSFORM (Y/N)?'
  READ(5,100) IUMAT
  FORMAT(I1)
  IF (IUMAT.EQ.'Y') THEN
    PRINT *, 'WHAT IS THE ORDER OF THE NON-SEASONAL DIFFERENCE'
    READ(5,*) ID1
    PRINT *, 'WHAT IS THE ORDER OF THE SEASONAL DIFFERENCING?'
    READ(5,*) ID2
    PRINT *, 'TRANSFORMATION COEFF: IP=0 (LN), IP=0(2(1)-Z(1))'
    READ(5,*) IP
    PRINT *, 'LENGTH OF SEASON: IS=0'
    READ(5,*) IS
    LZA=LU
    CALL FTRDIF(ID1, ID2, IP, IS, LZA, Z, SHIFT, LU, IER)
    WRITE (7, '(A50)') 'DIFFERENCED DATA'
    WRITE (7, '(1X,F20.10)')(Z(I), I=1, LU)
  ENDIF
  NAC=LU/2
  IF (NAC.GT.45) NAC=45
  NPAC=LU/2
  IF (NPAC.GT.45) NPAC=45
  CALL FTAUTO(Z, LU, NAC, NPAC, 7, A, MEAN, VAR, ACU, AC, PACU, UK)
  WRITE(6,162) TITL
  WRITE(7,103) TITL
103 FORMAT(1H1, 1X, A20)
  PRINT*, 'MEAN = ', A, MEAN, ' VARIANCE = ', VAR
  PRINT*,

```