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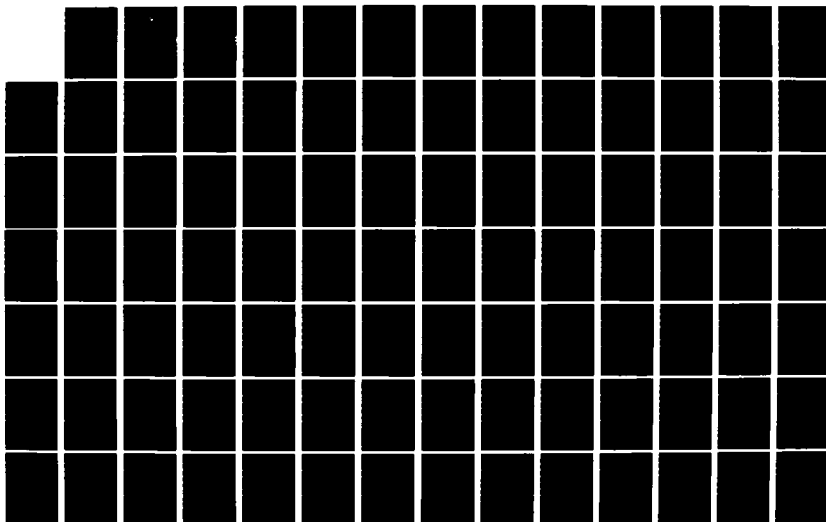
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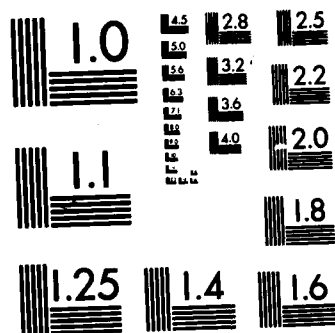
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FACTORS INFLUENCING ARMY ACCESSIONS

THESIS

AFIT/GOR/OS/82D-7

Kenneth Kalinich
Captain USA

Dennis Wenzel
Captain USA

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FACTORS INFLUENCING ARMY ACCESSIONS

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

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Graduate Operations Research

December 1982

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Acknowledgements

The analysis presented in this report represents our attempt to help the Army study the topic of accessions. Hopefully, we have provided Army manpower managers some useful techniques to aid further study. Throughout this paper we assume the reader has a basic knowledge and understanding of standard methods of statistical analysis.

We wish to express our deepest gratitude to Dr. Ivy Cook for providing his aid and assistance in seeing us through this effort, and to Dr. Richard Kulp for reviewing this report and offering valuable insights. We would like to thank Dr. Neil Dumas, Mr. Ed Schmitz, and Dr. Abe Nelson from the Army Research Institute for providing the MEPS data file and advice on how to manipulate the file. Our thanks is also extended to Major John Wallace, Dr. Marv Trautwien, and Mr. Gerald Klopp from the US Army Recruiting Command for providing us the Enlistment Projection Model and its associated data base plus a great deal of food for thought. A special thanks goes to Captain Phil Knorr who delayed going on leave and enjoying the beautiful California coastline until he provided the monthly accession data we requested. Finally, we are deeply indebted to Yong Sun Wenzel for the many hours of typing and clerical support she provided.

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Abstract

Factors influencing Army accessions were studied using the Army Research Institute's (ARI) Military Entrance Processing Station (MEPS) data base, a US Army Recruiting Command (USAREC) data base, and a Defense Manpower Data Center (DMDC) data base. Six types of analysis were performed: regression analysis, data base profile analysis through SPSS Frequencies and Crosstabs, factor analysis, discriminant analysis, time series analysis, and analysis of leading economic indicators. The USAREC Enlistment Prediction Model was improved; the MEPS file was reorganized, analyzed with respect to District Recruiting Command (DRC), and merged with the USAREC file; factor and discriminant analysis procedures were developed and employed to examine the merged file by DRC; Box-Jenkins time series analysis was applied to the DMDC data; and procedures were implemented using leading economic indicators. Computer programs were written by the authors to accomplish the foregoing analyses. Procedures developed in the study should aid USAREC and ARI researchers and managers to better understand the variables influencing recruiting, and enhance their ability to effectively allocate scarce resources by Region and DRC. Ultimately, the information derived from these analyses could aid ARI and USAREC planners in their formulation of recruiting policy.

FACTORS INFLUENCING ARMY ACCESSIONS

I. Introduction

The subject of this thesis is accessions and the factors influencing a potential recruit's decision to join the Army. The topic of accessions has been a great concern for Army planners since the birth of the All-Volunteer Force. Currently the United States Army Recruiting Command (USAREC) is experiencing a "boom" in recruitments, which can be attributed to the zealous efforts of USAREC recruiters and to the current economic conditions. However, once the economic situation reverses, there will be more pressure put on the internal system to meet enlistment quotas. Whether operating in "boom" or "bust" years, Army planners must be able to effectively allocate both dollars and manpower within USAREC, and the Army as a whole, to make the most productive use of these limited resources.

This thesis is organized in the following manner:

- Chapter II Presents general background information on the topic of accessions. Additionally, it discusses current related research that influenced this study, and highlights the importance of this effort.
- Chapter III Discusses the methodology employed in Chapters IV, V, VI, and VII.
- Chapter IV Presents regression analysis performed on the USAREC data base.

Chapter V Discusses the Military Entrance Processing Station (MEPS) applicant file and the key problems encountered in analyzing this MEPS file. Also included is a discussion of the merging of key elements in the USAREC data base with the MEPS file.

Chapter VI Presents discriminant and factor analysis performed on the merged file. The factor analysis section demonstrates a technique for analyzing the critical factors affecting recruiting at the regional and the DRC level. Next, procedures are developed for performing discriminant analysis on the merged MEPS and USAREC data to determine the key variables that influence personnel to join the Army over the other services.

Chapter VII Presents time series analysis performed on nationwide accession rates. It presents the development of three leading indicator models for accession rates.

Chapter VIII Highlights the major accomplishments of this thesis and discusses the results and conclusions from the analytic chapters.

II. BACKGROUND

General Topic

The debate over the All-Volunteer Force (AVF) encouraged the creation of a presidential commission, named the Gates Commission, which was tasked with developing a comprehensive plan for eliminating the draft and moving toward an all volunteer armed force. In 1970 the Gates Commission delivered its final report to the President and to Congress with the recommendation that first-term military pay be raised to a level that could compete with current levels of pay received by 18 to 21 year old male high school graduates. This would allow the Armed Forces to attract enough qualified volunteers without the need for the draft (Ref 4).

The movement away from the draft toward the AVF was partially due to the increasing resistance to the Vietnam War, but was also due to a natural evolution that was dictated by the economic forces of the human resource market. Increasing numbers of men were reaching draft eligible age each year, while the "winding down" of the war moved the Armed Services toward decreasing their force size. These coincident factors operating together meant that a smaller percentage of the eligible population would actually serve in the Armed Forces. Based on these conditions and the Gates Commission recommendations, Congress raised first-term pay in 1971, which coincided with plans for termination of the draft by 1973. Secretary of Defense Melvin Laird in fact ended draft calls in January 1973, six months prior to the expiration of

the draft authority. The nation thus became committed to the AVF, and all new recruits were strictly volunteers.

Initial reports to Congress (Ref 5:5928) indicated that the services had been able to successfully recruit a socially representative mix of qualified personnel to meet defense requirements. Despite the rosy picture painted to Congress, the Army experienced recruiting shortfalls: failing to meet requirements for gross number of enlistments, failing to attract and enlist sufficient numbers of recruits into the combat arms specialties, and failing to recruit enough "higher category" personnel to fill the Army's increasing number of technical positions (Ref 4).

2 Manning the Force became one of the key issues faced by the Chief of Staff of the Army. This was evidenced by the intensification and expansion of resources, both in dollars and in manpower, allocated to the U.S. Army Recruiting Command (USAREC). Greater and greater pressures were placed on recruiters to meet their mission requirements in the face of continued shortfalls, so much so that grievous violations of recruitment standards occurred leading to the conviction and imprisonment of several recruiting personnel including officers. Today, only officers who are in the top third of their year group are selected for assignment to USAREC and the enlisted recruiters are only chosen after a very extensive screening process. Despite the increased emphasis, advertising, dollars, and manpower, USAREC continued to experience shortfalls until the economic downturn. An

important, intuitively obvious factor that influenced enlistment rates is the condition of the marketplace.

Current Related Research

The topic of accessions is of critical importance to Army planners. Thus there are a myriad of studies in this field. An entire thesis could be directed to a literature review. However, since this thesis is an application effort, the main concern is that no current research is being duplicated. With this in mind, the Deputy Chief of Staff for Personnel's analysis shop, The Army Research Institute (ARI) and the United States Army Recruiting Command (USAREC) were contacted with this proposed study topic (accessions). There are many ongoing studies of which a few are discussed below and both ARI and USAREC enlisted our services in studying accessions.

Several models have been developed which show the relationships between recruiting variables and mission accomplishment (actual accession of personnel into military service). USAREC uses an automated predictive model along with professional judgement and institutional memory in the allocation of resources and mission requirements among its five Region Recruiting Commands (RRC's) and its 57 District Recruiting Commands (DRC's). This model, the Enlistment Prediction Model (EPM), and regression analysis are used to produce the various missions that are assigned to the RRC's. Next, market recruitment potentials are converted to percentages of the command and specific regional missions are

assigned to the DRC's. Program Analysis and Evaluation (PA&E) Directorate personnel use professional judgement to refine the mission which is further adjusted after negotiation between the USAREC Commander and the DRC Commanders. Current research on the relationships between the various variables and the recruiting mission has not yet provided adequate models for the allocation of recruiters, advertising dollars, recruiter aides, etc., in determining where these resources can be most productive.

Two recruiting resource allocation models have been developed by USAREC: the EPM, discussed above, and the Veteran's Educational Assistance Program (VEAP) Incentives Model. The VEAP Model uses unemployment rates and number of active recruiters in the system as two of its four explanatory variables. There is only limited data on VEAP contracts (only that available since the end of the G.I. Bill), so that simultaneous equations are used to base predictions on term of enlistment and the number of accessions. Once more data becomes available, a regression model will be developed with the basic VEAP Model.

Two recruiting resource allocation models have been developed by contract: the Claritas Geodemographic Model, and the N.W. Ayer Advertising Effectiveness Model (Ayer Model).

The Claritas model uses over 500 demographic variables that are combined into 34 factors. These factors, combined with measures of recruiter strength, proportion of

population serving in the Armed Forces, are used in a linear regression model to predict the annual recruit penetration into the population of available males by mental category. The Claritas model was done under contract for the Army, so that the specifics of the model are known only to the contractor. Claritas uses r squared as a measure of effectiveness in order to determine where the Army should concentrate its recruiting efforts in order to maximize accessions.

Another study sponsored by USAREC, was the evaluation of the effectiveness of the Army's National Advertising Expenditures (the Ayer Model). The object of the modelling project was to measure the impact of dollars spent for recruiting on the quantity and quality of recruits. A secondary objective was to measure and compare the influences of other major factors such as pay, size of the recruiting force, type and extent of recruiting mission, and the amount of money spent on advertising in order to determine the most cost effective way of increasing the quality of accessions. The model assumed that any omitted variables were not dominating influences and that past (1976-1980) relationships will persist, staying relatively close to their observed ranges. The main findings of this study were that dollars spent on advertising were the most cost effective way of increasing the quantity and quality of accessions. It should be noted that N.W. Ayer International is the advertising agency that handles a majority of the Army advertising.

The Optimal Recruiter Allocation Model (ORAM) was developed to show the relationship between the many dependent variables and the District Recruiting Command's mission (Ref 23). Its findings suggest that the optimal allocation of recruiters would move recruiters from the Northern and Western Regions and place them into the two southern regions. This seems to tie in with the 1980 census data which indicated population shifts into the "Sun Belt", and with the traditional conservatism associated with the South and its support of the military. ORAM uses past performance to allocate recruiters to areas where recruiting has been successful.

Two models developed for the Navy are Morey's Budget Allocation and Enlistment Prediction Model, and Goldberg's Navy Enlisted Supply Study. All of the models discussed above are summarized in Ref 16.

Dale and Gilroy (Ref 5) present an application of time series analysis used to predict accession rates. This was a working paper which the authors permitted us to use as a source in this thesis. An objective of the paper was to study the relationship between economic variables and accession rates. Unemployment rates were one of the key independent variables in this study and the dependent variable was male high school graduate mental category I-IIIA accessions. Regression analysis was used lagging unemployment rates to determine the correlation between accessions and the lagged unemployment rates.

The Dale and Gilroy study was important to this thesis effort because it is a current working project and it studied one of the variables important to this effort, unemployment rates.

Problem Statement and Research Objectives

The thrust of this thesis is identified as follows:

1. Study accessions in an attempt to understand what factors influence them.
2. Build a discriminant function to predict whether a potential accession will join the Army or other services.
3. Enhance the USAREC Enlistment Prediction Model.
4. Conduct time series analysis on accessions using Box and Jenkins techniques.
5. Developed leading indicator models to predict accessions based on the following input variables: unemployment rates, the producer price index and the prime rate.
6. Provide to ARI and USAREC usable computer programs to accomplish the above.

III. METHODOLOGY

Introduction

This chapter presents the methodology employed in the following four chapters.

The Data

Initially this study started as an analysis of a ten percent random sample of the Military Entrance Processing Station (MEPS) Applicants file which was received from the Army Research Institute (ARI). This file consists of up to 256 variables of information about individuals who show an interest in the armed services. This interest is manifested by the applicant arriving at a MEPS to begin enlistment processing. Approximately 58.18 percent of the applicants turn into accessions. There are 48,520 applicants or cases in the file, so that, in order to facilitate some form of a cost effective analysis, the number of variables per case was reduced to what was considered a manageable and minimum number of essential variables. These included such variables as date of birth, sex, service processed for, etc.

Additionally, the United States Army Recruiting Command (USAREC) was visited and another data base was obtained, which will be referred to as the USAREC file. The USAREC file is input into an SPSS regression routine to predict various levels of accessions. This model is the initial phase in the quarterly process of assigning the recruiting mission to the fifty-seven District Recruiting Commands (DRC's).

The focal point of this phase of the analysis was to enhance the USAREC regression model. This is discussed in Chapter IV.

There were many variables in the USAREC file that could be applied to individuals on the MEPS Applicant File. For instance, the USAREC file lists the unemployment rate for the specific DRC's for specific quarters. This is an important variable because it reflects the unemployment rate that was influencing the applicant to make contact with a recruiter. The problem became to merge desired variables in the two files into a new file. This process is discussed in detail in Chapter V. The major stumbling block in this step was the fact that the variables in the USAREC file relate to DRC's, whereas the variables in the ARI file relate to individuals, and the individual MEPS records are not categorized by DRC. The task became to equate an individual MEPS record to a DRC. Once this task was accomplished, meaningful analysis was performed on the merged file using discriminant and factor analysis routines from SPSS. These results are discussed in Chapter VI.

Another objective of this study was to perform time series analysis on accession data. The USAREC file contained only 22 quarterly data points which is not an adequate amount to perform time series analysis. A third data set of monthly accession figures from October 1975 to July 1982 was obtained from the Defense Manpower Data Center (DMDC), US Army MILPERCEN Liaison Officer, Monterey, California. The 81 data points were utilized in the analysis performed in

Chapter VII. When modelling accessions using leading indicator techniques, the following variables were used as input variable:

<u>Variable</u>	<u>Journal Source</u>
National Unemployment Rates	Federal Reserve Bulletin
Producer Price Index	Monthly Labor Journal
Prime Rate	Monthly Labor Journal

There was a slight problem to be resolved when using these variables. From month to month the rate can change due to revised calculations. Therefore, the last time a rate or index appears in a journal is the rate used in the analysis. For example, in the September issue, for the first time, is listed the unemployment rate for August. However, the August rate will appear in several future editions and may be changed. In June of the following year the August rate will no longer be shown. Thus, this analysis used the rate from the May issue.

A sample of the USAREC file is shown in Appendix A-1. Complete listings of accessions, unemployment rates, the producer price index, and the prime rate are shown in Appendices A-2 through A-5.

Analysis Techniques

All analyses were performed on a Cyber CDC 6600 using SPSS for the regression, factor and discriminant analysis. Biomedical Computer Programs P-Series (BMDP) (Ref 24) was used along with FORTRAN time series computer programs (referred to as TSP) that utilize various International

Mathematical and Statistical Library (IMSL) subroutines.

Regression

It is felt that regression analysis is a common method of analysis, therefore, it is not expounded upon in this paper.

File Merge

The USAREC file and the MEPS applicant file were merged in order to perform multivariate data analysis. This process is discussed in detail in Chapter V. The merged file is referred to as MU for MEPS-USAREC.

Factor Analysis

Factor analysis was performed on the MU file using the SPSS subroutine Factor to discover how the various variables in the analysis "hang together" to form what are called factors or principal components. The SPSS method of factoring chosen was "Principal Component Analysis", i.e., TYPE=PA1. Factor analysis can be used to reduce the dimensionality of the data sample by condensing out principal components from the patterns and relationships found among the observed variables in the sampled data. This type of analysis is similar to using "cluster analysis" on a correlation matrix to pick out clusters of variables that have high correlation coefficients among each other, and calling the resulting cluster a "factor." The MU file was examined using factor analysis in order to add to the overall MU data profile and to enhance the cross-tabulation and discriminant analysis.

Thus, this study supports the thesis objective of giving ARI and USAREC a detailed overview of the important factors relative to recruitment. Chapter VI contains the results of the factor analysis performed on the MU file.

Discriminant Analysis

Discriminant analysis was performed on the MU file using the SPSS subroutine Discriminant to examine how well the different MU variables could predict that an individual would join the Army over another branch of the service, and to discover the differences among these predictive variables by region. The fundamental aim of discriminant analysis is to formulate a rule that can be used to correctly classify individual cases into two or more groups based on attribute variables associated with the given cases. In SPSS the rule that is formulated consists of assigning both standardized and unstandardized weights to the attribute variables that can then be used to predict into which group a randomly sampled case may fall. Under SPSS there are two ways to classify groups, given raw input data: either by using Fisher's Linear Discriminant Coefficients, or by using the Canonical Discriminant Function Coefficients. If Fisher's Coefficients are used, then the highest of the computed functional values will show what group the input case is to be classified. If the Canonical Coefficients are used, then for the case of two groups, one can classify the input case based on the sign of the resulting functional value since the overall population mean (population centroid) will have

a value of zero. In this study the Canonical Coefficients rather than Fisher's Coefficients are tabled in Appendices C-9 through C-12. When the unstandardize Canonical Coefficients are used, only one equation and set of coefficients is required to compute which group a random case belongs to. The result of such a computation on raw input data will be either positive showing it belongs to one group or negative showing it belongs to the other group. A zero result would point to neither group. The standardized weights show the intensity with which a particular variable is able to help predict into what group a case belongs. The unstandardized weights are coefficients which are very much like the coefficients in regression analysis that are used to compute a dependent variable; but in discriminant analysis the computed variable is compared to the group means to show where it falls relative to them, thus predicting to which group a case "belongs."

To develop and later test the discriminating equation, the MU file is randomly divided into two halves. The first half of the file is used to model the discriminating equation, then the first half is run against the formulated equation to see what percentage of the records are correctly classified by the equation. The second half of the file is likewise run against the same formulated equation to determine how well the equation correctly classifies a random data sample other than the random sample that created the equation.

The SPSS procedure includes a listing of both the standardized coefficients as well as the values of the group centroids, i.e., the values of the discriminant function evaluated at the group means. There are also five important statistical values generated by the discriminant subroutine:

1. Canonical Correlation,
2. Wilks Lambda,
3. Chi-Squared,
4. Degrees of Freedom, and
5. the corresponding Significance.

The last value is a percentage used in hypothesis testing such that if a test is conducted at alpha equal .05 and the resulting Significance is greater than .05 then the null hypothesis will be accepted. Specifically, in the case of discriminant analysis, the null hypothesis is that the group centroids are equal, i.e., there is no significant difference between the groups. However, if the Significance is less than .05 then the null hypothesis will be rejected. Specifically, it is concluded that the discriminant functions provide a significant differentiation among the groups. The Significance value in this study is a resulting measure of the following test of hypothesis:

$$H_0 : U_1 = U_2$$

$$H_1 : U_1 \neq U_2$$

where U_1 = the group centroid for non-Army records
and U_2 = the group centroid for Army records.

To test this hypothesis a chi-squared statistic is computed by SPSS and compared to the tabled value of chi-squared at a given alpha and with $p*(g-1)$ degrees of freedom, where p is the number of parameters and g is the number of groups. If the computed chi-squared is greater than the table value of chi-squared, the null hypothesis will be rejected. If the null hypothesis is rejected, then it can be concluded that the discriminant functions do indeed provide a significant differentiation among the groups.

The discriminant coefficients, centroid values, and forementioned statistics are the primary tools used in this portion of the study to examine the MU file and to try to discover what variables, if any, had an impact on differentiating the Army from the non-Army prospective recruits.

The Mahalanobis distance stepwise method was employed in all discriminant analyses performed in this study. This method allowed only the most significant variables to enter in each individual analysis, thus permitting very refined differentiation by DRC. Since only the most important variables within each DRC were selected, a clearer definition of the demographic differences among DRC's can also be developed. The selection criteria for the ~~entry~~ of a given variable in the stepwise procedure depended on having a partial F ratio of greater than or equal to 1.0, while the tolerance level was set at .001 (Ref 20:448-454). Chapter VI contains the results of the discriminant analyses performed on the MU file.

Time Series Analysis

The goal of the time series analysis was to develop a model which predicts accessions based upon previous values of accessions. A FORTRAN program called TSP was written based upon Box-Jenkins (Ref 1) time series analysis techniques. This program uses IMSL subroutines to calculate autocovariances, autocorrelations and partial autocorrelations. These values are graphed and examined for significant values. Additionally, Gray, Kelley and McIntire's R and S array techniques for model identification (Ref 9) have been incorporated into this program listed in Appendix A-6. Once the model has tentatively been identified, BMDP time series routines are used to further analyze the model. Once a final model has been chosen, adequacy checks are conducted, using FORTRAN programs and BMDP. These checks included the Portmanteau lack of fit test and the cumulative periodogram plot (Ref 1:290-298) and analysis of the residual series for significant autocorrelations. This time series approach is applied in Chapter VII.

Leading Indicator Analysis. In modelling accessions using a leading indicator, the desired results are two-fold: first, determination of an input variable that leads accessions, in order to allow use of current values of the input variable to predict future values of accessions, and second, tightening of the standard error band about the predicted values of accessions. Once again BMDP leading indicator techniques were used. The steps in this modelling process are

as follows:

1. Model the input variable as an Autoregressive Integrated Moving Average Process (ARIMA) to obtain the pre-whitened input series, say $R_x(t)$.
2. Apply the ARIMA model to accessions and denote the filtered output series as $R_y(t)$.
3. Cross correlate $R_x(t)$ and $R_y(t)$ attempting to identify the functional form of the transfer function component.
4. Identify an ARIMA model for $R_y(t)$ and combine the ARIMA component with the transfer function component to obtain a tentative transfer function model.
5. Apply autocorrelation and cross correlation checks (Ref 1:392-298) to test for model adequacy.
6. Forecast future values of accessions.

All of these steps were performed using BMDP. This technique is applied in Chapter VII, using accessions as the output variable and unemployment rates, producer price index, and the prime rate as input variables.

Statistical Significance

In any study, results could appear that are attributable solely to chance or sampling variance. In order to minimize this possibility, tests described in this report are conducted at an alpha level of .05 in Chapter IV and Chapter V. Therefore when something is referred to as being significant or statistically significant, this equates to a less than five percent likelihood that the result is due to chance. Unless otherwise clearly indicated, significance

relates to an alpha equals five percent level. In the time series analysis (Chapter VII) when discussing autocorrelation plots, significance relates to an approximate two standard error band.

Assumptions

The following assumptions are made in this report:

1. The relationships that exist between the variables examined over the time periods examined are not changing.
2. The results from the BMDP time series analysis are valid.
3. The results from TSP are valid.

The second and third assumptions are of particular concern. In order to validate BMDP and TSP, the results of Box-Jenkins Gas furnace example (Ref 1:381-409) were compared to results of the same example from BMDP and TSP analysis. This test validated the acceptability of both BMDP and TSP.

Choice of Dependent Variable

There are numerous categories of accessions but the time series and regression segment of this report studies only one: Male High School Graduate Mental Category I-IIIA accessions (CAT13AM). This is done for two reasons: first, for continuity in the analytic phases of the study, and, second, because the other categories of accessions such as female, mental category IV, and prior service accessions are demand constrained whereas CAT13AM accessions are supply

constrained. Recently the Army has been able to focus almost all of its recruiting effort on CAT13AM accessions and has eliminated the accession of non-high school graduate and mental category IV personnel. One of the underlying objectives of this study is for it to be useful for Army personnel management policy makers and planners. Therefore the dependent variable studied in this report is CAT13AM.

IV. REGRESSION ANALYSIS

One of the main objectives of this report is to take the current model that the United States Army Recruiting Command (USAREC) uses to predict Male HSG Mental Category I-III A accessions and improve on its capability to account for the variance in accessions. The regression model is called the Enlistment Projection Model (EPM) and it is the first step in a process that USAREC planners and managers use to assign quarterly recruiting missions to the various District Recruiting Commands (DRC). The EPM and data base were provided for use in this thesis by USAREC Plans and Analysis Section. The focal point of this study is essentially Male HSG Mental Category I-III A accessions so that we only concern ourselves with this variable as a dependent variable. Table 1 is a summary of the variables used in the model and a brief explanation of their meaning. In Appendix A-1 is a sample of the USAREC data base and its associated input format.

The regression design statement used by USAREC in their SPSS Program was modified so as to specify an inclusion and exclusion level for variables to enter and leave the model and is as follows:

```
REGRESSION METHOD=STEPWISE/  
  VARIABLES=AREA,REACT,HSSNR,QMA,RCTRS,NPSMACC,  
  HSDMACC,UNEMP,RCTREX,INCOME,BLACKS,PROPEN,Q1VAR,  
  Q2VAR,Q3VAR,DODRCR,AIDES,DODN,DODH,TOTCON,HSGCON,  
  ADVCONST,DRCADV,CAT13AM,PSTOTACC,NPSFACC/  
  REGRESSION=CAT13AM(*,2.0,*,1.99) WITH AREA,HSSNR,  
  QMA,UNEMP,RCTREX,INCOME,BMA,PROPEN,Q1VAR,Q2VAR,  
  Q3VAR,DODRCR,AIDES,ADVCONST,DRCADV,RCTRS,REACT/
```

The model was run for the five recruiting regions with following results:

<u>Region</u>	<u>Adjusted r^2</u>
NE	.75220
SE	.73807
SW	.68286
MW	.62862
WEST	.75133

Final models for each region are in Appendix B-1. It is important to note that we are not attempting to analyze the resulting equations that model accessions in the various regions. However, analysis of the results and the significance of various variables in the models did aid in the following chapters of this report.

Studying the results from the USAREC model and considering the meaning of some of the variables, we decided to develop a new variable called density that would be a reflection of some of the variables already in the model. Our perception was that several of the variables alone had hard-to-interpret meanings whereas in some functional relationship with other variables they would have more meaning. For instance, in several models DRC area in square miles (AREA) is significant as is on-production recruiters (RCTRS) and qualified military available (QMA). It seems to make sense that accessions might be tied to some sort of relationship between these variables such as $\text{Density} = \frac{\text{RCTRS}}{\text{QMA}}$ or $\text{Density} = \frac{\text{RCTRS}}{\text{AREA}} * \text{QMA}$. Density was computed as indicated and added to the data and the regressions were run again. Additionally, consideration was given to the possibility that

<u>VARIABLE NAME</u>	<u>DATABASE COLUMNS</u>	<u>VARIABLE DESCRIPTION</u>
TIME QTR	1-4	FISCAL YEAR & QUARTER
RGN,DRC	5-6	DISTRICT RECRUITING COMMAND CODE
AREA	7-11	DRC AREA IN SQUARE MILES
QMA	12-16	QUALIFIED MILITARY AVAILABLE
REACT	17-21	REACT LEADS (MAGAZINE ADS)
HSSNR	22-26	MALE HIGH SCHOOL SENIORS
RCTRS	27-30	ON-PRODUCTION ARMY RECRUITERS
NPSMACC	31-36	ARMY NON-PRIOR SERVICE MALE ACCESSIONS
HSDGMACC	37-41	ARMY HIGH SCHOOL DIPLOMA GRADUATE MALE ACCESSIONS
UNEMP	42-44	DRC OVERALL UNEMPLOYMENT
RCTREX	45-47	PERCENT OF DRC RECRUITERS WITH ONE OR MORE YEARS EXPERIENCE
RCTRSPCT	48-50	ARMY RECRUITERS AS PERCENT OF DOD RECRUITERS BY DRC
DODNPS	51-56	DOD NON-PRIOR SERVICE MALE ACCESSIONS
DODHSDG	57-62	DOD HIGH SCHOOL DIPLOMA GRADUATE MALE ACCESSIONS
INCOME	63-67	MEDIAN DISPOSABLE FAMILY INCOME
BMA	68-72	BLACK MILITARY AVAILABLE
TOTCON	73-76	ARMY TOTAL CONTRACTS
HSGCON	77-80	ARMY HIGH SCHOOL DIPLOMA GRADUATE MALE CONTRACTS
PROPEN	81-83	ACTIVE ARMY ENLISTMENT PROPENSITY
AIDES	84-87	HOMETOWN RECRUITER AIDES (AVERAGE)
CAT13AM	88-91	ARMY MC 1-3A MALE ACCESSIONS
PSTOTACC	92-95	ARMY PRIOR SERVICE TOTAL ACCESSIONS
NPSFACC	96-99	ARMY NON-PRIOR SERVICE FEMALE ACCESSIONS
DRCADV	100-103	DRC LOCAL ADVERTISING EXPENDITURES

Table I. Variables in USAREC Model

accessions are not driven by a linear function but rather that it might be some sort of a multiplicative or Cobb-Douglas type production function of the form:

$$Y = e^{a_0} X_1^{a_1} X_2^{a_2} \dots X_n^{a_n}$$

where Y represents accessions, the X_n 's the various independent variables, and the a_n 's their associated parameters. The equation is solved by ordinary least squares regression after utilizing a logarithmic transformation as follows:

$$\ln Y = a_0 + a_1 \ln X_1 + a_2 \ln X_2 + \dots + a_n \ln X_n$$

The coefficients generated by SPSS for the a_n 's represent each of the variables elasticity with relationship to accessions. All of the models were run again taking a logarithmic transformation of all variables. In addition, a model was estimated with both densities in the equation. The resulting adjusted r-square for all models is in Table II. The SPSS output for only the final iteration of optimal models discussed below is in Appendix B-2.

From Table II it is clearly seen that in all cases the USAREC Model has been improved. By saying "improved" it is meant that more of the variance in the dependent variable is being accounted for by the independent variables. The model that does the best overall job is Model 4, the log transformation of the USAREC model including the variable $\text{Density} = (\text{RCTRS} * \text{QMA}) / \text{AREA}$. For the northeast, southwest and west regions the adjusted r^2 value is the highest value and for the midwest region the adjusted r^2 value is within

Table II. Listing of Adjusted r^2 for Various Enlistment Projection Models

1	2	3	4	5	6	7	8
Model Region	USAREC LN of Model 1	Density 1= (RCTRS*QMA)/ AREA	LN of Model 3	Density 2= RCTRS/QMA	LN of Model 5	Both of Densities In Model 7	LN of Model 7
NE	.75220	.76185	.75388	.76185	.75161	.76185	.76185
SE	.73807	.73661	.76889	.73661	.73807	.76868	.73661
SW	.68286	.71213	.68486	.71546	.68286	.68486	.71546
MW	.62862	.63073	.63679	.63073	.68262	.63679	.63890
WEST	.75233	.81162	.75248	.81231	.75133	.81162	.81231

.0082 of the largest value. That is not to imply that the key is the density variable. The summary of the final model for the northeast and midwest regions shows that density did not enter the equation modelling accessions (Model 1 and 4) and thus shows that the logarithmic transformation is responsible for the higher adjusted r^2 value. For the southeast region model 3 optimizes the adjusted r^2 value. Model 3 is the USAREC model plus a Denisty = $(RCTRS*QMA)/(AREA)$. In this model, Denisty proved to be a very strong variable, entering the model at step 6 with a F value of 44.84.

For the sake of simplification, models 3 and 4 will be combined into one SPSS regression program with two regression design statements; one with a logarithmic transformation of the USAREC Model plus Density = $(RCTRS*QMA)/AREA$ which is to be used to predict accessions for all regions except the southeast region and the second with the USAREC model plus Denisty = $(RCTRS*QMA)/AREA$ which is to be used for the southeast region. A complete listing of this program is at Appendix B-3. This model will be provided to USAREC for use as a new Enlistment Projection Model.

Having evaluated all these models, there are some interesting relationships between accessions and the various independent variables. It might be expected that the more dollars spent on advertising the more accessions the Army would have, yet it appears that, in the midwest, dollars spent on advertising has a negative effect on accessions. Table 3 is a listing of variables that have unexpected negative

effects on accession rates. Additionally, in the southeast and southwest regions, the number of react leads has a negative impact on accessions. A react lead is counted when an individual responds to any form of magazine advertising. It is these types of relationships that prompted the next portion of this study. We attempt to determine what variables are factors affecting accessions and to classify possible recruits as being likely to join the Army or not.

Results and Conclusions

The USAREC model was enhanced by computing a new variable $Density = (RCTRA * QMA) / AREA$ for the Southeast region and for all other regions by taking a logarithmic transformation of the previous model. However, there were several interesting and unexplainable relationships that appear in the models.

Recommendation for Future Research

There are many other variables that might further enhance the USAREC Model but due to time constraints we were not able to pursue them. Some examples are a wage differential variable and a percent annual pay raise variable. From this analysis questions arise as to what factors relate to Army accessions and how do they compare with the other services? What type of a person is likely to enter the Army? These questions will be addressed in Chapter VI of this report.

MODEL REGION	1	2	3	4	5	6	7	8
NE		LReact LDODCR		LReact LDODCR	DODRCR	LReact LDODRCR	DODRCR	LReact LDODRCR
SE	React	LReact	DRCADV React	LReact	React DRCADV	LReact	React	LReact
SW	React Aides		React	LReact	React Aides		React	LReact
MW	DRCADV		DRCADV		DRCADV		DRCADV	
W	QMA DODRCR	LQMA	QMA	LHSSNR	QMA DODRCR		QMA DODRCR	LHSSNR

Table III. Variables With Regression Coefficients
With Unexpected Negative Sign

V. Data Base Preparation

Topic Selection and Data Gathering

One of the many ongoing activities of the Army Research Institute (ARI) in Alexandria, Virginia, is its investigation of the Military Entrance Processing Stations (MEPS) data base to aid in answering a continuing chorus of questions at the highest levels of personnel management in the Army. The Personnel Research and Analysis Section at ARI (office: ARI-PERI-RP) suggested that their long run investigation could be aided through the employment of multivariate analysis techniques on a sample of the MEPS file. It was recommended that this study could most effectively be carried out by first building a "profile" of the general structure and content of the data base. Several areas of current interest to ARI were suggested as objectives for the investigation. Two of these objectives formed the basis of this thesis study:

1. Determine what factors influence fully qualified individuals to join the Army over other branches of the Military Service, and
2. Improve the Army's current predictive model of recruitment projections.

To aid in the pursuit of these objectives, it was recommended that more data and information be obtained from the operations researchers of the US Army Recruiting Command (USAREC) at Fort Sheridan, Illinois. USAREC (office: USAREC-PAE-RE) provided a complete copy of their recruiting model

input file, while ARI-PERI-RP was able to provide a useful random sample of the MEPS data base.

The data gathering phase also included an examination and modeling of a typical MEPS operation, and the MEPS site chosen for this research was Cincinnati. There, information was obtained on the characteristics of the MEPS operation, personnel flow, and the data being entered into the system. To verify the format of the elements being entered into the system, the MEPS Headquarters (MEPCOM) Data Automation Center was contacted. Throughout the study, both the ARI-PERI-RP and the USAREC operations research personnel aided the analysis with information and encouragement.

The data sample received from ARI was drawn from the MEPS Applicants File which contains 690 characters of personnel data on each individual who has applied for testing and entrance in any branch of the United States Armed Forces since 1976. The time slice of data that was made available for this study centered around personnel entering the Military Services in the 1980 to 1981 time frame. This particular sample consisted of a file containing 48520 records extracted at random from the MEPS file, selecting only records having a "9" as the last digit of the Social Security Number.

Selecting Variables that are Key to Recruitment Investigation

The first task involved identifying and extracting the "target" elements within the sample data, that is, to select and save on a separate file those variables in each record

that would be required to create the data "profile", and would later be used in the multivariate analysis. The file was meticulously screened to save all variables relevant to the study, while at the same time reducing the size of the records by eliminating variables that were either redundant or did not offer clear discriminating categories for future investigation. The sample was examined using the SPSS sub-routines Frequencies and Crosstabs and using several short FORTRAN programs in order to develop a profile of the data base. The aims of this data examination were:

1. To eliminate those variables having too many blank data fields,
2. To eliminate, if necessary, records with invalid entries critical to the analysis,
3. To get a "feel" for the percentages within the categories that were available for testing,
4. To examine the relationships among variables,
5. To examine the computed raw Chi-Squared scores among the various categories, and
6. To discover any obvious patterns existent in the cross-tabulation tables.

There were a number of variables in the initial study of the MEPS file that were eliminated from the final model:

1. Number-of-Dependents,
2. Religious-Denomination,
3. Years-of-Education,
4. Mental-Category,

5. Youth-Program-and-Youth-Program-Conducted-by,
6. Program-Enlisted-for-Option,
7. Designated-Option,
8. Enlistment-Option,
9. Enlistment-Option-Guaranteed,
10. Enlistment-Bonus-Level,
11. Training/Enlistment-Military-Occupational-Specialty,
12. Term-of-Enlistment,
13. Pay-Grade, and
14. Citizenship-Code.

These apparently useful discriminating variables were deleted for the following reasons:

1. Large numbers of blank data fields

Religious-Denomination, Years-of-Education, and Citizenship-Code had a majority of uncoded records, rendering most multivariate analyses useless during the modeling of factors and discriminants.

2. Incommensurable codes among both intra and inter-service categories of variables examined

All of the "Option" code variables (6 through 9), and Enlistment-Bonus-Level had a significant number of codes that could not easily be measured or be generally related to other variables. Within Program-Enlisted-for-Option there were 33 different codes; the Army codes alone contained several levels of Veterans Educational Assistance Program (VEAP) kicker enlistment options, a number of different Tuition Assistance choices, several assignment electives, and many

combinations of the foregoing alternatives. Designated-Option has 35 different codes, while Enlistment-Option has at least 518 different codes among which include many permutations of such things as: Advanced Enlistment Grade, Unit or Location Guarantee, Training or Skill Guarantee, and Accelerated Promotion. Additionally, these variables have a less common measure or basis for comparison when trying to relate their numerous permutations between the different Services. It also became unwieldy to attempt to break these given variables down into their separate categories and model them as indicator variables. Another difficult variable to categorize and compare within and among services is the Enlistment/Training-Military-Occupational-Specialty code; the Army alone has about 300 specialty designations.

All of the aforementioned variables have a great deal of intuitive appeal for comparing what draws individuals to enlist in one branch of the Service as opposed to another. Indeed, the kinds of educational benefits, training, assignments, advancement potential, and job opportunities should be the very discriminating variables that would differentiate individuals from joining one branch of the Service over another. However, the problem boils down to an almost impossible task of sorting out, classifying, and subjectively weighting the numerous categories within the variables involved. Thus, these particular variables were dropped from further consideration.

3. Frequent occurrence of erroneous data fields

Mental-Category when compared against the Armed Forces Qualification Test (AFQT) scores had a substantial amount of miscoded data entries. The Mental Category codes did not agree with the limits set by AFQT scores for 10.6 percent of the records. ARI-PERI-RP personnel confirmed a problem with this data, and suggested that AFQT was a more accurate indicator of mental distinction. The "Option" codes also contained miscodes of "S" for "5", zero for character "O", and "2" for "Z" in many cases, along with a number of unrecognized category codes. Also, the Number-of-Dependents variable contained an erroneous range of dependents in a range from 10 to 99 in about two percent of the file.

4. Inability to substantially enhance the predictability of the final model

Number-of-Dependents may have had a tolerable level of erroneous data, but it was decided to drop it due to the fact that 95 percent of the records had zero dependents, attributable to the high percentage of young, single individuals on the file. Thus, Number-of-Dependents provided very little variance to use for factor analysis and predictive purposes.

Years-of-Education (discounting blank fields) ranged from 1 to 24, with the distribution of data approaching the shape of a Normal curve, having a mean of 11.5 and a standard deviation of 1.3. However, years of education is not as exact a measure of educational achievement as is the variable

Level-of-Education, since the "worth" of a given number of years of education is only valued in terms of the type of diploma one has, not by how many years it took one to acquire that diploma. In addition, the Armed Forces place much emphasis on recruiting high school graduates as opposed to recruiting those who have twelve years of education but no high school diploma. And enlistees with a college degree have a much better opportunity for enlisting into uniquely qualified Occupational Specialties as well as officer training than do individuals with 16 or more years of education but no college diploma. Those who have completed a given "level of education" are by definition higher achievers than those who have received as many years of education, but who have not achieved the same level of education. Also, the Army prefers to recruit high school graduates over non-high school graduates. For these reasons, Years-of-Education, being less than an interval level variable, was deleted from the study, and Level-of-Education was retained in the study as a much more precise ordinal level variable.

Youth-Program-and-Youth-Program-Conducted-by was an insignificant variable because of the very small number of occurrences of individuals involved in such programs. Term-of-Enlistment was more like a dependent variable than a predictor variable; the term depends primarily on which component of the services an individual enlists into (National Guard, Reserves, or Regular), and on what options are selected which may require special service obligations. Finally,

Pay-Grade was deleted from the model since it too depends on options selected and whether an individual was prior service; also, most records tended to be coded "E1" Trainee.

The majority of variables on the original MEPS file and those used in the final analyses are nominal level variables. Several ordinal level arrangements were applied without success, such as ordering Service according to an arbitrary progression of "desirability", or arranging Race according to Census Bureau statistics of median family income. Also, no new information was gained from assigning interval values to ordinal level data such as treating Level-of-Education categories as integers. Since none of these variable alterations were fruitful, it was decided to recode each of the given variable categories as "dummy" (indicator) variables.

Index Variables: Time and Location

Early in the investigation a need was recognized to perform regional analysis on the MEPS file as well as to manipulate time variables in the data. Part of the goal of this study was to determine whether there existed a variance in military recruiting depending on time and geographical location. Both the time and the location variables presented difficulty in early attempts to correctly isolate and categorize their values and the variables related to them. There are a number of dates on the MEPS file associated with every record to include:

1. Date-of-Action,
2. Date-of-Birth,

3. Date-of-Entry,
4. Date-of-Entry-2,
5. Entry-or-Discharge-Date,
6. Date-of-Grade,
7. Projected-Active-Duty-Date,
8. Delayed-Entry-Program-Date-of-Entry,
9. Advanced-Individual-Training-Graduation-Date,
10. Date-Processing-Took-Place, and
11. Cycle-Number-Julian-Date.

The last two dates (items 10 and 11) each have up to ten occurrences depending on the number of transactions processed against any given individual, such as mental examination on one day, physical examination on another day, entry into Delayed Entry Program (DEP) another day, and possible enlistment into the Regular force at a later date. Based on the Date-of-Entry variable in the original MEPS data sample, 37.9 percent of the records belong to 1980, while 54.8 percent belong to 1981, and 7.3 percent are blank. Based on the Date-of-Action variable, 60.7 percent of the records belong to 1980, while 39.3 percent belong to 1981. Using the earliest of the Date-Processing-Took-Place entries in each record, 4.2 percent of the records belong to 1979, while 78.9 percent belong to 1980, with 16.9 percent in 1981.

Choosing the correct date was important to the profile building of the initial investigation, but it became even more crucial for the final analyses when the MEPS and USAREC files were unified in a study of the key variables from both

files. It became imperative in that final study for the variables to be combined into a meaningful sequence. ARI-PERI-RP faced the same problem of arriving at a date variable that would properly represent prospective accessions at a definite point in time.

ARI-PERI-RP representatives visited a Military Entrance Processing Station (MEPS) to examine the flow of personnel through the system and to understand the dates associated with the various transactions on the file. These representatives determined that using Date-of-Action, Date-of-Entry, or a combination of the two was not capturing the time closest to the prospective enlistee's decision to join the Service. Rather they suggested, following their thorough research, that the best date to use for this purpose was the earliest entry from Date-Processing-Took-Place. This preferred date was used in all subsequent analyses in this study, to include the crucial MEPS and USAREC file merging phase.

The location variable was not as elusive as the time variable, but choosing workable regional boundaries proved to be virtually impossible given the original regional variables on the MEPS file. The MEPS data base has the following location variables within each individual record:

1. Sector-ID (Eastern, Central, and Western),
2. MEPS-ID,
3. Home-of-Record, state and county,
4. Home-of-Record, ZIP Code,
5. Present-Address, state and county,

6. Present-Address, ZIP Code,
7. Transfer-to-Code (unit of assignment),
8. MEPS-Code (up to ten transactions),
9. Recruiting-Station-Identification,
10. Advanced-Individual-Training-Location, and
11. Test-Site.

One location variable used by ARI to generate regionality within their data is the MEPS-ID. There are 71 MEPS-ID's, each representing one of the processing centers where the potential enlistees are examined and inducted into the various branches of the Military Service. The problem with using this location variable is that it cannot be directly related to the Recruiting Regions and Districts that are the locus of Army recruiting efforts as well as the locus of the accession results of that recruiting. Compounding this problem is the fact that a group of individuals may all be recruited from the same ZIP Code and county but be processed separately at several different MEPS. Thus, there is no homogeneity for developing characteristics of population based on MEPS-ID. Recruiting-Station-ID cannot be used since it is not recorded on many of the records in the file. In addition, for those records in which Recruiting-Station-ID does appear, it is coded differently for each branch of the Service, and even the Army codes do not directly represent the five USAREC Regions or their 57 District Recruiting Commands (DRC).

Initial regional analysis of the file had to be based on MEPS-ID, but breaking the country down into these 71

processing locations was fruitless, especially given the nominal nature of most of the remaining MEPS variables, and given the fact that the MEPS-ID's could not be directly related to recruiting results of any given USAREC Region. In addition, any kind of multivariate analysis obtained from this type of regional breakdown could not easily be related to analysis of the USAREC data base.

Determining How to Link the MEPS and USAREC Files

The USAREC data base is organized by DRC within year and Quarter, thus giving each year a total of 228 records (57 DRC's times 4 Quarters). Each of these records contains summary statistics for the individual DRC's concerning demographics, economics, recruiter data, advertising, and accessions. The only time variable on the USAREC file is Fiscal-Year-and-Quarter. The only location variable is DRC; yet there is no regional variable on the MEPS file that is directly comparable or easily translatable into DRC. ARI was not aware of a conversion technique, but gladly welcomed our support in an effort to accomplish such a translation since several of their studies could benefit from having the ability to analyze the MEPS file by DRC. This was incentive enough in itself to launch an effort to translate DRC's for use in merging the two files and to eventually analyze the combined data base.

The first stage in DRC translation was to examine all prospective location variables, testing for adaptability in conversion and for completeness of record entries. That is,

any adopted conversion variable must be able to be precisely translated into a DRC code, and information must be consistently recorded in the conversion variable's data fields, meaning that there must be few, if any, blank entries. One thing to keep in mind in this research is that many MEPS data fields are intentionally left blank in order to economize coding effort, depending on the status of the individual at various stages in the testing-to-enlistment process. ZIP Codes were studied for a time until it was realized that ZIP Codes do not correspond to county boundaries, sometimes having a ZIP Code overlap different counties. Also, both USAREC and the Census Bureau organize their statistics along county boundaries, not by ZIP Code. USAREC-PAE-RE provided a map of these county boundaries by DRC and Region, which could be used to recode the MEPS state and county codes into DRC's.

The applicable location variables for state/county on the MEPS file are: Home-of-Record, state and county, and Present-Address, state and county. Examination of the data within these fields revealed that Home-of-Record had much more consistency in information being present than did Present-Address. However, it was felt that in those cases where Present-Address had valid information different from Home-of-Record, Present-Address should then be used. The logic in this is that Present-Address is a better indicator of the location from which an individual is recruited. With the proper state and county determined, the next step was to relate each county to its proper DRC.

DRC's do not overlap county borders, however, DRC's do overlap state borders, that is, any given DRC may contain counties from more than one state, and the respective states may contain parts of several DRC's. This means that a county to DRC conversion must be carried out on a county by county basis. Each county, all United States possessions, and certain foreign countries were recorded by their proper DRC and then coded into a FORTRAN program. This program was used to convert the county/states to DRC's while also converting and purifying several other variables on the MEPS data base, such as Level-of-Education, Race, Marital-Status, Service, and Sex, as well as creating or computing others such as Age, Hispanic, and a composite code for Status. The output generated by this program allows ARI for the first time to analyze the MEPS files using DRC codes. This is a capability beneficial to both ARI and USAREC since it facilitates the further exchange of information between the MEPS and USAREC data bases.

Program for Merging the Data Bases

The groundwork having been laid for analyzing the MEPS file based on DRC and for relating the two data bases, the next task was to create a program that would do the actual merging of the MEPS and USAREC files. Since the USAREC file is composed of summary statistics organized by Quarter, while the MEPS file is organized as individual personnel records, there are two approaches that can be used to merge the files:

1. Condense the MEPS data into summary format by DRC by Quarter, or

2. Attach applicable USAREC data fields to each MEPS record by individual by DRC by month from the applicable Quarter. This given approach was taken since the primary concern was to analyze recruiting variables as they affected individuals.

The USAREC file contains chiefly ratio level data composed of demographic, economic, and accession statistics. Many of the variables pertain only to the Army and thus cannot be directly applied against the Navy, Air Force, or Marine records in the MEPS file. Among the variables not applied or merged with the MEPS file are: Percent-of-DRC-Army-Recruiters-with-One-or-More-Years-Experience, Army-Non-Prior-Service-Female-Accessions, and DRC-Army-Local-Advertising-Expenditures. However, these variables and others in the USAREC file were considered and used in the improvement of the USAREC Regression Model. Seven other variables were entered into the multivariate factor and discriminant analyses since these seven variables pertained directly to all of the Armed Services:

1. Qualified-Military-Available,
2. Male-High-School-Seniors,
3. DRC-Overall-Unemployment,
4. DOD-Non-Prior-Service-Male-Accessions,
5. DOD-High-School-Diploma-Graduate-Male-Accessions,
6. Median-Disposable-Family-Income, and
7. Black-Military-Available.

There is an eighth Army variable on the USAREC file that has a direct inverse relationship with the other branches of Service:

8. Army-Recruiters-as-Percent-of-DOD-Recruiters-by-DRC.

The information from these eight variables was merged with the data from the MEPS file based on the MEPS conversions of state/county to DRC and the conversion of Month to Quarter. The program that was written to do this merging function can merge a period of up to three years of data at a time, and can easily be modified to merge more years on a given run or modified and rerun several times to merge data for a group of years. This program is the final in a series of three programs that can be used by anyone having access to both the MEPS file and the USAREC file. These programs are written in FORTRAN so that the input and output formats can be easily modified to incorporate more or fewer of any of the variables located on either file. Thus, expansion or contraction of the numbers and kinds of variables to be analyzed is permitted with little recoding effort.

An option also exists to use only the MEPS file by running only the first two programs in the series. Thus, analysis of the MEPS data base can be done independently of the USAREC data and USAREC variables, but with the benefit of DRC recoding. This translated data gives ARI the capability of performing several of the DRC analyses that they could not do in the past. Output from both the second and third programs is highly compatible with SPSS input format and the data

manipulation requirements since it is almost all numeric in format, unlike the unrecoded MEPS file.

The output of the third program is a merged MEPS USAREC (MU) file containing the following variables:

1. Year,
2. Month,
3. DRC (first character is a Region code: 1,3,4,5,or 6),
4. Status, a composite variable based on the MEPS Status-Code for an individual record and on the MEPS-Entry Status. See Appendix A7 for an explanation of these variables. The following are the MU Status codes and their parent codes from the MEPS file:

- 1 = Qualified, Not Joined (MEPS Status-Code D, MEPS Entry-Status blank),
- 2 = Enlisted into Delayed Entry Program (DEP) (MEPS Status-Code A, MEPS Entry-Status 3),
- 3 = Enlisted without DEP (MEPS Status-Code A, MEPS Entry-Status $\emptyset$),
- 4 = Shipped Reservist from DEP (MEPS Status-Code B or C, MEPS Entry-Status 2),
- 5 = Shipped Enlistment from DEP (MEPS Status Code B or C, MEPS Entry-Status 1),
- 6 = Shipped without DEP (MEPS Status-Code B or C, MEPS Entry Status $\emptyset$),
- $\emptyset$ = all other combinations of MEPS Status-Code and MEPS Entry-Status.

5. Service (Army, Navy, Air Force, or Marines),

6. Component (National Guard, Reserve, or Regular),
7. Prior-Service Indicator,
8. Mental-Category (for reference only),
9. Armed-Forces Qualification-Test (AFQT) score,
10. Level-of-Education (Less Than HS Diploma, HS Equivalency, HS Senior, 1 year College, Associates or Nurse, Baccalaureate, Masters, Post Masters, or Doctorate/Professional),
11. Age (computed using MEPS Date-of-Birth and earliest Date-Processing-Took-Place),
12. Sex,
13. Race,
14. Hispanic (recoded from MEPS Ethnic-Group),
15. Marital-Status (Married, Never Married, or Other),
16. Qualified-Military-Available,
17. Male-High-School-Seniors,
18. DRC-Overall-Unemployment,
19. Army-Recruiters-As-Percent-of-DOD-Recruiters-by-DRC,
20. DOD-Non-Prior-Service-Male-Accessions,
21. DOD-High-School-Diploma-Graduate-Male-Accessions,
22. Median-Disposable-Family-Income, and
23. Black-Military-Available.

These 23 variables became the heart of all further research in the profile and multivariate analyses. The MU file merges the data base resources of ARI and USAREC, and can be used as a model for exchange of data resources between these organizations through the common link of DRC codes. Listings

of the three aforementioned FORTRAN programs can be found in Appendices C-17 through C-19.

Preliminary Analysis of the MU file

Several SPSS Cross-tabulation runs were carried out on the various MU variables, breaking the data out mainly by Service, by Region, and by Level-of-Education. The ARI-PERI-RP operations researchers encouraged this type of investigation since it would help in focusing on the key variables and the categories within variables to be evaluated. The researchers at ARI periodically examine the MEPS data base in this way in response to the many studies undertaken by their organization.

Based on the MEPS earliest Date-Processing-Took-Place entry that was used as the Month variable in the new MU file, only 4.2 percent of the data fell within 1979, with 70.5 percent of this being skewed to the last four months. The 1980 data was also skewed with the first four months containing only 10.0 percent of the 1980 data. The 1981 data included only January and February records. Some initial analysis was conducted on the 1980 records alone, while all later investigation down to the DRC level was conducted on the latest one year period from March 1980 to February 1981. For all practical purposes this means that only four quarters of USAREC data were involved in the study: from the second quarter of 1980 to the first quarter of 1981. The month of March in the first quarter of 1980 contains only 2.1 percent of the last 12 months of data.

The Year variable was combined into the Month variable by recoding January 1981 as month 13 and February 1981 as month 14. The MU Status variable was not considered in the final factor and discriminant analyses since it is more of a dependent variable than a predictor of whether an individual will join the Army over another branch of service. Under factor analysis the MU Service variable was recorded into four indicator variables, each representing a branch of the Service. Under discriminant analysis the MU Service variable was recoded into groups as Army and Non-Army. The MU Component variable was used to break the study down into three separate analyses, so that the factors affecting recruiting of National Guard, Reserves, and Regular enlistees could be investigated separately.

At the DRC level, the MU Prior-Service variable was used to examine only those without prior service since there are certain Service unique restrictions imposed on prior service enlistees. The Air Force, for instance, will not accept prior service individuals unless they enlist into critical skills. This fact tends to "push" unemployed prior service individuals toward enlistment into the Army, as is borne out in the initial analysis by region.

Additionally, the Prior-Service variable was used to delete prior service records from the final model because all branches of the Service are interested primarily in those factors that affect the recruiting of non-prior service male accessions. For this same reason the variable Sex was used

to delete all female records from the final DRC level analyses; the Services do not have to gear advertising or resources toward the recruitment of females because the quotas for female enlistments are easily being filled without special recruitment efforts in that area.

Records with blank Mental Category fields were eliminated from consideration in the analyses. The MU Level-of-Education variable was recoded into indicator variables as indicated in the variable list below. Race was also recoded to allow for indicator variables in both White (75.9 percent of MU file) and Black (19.8 percent of MU file) records. Finally, Married was established as a separate indicator variable based on the Marital-Status variable.

The data on the MU file was not altered, rather certain variables were recoded using SPSS "IF" statements to create "dummy" (indicator) variables, while certain other variables ceased to be considered in the final analyses at DRC level. The following is a list of all the recoded variables used as input to the multivariate analyses:

1. Month,
2. DRC,
3. Army,
4. Navy,
5. Air-Force,
6. Marines,
7. AFQT score,
8. No-High-School-Diploma,

9. High-School-Senior,
10. High-School-Diploma, but less than college degree,
11. College-Degree,
12. Age,
13. White,
14. Black,
15. Hispanic,
16. Married,
- 17 - 24. the eight USAREC variables.

Once the key variables had been selected and the data base constructed, the next phase of the study could be performed, namely the multivariate classification analyses: Factor Analysis and Discriminant Analysis using SPSS sub-routines.

VI. Multivariate Analyses

Factor Analysis

The factor relationships among the variables were studied at the national, regional, and DRC levels to focus on and uncover any tangible demographic differences among prospective recruits. Armed with this data profile and the related statistics, the planners at USAREC might better be able to channel resources to meet the needs of a particular region and DRC based on known critical factors influencing a particular segment of the nation. Understanding where there do and do not exist differences in a particular variable's relationship with other variables and what those relationships are can often give the decision maker a key to the realignment of scarce resources.

Initial analysis and the cross-tabulation runs showed that there existed a substantial difference in the data by Component (National Guard, Reserves, and Regular). There were no Navy or Marine National Guard and very few Air Force Reserve records on the MEPS file. Also, the different components were logically best analyzed in separate categories since the Regular forces have a different mission than the Guard or Reserves. When the forces were broken down by component, there were not enough record samples in the Guard to do separate analysis of this component. In the Reserve there were only enough records to carry out analysis down to the regional level. There were, however, enough Regular forces records so that both factor and discriminant analysis

could be performed down to the DRC level on the Regular component.

Regional level analysis was conducted both with and without prior service and female records, while all analysis at the DRC level was performed only on male non-prior service records.

How to Read the Factor Analysis Tables

The factor analysis results are given in tabular form by Region and by DRC. Explanations of variables and codes for multivariate analysis are given in Appendix C-1. The complete set of Factor Tables is given in Appendices C-2 through C-4:

C-2 = Factor Analysis Tables by DRC,

C-3 = Factor Analysis Table by Region for Regular Forces, and

C-4 = Factor Analysis Table by Region for Reserve Forces.

Appendix C-2 should be referred to while reading the following explanation of the Factor Tables. The various principal components (factors) are listed across the top of the table. In the upper half of the table are listed the variables (by row, e.g., Army, Navy) which make up the various factors. In the bottom of the table are the different DRC's for a given Region (e.g., 1A, 1B); and included on the left hand side is a column of numbers representing the percentage of information that the factors have retained from the original variables. Interpretation of the factors is

accomplished by knowing from what variables the given factor is derived and recognizing how much weight a given variable contributes to the composition of the given factor.

These variable weights are based on the values of the factor loadings, which are given as matrix output from SPSS. Signs for the factor loadings are important in explaining positive or negative changes in the value of the factor. The factor value will tend to increase when variables with which it has high positive correlations increase, and decrease when negatively correlated variables increase in value. Thus the positive and negative correlations of the given factor can be thought of as positive and negative "poles" of the factor, and the correlated variables are associated with the positive or negative "pole" depending on their correlation sign. Since values in the factor loadings matrix are correlations, they must be squared to determine the percentage of contribution they provide to the explanation of any given factor. The tabular output results take this into consideration by assigning "measures" within the cells of the Variable by Factor part of the table as follows:

"++" = 50 to 99 percent of the variable is like the positive "pole" of the factor,

"--" = 50 to 99 percent of the variable is like the negative "pole" of the factor,

"+" = 25 to 50 percent of the variable is like the positive "pole" of the factor,

"-" = 25 to 50 percent of the variable is like the negative "pole" of the factor.

The table is intended to be read using the following algorithm:

1. Select a DRC of interest.
2. Read across the selected DRC row until an "X" is encountered. This signifies that a given factor in the column above is associated with the selected DRC.
3. Read up the "X" column until a "++", "--", "+", or "-" is encountered. This signifies that a given variable is associated with the given factor.
4. Read across the row to the left to find the associated variable and note the variable name.
5. Go back along the row to the given factor column.
6. Repeat steps 3 through 5 until the top of the table is reached.
7. Record a preliminary interpretation for the combination of the noted variables and call this interpretation a factor.
8. Go back down the column to the original DRC row.
9. Repeat steps 2 through 8 until the right hand side of the table is reached.
10. Analyze the recorded factors among themselves for a within DRC comparison.
11. Repeat steps 1 through 10 until all individual DRC's of interest are analyzed.
12. Analyze all DRC's of interest between DRC's.

With these Factor Tables one can compare DRC's with each other or by comparing one table with another table, compare different Regions with each other. Thus, one can quickly refer to the factors facing recruiters within any given DRC and then make comparisons by DRC or Region to see what factors other recruiters face. At the managerial level, one may be able to use the tables to aid in the allocation of scarce resources depending on the profile characteristics of a given Region or DRC.

Factor Analysis Interpretation

2 The first DRC in Appendix C-2 is DRC 1A (Albany) with associated factors in columns 1, 10, 15, 17, 20, 26, 32, and 39. For convenience, column 1 will be referred to as "factor 1", column 2 will be referred to as "factor 2", and so on. Factor 1 is composed of a strong increase in accessions accompanied by a strong increase in unemployment rates, with a slight positive correlation associated with an increase in the number of Army recruiters. Thus, one can interpret factor 1 as a barometer for accessions which will increase or decrease in the same direction as the increase or decrease in the percentage of unemployment, and slightly "influenced" by movement in the same direction of a change in the percentage of Army recruiters in the DRC. It should be noted at this point that only DRC's 1A (Albany), 1G (New Haven), and 1N (Syracuse) have this particular relationship within Region 1. However, DRC 1D (Concord) in factor 2 has a stronger correlation between the increase in percentage of

Army recruiters and the increase in accessions. Continuing in this vein, factor 3 shows that the other DRC's in Region 1 have no noticeable link between an increase in percentage of Army recruiters and the increase in accessions. However, factor 3 still strongly correlates increases in unemployment with an increase in accessions in all of the DRC's in Region 1. As one reads across to see what factors are present in a given DRC, one should freely perform a simultaneous analysis of related factors in other DRC's in order to quickly compare how the DRC's differ among one another. This gives the user a better grasp of the distribution of factor influences within the entire Region; and it is an aid to understanding the structure of a given factor in a particular DRC by relating it to similar factors in other DRC's.

Factor 10 in DRC 1A (Albany) shows that as time increases there is an accompanying increase in the median family income as well as an increase in the number of male high school seniors in the given DRC. One should keep in mind the period over which this analysis was performed, that is, March 1980 to February 1981. Only DRC 1A (Albany) and DRC 1G (New Haven) have the factor 10 relationship, while in DRC 1E (Harrisburg) factor 9 shows a strong negative correlation between number of male high school seniors versus the month and income variables. That is, in DRC 1E (Harrisburg) as months and income increase the number of seniors decreases. Another closely associated factor is

factor 8 in DRC 1B (Baltimore) and in DRC 1F (Fort Monmouth), which is really an enhancement of factor 10 in that the percentage of Army recruiters strongly moves in the same direction with months, income and the number of male high school seniors. In this same manner, factor 7 in DRC 1L (Pittsburgh) is an extension of factor 9, showing that an increase in percentage of Army recruiters is correlated with a decrease in the number of seniors. Other factors reflecting the month and income variable influences are factors 4, 5, 6, and 11.

Factor 15 in DRC 1A (Albany) is the race factor which is a relationship that is present in 31 of the 57 DRC's. Factor 16 is another race factor but it contains the slight influence of AFQT. Factor 17, college degree is a separate ingredient or principal component in DRC 1A (Albany). Factor 17 is separate in most of the DRC's, however it is sometimes correlated with other variables such as with age in DRC 1G (New Haven) and in DRC 1L (Pittsburgh). Factor 20 in DRC 1A (Albany) shows a dichotomy between high school senior recruits and high school diploma recruits with a strong linkage to the age of the recruit. Factor 26, the Army variable correlated with the No-High-School-Diploma variable, is also evident in DRC 1A (Albany). This factor implies that non-high school diploma recruits tend to join the Army in DRC 1A (Albany). Other factors in this DRC include the Marines as a factor by themselves. Also, the Navy and Air Force are one category, although the signs

between these Service variables are opposite. The Air Force versus Navy factor by itself simply implies that recruits from these two services have virtually opposite association among the other variables in the sample from DRC 1A (Albany). That is, one can distinguish the recruits between these two services based on the other variables in the analysis.

As a cautionary note, the preceding interpretation of factors must be combined with all the other facts available concerning the DRC for the given period of analysis. Common sense and good management are essential in any use of these findings. Also, exact interpretation of the factors is not always possible. All factors in a given DRC are orthogonal, that is, each factor is independent of all the other factors. Possibly the safest way to handle comparisons of large numbers of factors is to use the technique of hyphenation between the variables for a given factor to form a chain of variables naming the given factor. This is possibly a more precise method of carrying meaning, but it lacks interpretation and ease of handling. Also to be noted is the percentage given in the left hand column in the bottom half of the table. As an example, the percentage for DRC 1A is only 78, which means that 22 percent of the information contained in the original variables is absent from the factors shown in the table for that DRC. These cautionary notes must be kept in mind when performing analysis on demographic data that is hard to measure and prone to subjective interpretation.

The analysis of factors points out the principal components that recruiters face in a given DRC. At the same time, relationships are examined between DRC's and between similar factors as an aid to the understanding of the principal components which affect the given DRC. This same procedure can be applied to regional level analysis as well. Regional level managers may be able to use the factor analysis to redirect resources through an understanding of the differences between DRC's based on the different factors affecting the individual DRC's. It is important that these factors be interpreted within and between DRC's in order to realize the full fruit of the factoring technique. That is why the tables presented in this study are constructed for ease of this type of "within and between" comparative analysis of factors by DRC and Region.

Conclusions about the factor analysis are easily drawn by extending beyond the interpretation of the principal components or factors. For instance, the Race factor which has the slight correlation with AFQT in certain DRC's can be examined nationwide. If one plots the geographical location of the presence of the Race-AFQT factor on a map, one will see a prevalence of this factor in the southern states, and in certain heavily populated areas. This could possibly mean that AFQT test questions are geared toward one cultural segment of the country. Another factor, the Army correlation with No-High-School-Diploma, factor 26 in Region 1, shows that non-high school graduate recruits are

principally associated with the Army. This may be an unpalatable interpretation for the Army to accept. However, the idea is to make the recruiting manager aware of the presence of a factor with this type of configuration and thus aid him in aligning or reallocating scarce resources such as advertising in the given DRC. For instance, it may tell the recruiting manager that this particular DRC needs more advertising showing high technology Army weapons, Army computer technicians at work, and the numerous educational benefits available to Army recruits.

The overall aim of this analysis is to provide the manager with an additional tool to focus on the factors affecting recruiting by individual DRC and Region. With this added information the manager should be able to make better decisions on the allocation of scarce recruiting resources; and the higher level recruitment planners should be better able to determine whether to continue or alter recruitment policies.

Discriminant Analysis

The primary aim of discriminant analysis in this study was to discover the identity and magnitude of the principal variables that could be used to distinguish Army accessions from non-Army accessions. This analysis was carried out at the national level, the regional level, and the DRC level. Only Regular Forces were examined at the DRC level. USAREC and ARI planners should be able to use the discriminant analysis procedures developed in this study to better

understand the differences between Army and non-Army accessions. The comparative analysis techniques presented herein can aid operations research analysts at ARI and USAREC to differentiate variables that are critical to Army recruitment in the various DRC's and Recruiting Regions.

Factor analysis and cross-tabulation runs had pointed to a difference among Recruiting Regions and among Components (National Guard, Reserves, and Regular) for all analyses involving differentiation by the Service variables (Army and non-Army). It was therefore decided to begin this portion of the study by doing discriminant analysis on the MU file Regions and Components. That is, the variable "Region" was specified with the SPSS keyword "GROUPS=" as the variable to be evaluated under discriminant analysis. Likewise, the variable "Component" was evaluated under an independent analysis. The purpose of this examination was to test whether these two variables exhibited group differences as they had done in the factor and cross-tabulation analysis. Finally, based on the results of the analysis by Region and Component, "Service" was evaluated as the "GROUPS=" variable to form the core of the discriminant analysis.

The results of testing the Regions as groups and testing the Components as groups showed that there was evidence of differences both among Regions and among Components. The discriminant analysis test of Regions revealed that 72.6 percent of the cases could be correctly classified by Region based on the discriminant equation using all the MU

file variables except Status and Component. The first function had an eigenvalue which accounted for 75.10 percent of the variance. The canonical correlation for this first function was very strong at .8569 and the Wilks Lambda value was extremely significant at .1219. The Component variable had less dramatic differences with 58.4 percent of the sampled cases correctly predicted, a first function percent of variance at 88.77, a canonical correlation of .302, and a Wilks Lambda of .8973. The results of these two tests confirm the suspicion that the MU variables are influenced by regionality and by component of service. Thus, as in the case of Factor Analysis, it was decided to break the discriminant analyses down into separate tests by Region and by DRC for all tests concerning the determination of differences between the Army and the non-Army groups.

Sir Maurice Kendall in Multivariate Analysis (Ref 15: 177) says that "... the amalgamation of classes may give rise to misleading conclusions", as is demonstrated in "Simpson's paradox." Simpson's paradox can be exhibited through contingency tables where two sub-tables are created from a parent table, each table having the same row and column categories. The two sub-tables may be tested and yield one conclusion about the association of the tabled categories; however when the parent table is similarly tested it yields a completely opposite conclusion about the association between the categories. For example, the tabled categories may be Service versus Education Level, the

two sub-tables may be Region 1 and Region 3, while the parent population would be the combination of the two Regions. Simpson's paradox in this case would occur if the contingency tables for Region 1 and for Region 3 showed there was a difference between Service and Education Level, yet the parent contingency table composed of the two Regions added together showed no difference existed between Service and Education Level. Sir Kendall recommends that classification type of analyses be carried out at the lowest level feasible, that is, that the analysis be broken down into sub-categories to the lowest level that still permits enough cases per cell and is not prohibitively costly in terms of computer resources.

Following Sir Kendall's advice, this study broke the analysis down to the DRC level in the case of the Regular Forces. However, there were not enough differentiable records in the Reserve Forces to do analysis down to the DRC level; nor were there enough cases in the National Guard Component to accomplish discrimination at the Regional level. There are no Navy or Marine National Guard records, and only a small percentage of Air National Guard on the file. It should also be noted that some Regions had no Air Force Reserve records on the MU file; however, there were enough Army versus non-Army Reserve cases to accommodate analysis by Region. The Prior Service and Sex Variables were used to further classify the final analyses; Regional level scrutiny of the MU file involved discriminant analysis both with

and without the prior service and female cases. DRC level study was done without prior service and female records since the main Army recruitment focus is on non-prior service male accessions, thus following Sir Kendall's recommendation concerning categories.

The USAREC "Intensity" Variables

The USAREC variables on the MU file are treated as "barometers" of demographic and economic conditions which affect each individual whose records are on the MU file. These barometers indicate by DRC and by quarter the "intensity" that certain demographic and economic variables have on individuals. Six of the USAREC variables are fairly straight-forward predictor variables which affect the individual; the other two variables are usually used as dependent variables in recruitment modelling. The latter two variables on the MU file are DOD-Non-Prior-Service-Male-Accessions, and DOD-High-School-Diploma-Graduate-Male-Accessions. To accommodate both the role of predictor and non-predictor for these accession variables, two sets of discriminant analyses were generated down to the DRC level, so that the user may choose the equations and relations among variables that are most suitable to his interests.

The following is a short summary of how the eight "intensity" variables affect the individual:

1. **Qualified Military Available and Male High School Seniors:** These two variables give an indication of the supply side of the manpower market relating to how much

the individual must compete to get into the military. The Army in 1982 did not have to accept non-high school diploma recruits. "The Marines are looking for only a few good men."

2. Black Military Available: Same as part 1 above, plus there is a demographic intensity in terms of an important racial group in today's Army. The density of the black population in a given DRC may well have an impact on whether an individual (black or white) will join the Army from a given DRC.

3. DRC Overall Unemployment Rate and Median Disposable Family Income: These variables exhibit the economics of a given DRC that will "drive" individuals toward or away from military service.

4. Army Recruiters As Percent of DOD Recruiters by DRC: The "intensity" of Army recruiters as a ratio of the overall number of DOD recruiters in a given DRC supplies an indication of the inter-service "competition" for recruitment in that DRC and the individual's likelihood of contact with Army type recruiters as opposed to other service recruiters.

5. Finally, the two accession variables: These are technically output of the recruitment process, not true predictive variables. However, the number of accessions closely parallels accession quotas which are based on projections of a DRC's ability to provide recruits in a quarter. Therefore, these accession variables could be treated as accession quotas, giving a measure of the "intensity" of

the demand side of the recruiting economics. As in all supply and demand systems, the intensity of demand in the market place has an impact on how many individual suppliers will be willing to come in.

The Discriminant Analysis Tables are organized in rows of standardized coefficients by DRC. This facilitates comparison within any given DRC among the standardized coefficients to show which variables are of greatest relative importance in predictive ability. Comparison between DRC's can be made by noting which variables are important in one DRC as opposed to the variables that are important in another DRC. This is somewhat similar to the comparative techniques that were employed to relate factor differences in the factor analysis. However, variable relations and intensities under factor analysis will not correspond exactly with the importance of given variables in discriminant analysis. This is due to the fact that factor analysis attempts to determine how each of the factors relate to all of the others, while discriminant analysis tries to find in selected variables the discriminating features for one "group" type variable. Therefore, for the factor analysis in this study, the aim was to find relationships among the important variables that may relate to recruiting, while discriminant analysis was concerned with finding the variables and their relative intensities that differentiated Army recruits from non-Army recruits.

How to Read the Discriminant Analysis Appendices

Appendix C-5 through Appendix C-16 contain the numerical results of the discriminant analysis performed in this study. These Appendices contain the following classes of information:

- C-5 = Discriminating Power of Discriminant Functions
by DRC, No Accession Variables,
- C-6 = Discriminating Power of Discriminant Functions
by DRC, With DOD Accession Variables,
- C-7 = Discriminating Power of Discriminant Functions
by Region, No Accession Variables,
- C-8 = Discriminating Power of Discriminant Functions
by Region, With DOD Accession Variables,
- C-9 = Standardized Canonical Discriminant Function
Coefficients by DRC, No Accession Variables,
- C-10 = Standardized Canonical Discriminant Function
Coefficients by DRC, With DOD Accession
Variables,
- C-11 = Standardized Canonical Discriminant Function
Coefficients by Region, No Accession
Variables,
- C-12 = Standardized Canonical Discriminant Function
Coefficients by Region, With DOD Accession
Variables,
- C-13 = Percentages of Cases Correctly Classified into
Army and Non-Army by DRC, No Accession
Variables,

C-14 = Percentages of Cases Correctly Classified into Army and Non-Army by DRC, With DOD Accession Variables,

C-15 = Percentages of Cases Correctly Classified into Army and Non-Army by Region, No Accession Variables, and

C-16 = Percentages of Cases Correctly Classified into Army and Non-Army by Region, With DOD Accession Variables.

Appendices C-5 through C-8 are each organized into five columns containing: Canonical Correlation, Wilks' Lambda, Chi-Squared, Degrees of Freedom, and Significance. Appendices C-6, C-8, C-10, C-12, C-14, and C-16 contain only those DRC's or Regions whose discriminating functions were modified with the addition of the DOD Accession variables, implying that DRC's or Regions which are not listed in C-6, C-8, C-10, C-12, C-14, and C-16 have no increase in predictability when the Accession variables are included. The national and regional level results in Appendices C-7, C-8, C-11, C-12, C-15, and C-16 contain output that falls into two categories:

1. Analysis including prior service, non-prior service, male, and female fully qualified applicants, and
2. Analysis including only non-prior service male fully qualified applicants.

The first of these categories will have a "PS,F" (prior service and female) indicator in the column marked

"Component & Region." The components are abbreviated "RSV" for Reserve and "REG" for Regular. The regions are the five standard regional numbers: 1, 3, 4, 5, and 6. Thus, a typical "Component & Region" mnemonic would be "RSV3 PS,F" meaning Reserve, Region 3, with prior service and female applicant cases included. In all cases when prior service and female cases are added to the analysis, both the "Prior Service" and the "Sex" indicator variables come into the models as significant predictors in the discriminating functions for Army versus non-Army. As was pointed out earlier, detailed analysis at the DRC level focuses only on the most sought after "target" group, non-prior service males.

The canonical correlation values in Appendices C-5 through C-8 give one measure of discriminating power by showing the relative association of the discriminant function with the dummy variables Army and non-Army. The second measure of discriminating power is given in the value associated with the Wilks' Lambda, its conversion to a Chi-Squared approximation, and the resulting significance value. The Wilks' Lambda is an inverse measure of the discriminating power of the original variables, so that the lower values of Wilks' Lambda imply greater separation of the Army versus non-Army groups. The results contain a Chi-Squared measurement based on a transformation of Wilks' Lambda which is asymptotically Chi-Squared distributed. Finally, the results are converted to a significance value for hypothesis testing: the lower the value in the Significance column

the greater is the probability that the Army versus non-Army groups are distinguishable. Appendix C-5 can be examined at alpha equal .01, meaning that values in the Significance column above .01 imply the rejection of the hypothesis that the Army versus non-Army groups are indistinguishable with 99 percent confidence.

Appendices C-9 through C-12 give only an abbreviated form of the standardized coefficient rounded to the hundredths decimal place. The purpose of these four appendices is to give the reader a tool for comparative discriminant analysis among DRC's and Regions, not to give final exact equations. Since this study only involved a sample from the MEPS data base, it would be wise to compute exact coefficients from the whole data base rather than rely on this sample. The procedures and programs as outlined in this thesis are designed to accommodate this type of exact analysis. Therefore, the results of the MEPS sample data are confined to comparative analysis within and among the DRC's and Regions, and highlight those variables most critical to these Regions and DRC's.

The standardized coefficients in Appendices C-9 through C-12 show the relative weights that the different variables have in predicting Army versus non-Army accessions. All positive coefficients imply that as the value of the respective variable goes up so does the likelihood that the given individual or "target" case will join the Army. All negative coefficients say that the respective variables point

toward the individual having a tendency to join another branch of service. By comparing standardized coefficient magnitudes of variables within a DRC, one can come to understand which variables have a greater impact in the DRC, and by how much this impact will influence an individual to join the Army. To compare DRC's with each other, one simply has to look down the columns of Appendices C-9 through C-12 and see which DRC's do or do not have standardized coefficients in the different variable columns. However, relative weights of coefficients can not be assigned when comparing between DRC's since the values of the centroids are not the same in each DRC.

Appendices C-13 through C-16 show the percentages of individuals that were correctly predicted to go into the Army or not based on using Fisher's Linear Discriminant Function Coefficients and plugging in the variable values of each individual on a case by case basis. This final measure of the effectiveness of the classification process is divided into two parts on each page of Appendix C-13 through Appendix C-16. The first part shows the results of using the classification function to predict the groups of the analyzed cases which created the function in the first place. The second part shows the results of calculations performed on a random sample of the data different from the data that created the function.

Results of the Discriminant Analyses

Most of the canonical correlations have values between .300 to .599, showing that the derived discriminating functions are moderately correlated with the Army versus non-Army groups. DRC's having lower than "moderate" correlation of less than .300 are: 4D (Denver), 4J (Oklahoma City), 5B (Cincinnati), and 6E (San Francisco). When the DOD Accession Variables are added, only 4D (Denver) increases in predictability enough to move into the "moderate" range. At the national and regional levels, three analyses have canonical correlations above .599, namely: RSV3 PS,F (Reserve, Region 3, with prior service and female); RSV3 (Reserve, Region 3, no prior service nor female); and RSV6 PS,F (Reserve, Region 6, with prior service and female). The addition of the Accession variables at the national and regional level had no notable effect on the results.

The second measurement of discriminating power, summarized in the Significance value, shows that the following DRC's have a questionable amount of discrimination between the Army versus non-Army groups: 3F (Louisville), 4D (Denver), 4J (Oklahoma City), 5E (Des Moines), 6E (San Francisco), and 6H (Phoenix). When the DOD Accession variables are included, only 4D (Denver) improves in predictability. In addition, even at an alpha value of .05 (95 percent confidence), there would still be questionable discriminating ability in 4J (Oklahoma City), 6E (San Francisco), and 6H (Phoenix). Researchers using the discriminant function

coefficients generated for these particular DRC's should keep in mind that there is a significantly greater chance for error in the predictive ability for these DRC's. At the national and regional levels, the Significance values show a confidence level of better than 99.99 percent.

Appendices C-9 through C-12 show standardized coefficient relationships within and between the various DRC's and Recruiting Regions. The most obvious pattern throughout these appendices is the strong negative relationship that the Armed Forces Qualification Test (AFQT) scores have with people joining the Army versus the other services. Only a few DRC's do not exhibit this relationship: 1J (Niagara Falls), 3C (Charlotte), 4A (Albuquerque), 4C (Dallas), 4J (Oklahoma City), 5C (Cleveland), 5E (Jacksonville), 6I (Portland), and 6J (Sacramento). The next strongest association of a large number of DRC's is to the variable "Age", which shows relatively large coefficient weights in most cases. The Age variable demonstrates that the older an individual is, the greater is the likelihood that the individual will choose the Army in most DRC's, with the reverse taking place in 1A (Albany), 4H (Little Rock), and 5E (Des Moines). At the national level both the "Prior-Service" and the "Sex" variables are linked to the Army, meaning that being male and having had prior service tends to help predict that the individual will join the Army.

An important variable that must be read with caution is ArmyR (Army Recruiters as Percent of DOD by DRC). This

critical variable can show by DRC how much effect the percentage of recruiters has upon an individual choosing the Army. However, great care must be taken in analyzing a limited number of data samples; only four quarters, that is four separate data points, per DRC were merged from the USAREC file since the MEPS file data contained a limited time period. There were nine DRC's that actually showed a negative trend as the percentage of Army recruiters increased; that is, as relatively more Army recruiters were present in certain DRC's, the applicants tended to join the other services. These nine DRC's were: 1E (Harrisburg), 4C (Dallas), 4D (Denver), 4E (Houston), 5E (Des Moines), 5J (Milwaukee), 6L (Seattle), and, when the Accession variables are added to the predictive model, 1I (Long Island), and 4F (Jackson). No definite conclusions should be drawn from these results until further analysis has been conducted over a longer time period. As has been repeatedly stated in this study, the driving purpose of this thesis effort is to establish a set of programs and procedures for the in-depth analysis of these sort of phenomena.

The last set of appendices on discriminant analysis, C-13 through C-16, give the results of the percentage of cases which were correctly classified by the derived discriminant functions. The obvious trend in these results is that the discriminant variables are slightly more often correct in predicting that an individual will join the other branches of service, than when these same variables are

used to predict that an individual will join the Army. That is, correct classification of Army applicants is less than the correct classification of non-Army applicants, in most DRC's. However, six DRC's show consistently better predictive ability for Army applicants over non-Army applicants: 3A (Atlanta), 3D (Columbia/Fort Jackson), 4A (Albuquerque), 5D (Columbus), 5L (Omaha), and 6F (Honolulu). Thus, in these six DRC's the percentage of correctly predicted Army applicants is higher than the percentage of correctly predicted non-Army applicants. At the national and regional levels these relative percentages are more evenly distributed, with no obvious trend.

2 In summary, the results of Appendices C-5 through C-16 lay down a format for research into the critical variables affecting Army versus non-Army recruitment. The analysis that surrounds these appendices provides a set of procedures to be used in examining the key relationships among the variables and their weighted effect upon the dependent group variables Army and non-Army. The analysis carried out down to the DRC level gives the researcher a clear picture of the effects of the specific set of variables that affect recruitment within a given DRC. At the same time, the analyst is able to compare coefficient weights to determine relative strengths among the critical variables. At the global level, the structure of the appendices allows the researcher to analyze the differences between DRC's, to note which variables deserve further investigation over different periods

of time, and which DRC's exhibit noteworthy countermovements to overall trends in the data base. The techniques and formats developed in this study can easily be expanded through the incorporation of more variables from Census Bureau statistics or other demographic and economic information available to USAREC and ARI. These results can then be further refined using longer time periods, and more data samples for the National Guard and Reserve. The ultimate aim would be to create very precise predictive models at the DRC level that could be used in ARI's continuing research concerning recruitment indicators, and in USAREC's efforts to optimally allocate scarce resources.

VII. TIME SERIES ANALYSIS

Introduction

This chapter presents the time series analysis, utilizing the techniques of Box and Jenkins, as performed on the accessions data shown in Appendix A-2. The modelling was done in two phases. First, Male High School Graduate Mental Category I-IIIA accessions (ACC13AM) was modelled as a simple time series and, second, unemployment rates, the producer price index and the prime rate were used as input variables with ACC13AM as the output variable in three leading indicator models.

General Information

It was initially hoped to use the data directly from the USAREC file to model ACC13AM. However there were only 22 data points (quarterly from mid 1976) and, in order to perform meaningful analysis using Box and Jenkins techniques, at least 50 data points are needed (Ref 1:18). Thus began the "Great Data Chase."

In earlier readings on the subject, to validate the hypothesis that the Army advertising dollar was well spent, N.W. Ayer had used Male High School Graduate Mental Category I-IIIA monthly accession data from April 1976 to March 1980. Accession data was requested from the United States Army Recruiting Command (USAREC) from January 1980 to the present. The overlapping data was requested in order to insure a "good" set of data when paired with the N.W. Ayer data.

Unfortunately, the new data from USAREC did not match the N.W. Ayer data. This anomaly was explained by a USAREC official as a problem of renorming the accession rates.

In the late seventies and early eighties tests that determined a potential recruit's mental category were compromised and personnel were categorized in mental categories higher than they should have been. Recently, in an attempt to rectify the bookkeeping, records have been checked and the accession rates adjusted to reflect a more accurate representation of the quality of recruits entering the services. These renormed rates were not available when N.W. Ayer conducted their study. USAREC personnel suggested contacting the "keepers of the data," the Defense Data Manpower Center (DMDC) in Monterey, California. From the Army Liason Officer in DMDC, monthly renormed Male High School Graduate Mental Category I-IIIA accession data (from October 1975 to July 1982) was received.

Once the data was received, the 81 points were analyzed in two ways. First, the points were analyzed as a simple time series. This was done in order to compare predictions with the second phase of the time series analysis. The second phase utilized Box and Jenkins leading indicator techniques with the unemployment rate, producer price index and prime rate as input or independent variables and the accession data (ACC13AM) as the output or dependent variable.

Modelling (Phase I) - ACC13AM as a Time Series

Appropriate computer output for this phase of modelling

is in Appendix D-1 through D-6.

Accession rates were modelled as each value being a function of previous values, in order to have a basis for comparison with the leading indicator models to be discussed later. Two methods were used to analyze the data: FORTRAN programs that were written while studying Box and Jenkins techniques (referred to as TSP) aided in model identification and residual analysis, and a standard time series analysis package in BMDP was utilized to fine-tune models and forecast future values. The TSP programs employed various subroutines from the IMSL library.

Initially the simple and partial autocorrelations were examined for significant lags or a recognizable pattern such as a damped exponential or a sine wave. The TSP programs generated plots of both the simple and partial autocorrelations. These are shown in Figures 1a and 1b. The two standard error band was estimated as:

$$2 \text{ SE Band} = \pm \frac{2}{\sqrt{n}}$$

where n is the number of observations in the time series.

The simple autocorrelation plot might be construed as either a linearly decreasing function indicating nonstationarity or a very long sine wave where only a small portion of the wave is plotted. The partial autocorrelation plot has a significant autocorrelation at lags 1 and 15. This could be an autoregressive process of order 1, assuming that the significance at lag 15 can be attributed to spurious

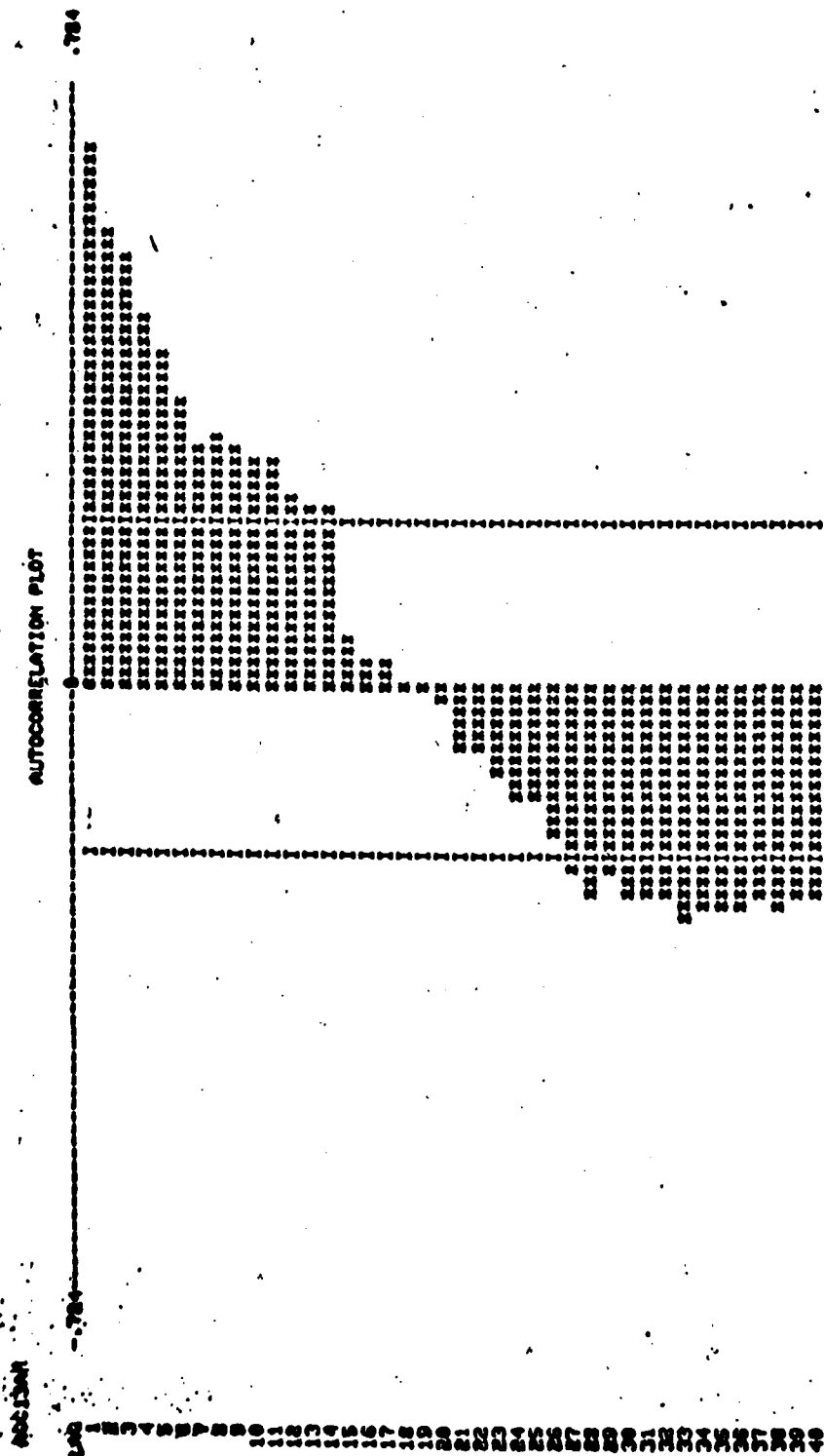
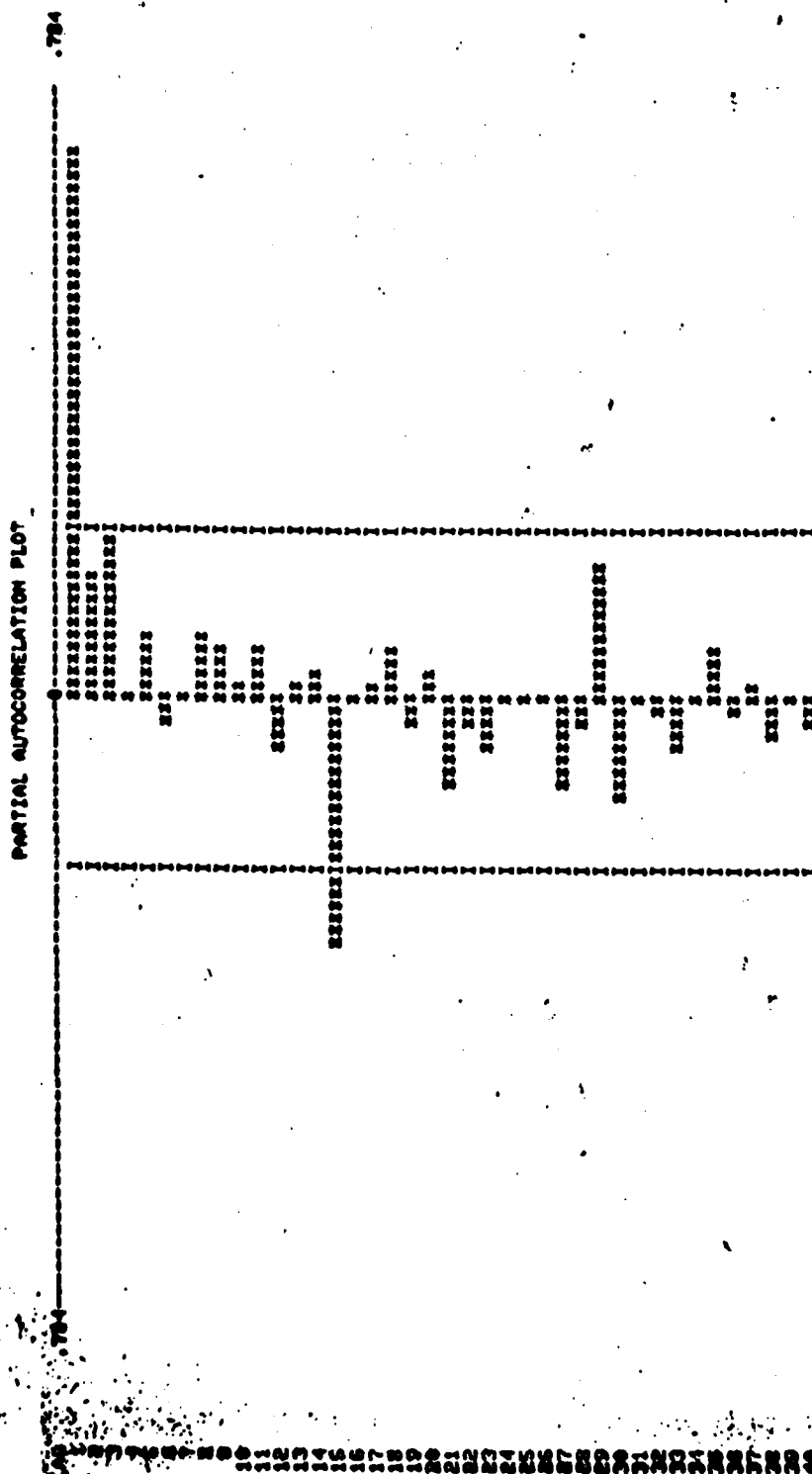


Figure 1a
Autocorrelation Plot of ACC13AM



LAG	1	2	3	4	5	6	7	8	9	10
FIRST LINE UAR(K), SECOND LINE STD(K)										
1	.018802	.028781	.030928	.036578	.037823	.038783	.037880	.034340	.024187	.024270
2	.137120	.108468	.176033	.191853	.194635	.196945	.194130	.185311	.184880	.185145

Figure 1b
Partial Autocorrelation Plot of ACC13AM

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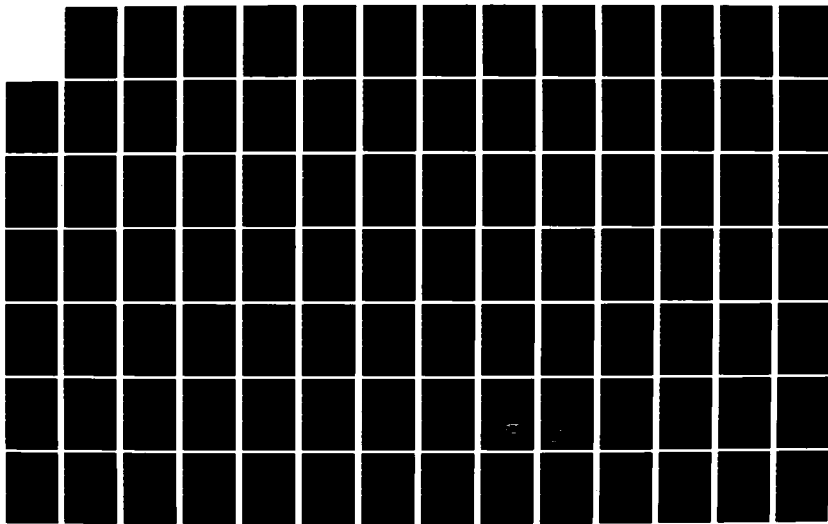
FACTORS INFLUENCING ARMY ACCESSIONS(U) AIR FORCE INST
OF TECH WRIGHT-PATTERSON AFB OH SCHOOL OF ENGINEERING
K M KALINICH ET AL. DEC 82 AFIT/GOR/OS/82D-7

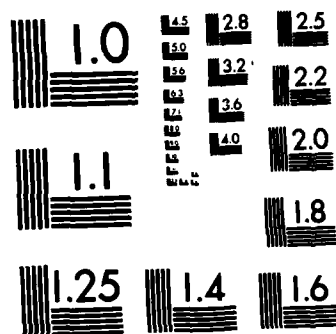
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

movement. Before any model was chosen additional techniques were used in model identification.

In order to analyze the periodogram for significance, the average of the intensity values is calculated to compare all intensity values for significance. This is done by using Table 7.1.2 in Fuller (Ref 8:284) to find the appropriate multiple (based on number of ordinates and the desired confidence level). The average intensity times the multiple (hereafter referred to as periodogram multiple) is computed and compared with all intensity values. The average was approximately 2,421,741 and the periodogram multiple for a 40-value periodogram at the 95 percent confidence level is 6.295. Therefore any intensity value over 15,244,860 is significant. The only intensity value greater than the computed statistic (15,244,860) is at a period of 81 (Appendix D-1). This does not indicate a period of 81 but hints that the full period of the data has not yet been completed in the 81 data points.

Another tool used in model identification was developed by H.L. Gray, G. Kelly, and D. McIntire (Ref 9). This technique utilizes the R and S array method to aid in ARIMA model identification. By recognizing certain patterns in these arrays the p, d, and q (auto regressive, number of differences, and moving average) operators can be easily identified in the ARIMA model.

Using this methodology, the R and S arrays (at low and high frequency) were examined (Appendix D-2). The low

frequency values of the S array in Column 1 are all very close to -2 thus also indicating a possible nonstationarity in the data and the need to non-seasonally difference the data once to remove this nonstationarity. This was accomplished using the TSP programs as in earlier analysis.

For the differenced data, there were no significant simple autocorrelations, although there were several borderline cases (Appendix D-3). The only significant partial autocorrelation was at lag two, indicating that the differenced data might be modelled by an AR(2) process. Analysis of the periodogram of the differenced data, using the same periodogram multiple as before, indicated that any value greater than 5.7 million is significant at the 95 percent confidence level. There were no such values, thus there are no significant periods to be modelled out of the differenced data (Appendix D-3).

The R and S arrays for the differenced data indicated several possible models: ARMA (2,6), ARMA (4,2), and AR(6), all of which seemed to be an overfit of the simple AR(2) model. Appendix D-4 is a listing of the autocorrelation plots, periodogram values, and the R and S arrays for the differenced data. At this point, the BMDP time series package was used to help identify the model and perform various adequacy checks. Since our initial thought was that the process, once differenced, was autoregressive of order two, the data was differenced and modelled as AR(2).

Coefficients were estimated for the autoregressive parameters by the conditional least squares method and by backcasting. The coefficients for both the AR(1) and AR(2) terms were statistically significant. The residuals were estimated using these coefficients and then the residual series was examined for adequacy of the fit of the proposed model. If the model is adequate the residual series would not exhibit any significant simple or partial autocorrelations. The residual series from the ARI(2,1) model had no significant simple autocorrelations (but large at lag 14) and one significant partial autocorrelation at lag 14. For a listing of BMDP output for this model see Appendix D-5.

The foregoing results can be taken in two ways. When working at a 95 percent level of confidence in 100 lags one might expect 5 to be significant but still have an adequate model, or as in this case in 20 lags one might expect 1 significant autocorrelation. Taking this point of view one would accept this model as being adequate and the model for differenced data would be:

$$Z_t = -.2763Z_{t-1} - .3269Z_{t-2} + a_t$$

where a_t represents a white noise residual and Z_t are the various values of the differenced data at time t . The mean of this process was determined to not be statistically significant so it is not in the equation. Since Z_t are differenced data, the equation for undifferenced data is

$$(1-B)(1 + .2763B + .3269B^2) X_t = a_t$$

or

$$X_t = .7237X_{t-1} - .0506X_{t-2} + .3269X_{t-3} + a_t \quad (7-1)$$

However, if the significance of the partial autocorrelation at lag 14 is deemed to be unacceptable, an autoregressive term of order 14 would be added to the model and the residual series checked for any remaining significant simple or partial autocorrelations. This was done using BMDP. See Appendix D-6 for a listing of output for this model. Once again all coefficients were statistically significant and none of the partial or simple autocorrelations were significant for the residual series. Thus a multiplicative seasonal ARIMA (2,1,0)*(1,0,0)₁₄ is also tentatively considered as an adequate model with the following equation:

$$Z_t = -.1835Z_{t-1} - .2429Z_{t-2} + .2670Z_{t-14} + a_t$$

where Z_t once again represents differenced data and a_t the white noise residual series. Thus the equation for undifferenced data is:

$$(1-B)(1 + .1835B + .2429B^2 - .2670B^{14})X_t = a_t$$

or

$$X_t = .8165X_{t-1} - .0594X_{t-2} + .2429X_{t-3} + .2670X_{t-14} - .2670X_{t-15} + a_t \quad (7-2)$$

Before deciding on a final model for accessions there are two other checks to apply to the model. The Portmanteau lack of fit test (Ref 1:290-293) looks at the autocorrelations of the residuals taken as a whole rather than considering them individually.

$$\text{Computing } Q = n \sum_{k=1}^K r_k^2 (\hat{a})$$

where n is the number of data points (minus the number of times differenced), K is the number of autocorrelations considered and $r_k^2(\hat{a})$ is the estimated value of the residual series autocorrelation at lag k . Q has an approximate χ^2 distribution with $(K-p-q)$ degrees of freedom, with p and q representing the number of components in the model average components of the model. If the model is inappropriate, the average value of Q will be inflated or larger than the χ^2 statistic with $(K-p-q)$ degrees of freedom at the desired confidence level.

For the two models considered, the Portmanteau results at a 95 percent confidence level were:

ARI (2,1)	ARIMA (2,1,0)*(1,0,0) ₁₄
$Q = 24.298$	$Q = 25.723$
$\chi^2_{(38)} \cong 53.36$	$\chi^2_{(37)} \cong 52.16$

therefore both models given by equations (7-1) and (7-2) are adequate.

A final model check is a graph of the cumulative periodogram (Ref 1:294-297). This is done to insure that the model has accounted for all periodic components. The plots of the cumulative periodograms for both models are at Figure 2 and 3 along with the autocorrelations of the residual series used in the calculation of the Portmanteau Q value. Both plots were within the acceptable Kolomogorov-Smirnov limits. Additionally, both plots were almost identical in nature. This is expected because the ARIMA (2,1,0)*(1,0,0)₁₄ is an overfit of the ARIMA (2,1,0) model.

Since both models were adequate fits for the data, the BMDP Time Series package was used to predict future results for both models as well as for predicting values at various points in time throughout the data (Appendix E-9). In analyzing these forecasts, one might conclude the ARIMA (2,1,0)* (1,0,0)₁₄ model is better because it has a smaller standard error band. However, in much the same manner one would expect a higher r^2 in regression analysis when an additional variable is entered, a tighter standard error band is expected when a time series model is overfit. In most instances, the first one or two predictions are quite accurate but, as one proceeds further away from the start point, the predictions as compared to actual values showed marked differences. This helps to point out the reason for using the leading indicator technique. When one has a model that uses predicted values to predict values further into the future, the standard error band will get enormously wide. What is hoped for in the leading indicator portion is to find an independent variable that leads accession rates. This allows for use of actual current values of the independent variable to predict future values of the dependent variable.

Leading Indicator Modelling (Phase II)

Unemployment Rates as the Input Variable. Many studies have been done attempting to relate fluctuations in the economy, particularly the unemployment rate, to accessions. Recently Dale and Gilroy (Ref 5) used a time series analysis technique to show a correlation between unemployment rate

ACCESSIONS

ARIMA (2, 1, 0)

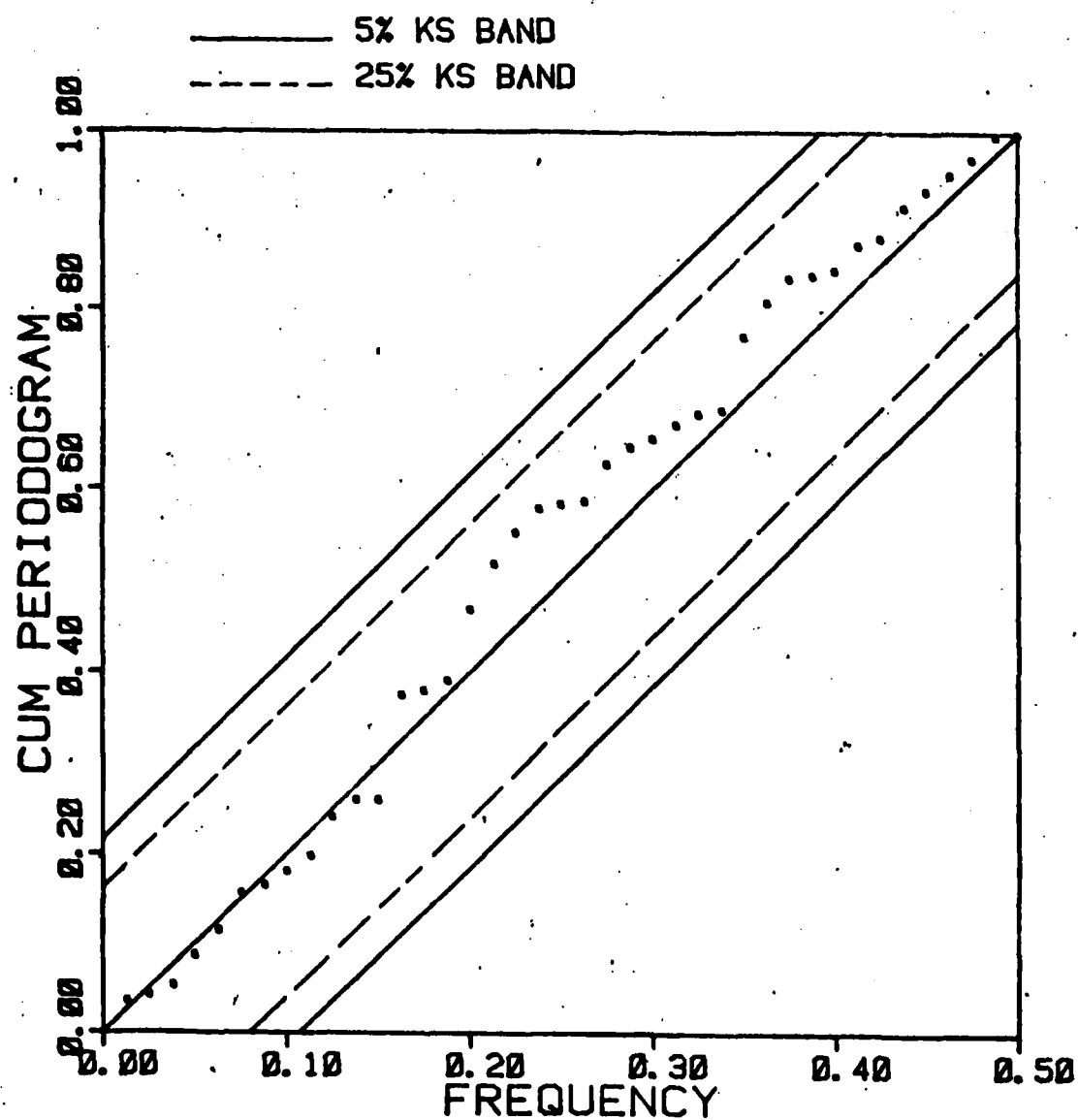


Figure 2

Cumulative Periodogram for ARI(2,1) ACC13AM Model

ACCNS DIFF

ARIMA(2, 1, 0) * (1, 0, 0)₁₄

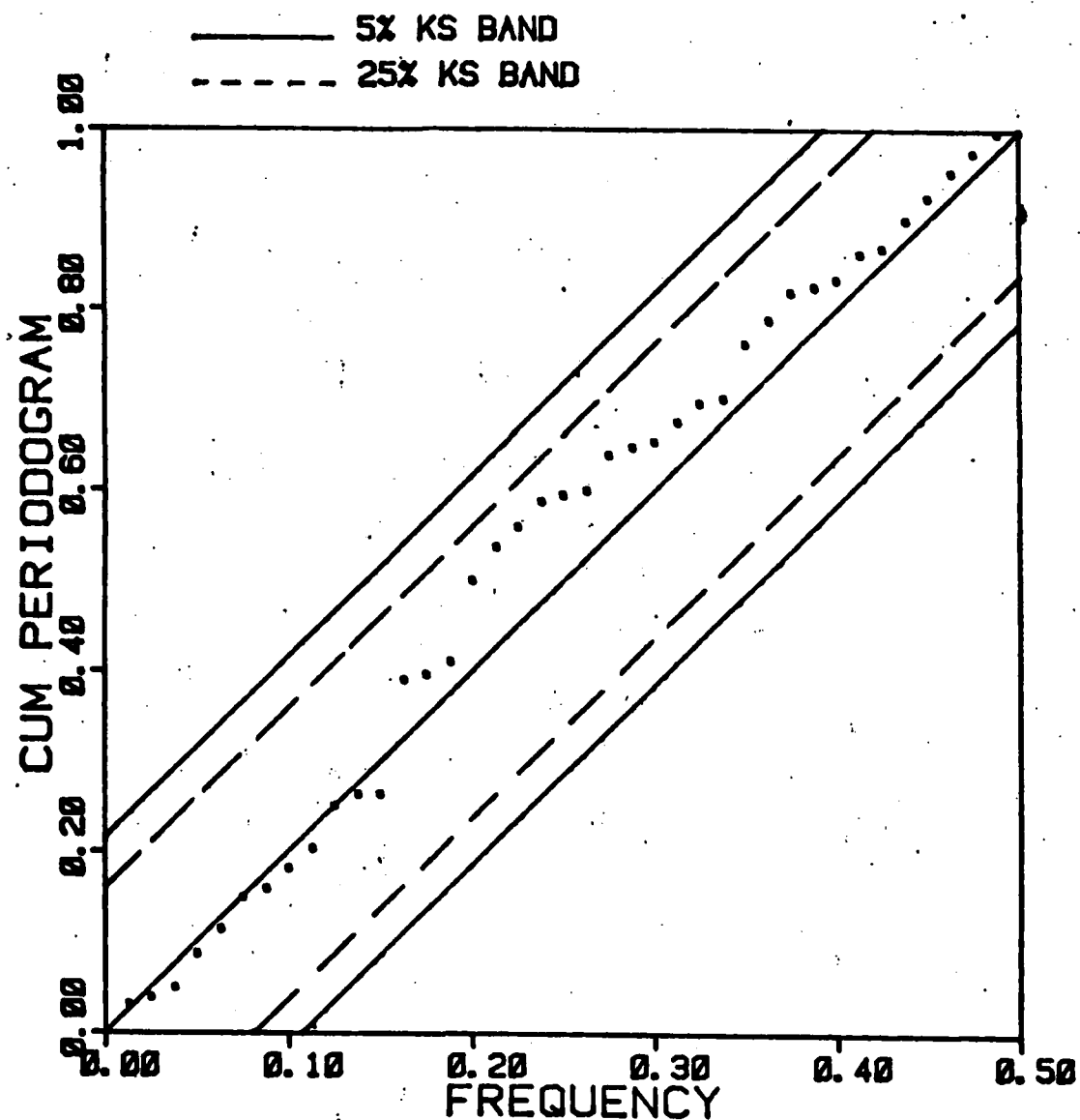


Figure 3

Cumulative Periodogram for ARIMA(2,1,0)*(1,0,0)₁₄

and accessions. They used regression analysis with various lags on unemployment rate as independent variables. Their dependent variable value, Male HSG Mental Category I-IIIA Accessions, are the same DMDC data used in this analysis. This phase of the analysis will extend the Dale and Gilroy study by using Box-Jenkins leading indicator techniques.

Hopefully the forecasts on accessions rates can be considerably improved by associating these forecasts with another variable. This will be the case if changes in accession rates are anticipated by changes in unemployment rates. The first step in the leading indicator technique is to model the input variable, unemployment rates. TSP was used in model identification. The simple autocorrelation plot of the raw data appeared (Appendix E-1) to be either the middle of a long sine wave or a linearly decreasing function. This pattern is recognized as indicating nonstationarity in the data which necessitates differencing. The periodogram implies the frequency of the data might be longer than the 81 data points utilized. The S-Array at low frequency tended to the value two in column one, thus indicating that one root of the polynomial function that explains the data lies on the unit circle, which also suggests a need to difference the data before proceeding with the modelling.

After differencing, the unemployment rate data was analyzed for significant autocorrelations. There were no simple or partial autocorrelations significant thus indicating that all that is needed is to difference unemployment

rate data and the pattern of the remaining residuals is white noise. However, closer examination shows that there are several large, though not significant, simple and partial autocorrelations (Appendix E-2). Knowing that the 2 standard error band is an approximation (Ref 1:32-34), it was decided to further model the data. The average intensity from the periodogram was .129. This multiplied by the periodogram multiple of 6.295, for 40 periodogram values at $\alpha = .05$ gives a value of approximately .81. There are no intensities greater than this value therefore seasonal differencing is not necessary. The S-arrays of the differenced data initially identified an AR(1), AR(2) and ARMA (4,2) as possible models. Appendix E-2 is a listing of the appropriate TSP computer output. BMDP was used to estimate the coefficient of the autoregressive parameter, calculate residuals and check the residual series for significant autocorrelations. As expected there were no significant simple or partial autocorrelations and the estimated AR(1) coefficient of .1332 was not statistically significant (T values all less than 2.0). Next the ARMA (4,2) model was investigated. Remembering that any of these models are an overfit to an ARIMA (0,1,0), one does not expect to find any significant autocorrelations and there were none. Once again none of the estimated coefficients were statistically significant. These models were therefore rejected. Next the AR(2) was investigated. There were no significant autocorrelations. The Portmanteau Q value was well within the

acceptable region and the plot of the cumulative periodogram values shows no model deficiencies. However, the estimated coefficients were not statistically significant and this model was also rejected.

Since differencing the data yielded no significant autocorrelations, it was attempted to model the unemployment rate data without differencing. First, an AR(1) model was applied to the data. The AR(1) coefficient was significant and there were no remaining significant autocorrelations in the residual series. The Portmanteau Q statistic was calculated (22.8) and compared to a chi-squared table value with 39 degrees of freedom and this model appeared to be adequate. Second, an AR(2) model was applied to the data. Both AR coefficients were significant and there were no significant autocorrelations in the residual sequence. The Portmanteau Q was calculated (21.5) and compared to a χ^2 table value with 38 degrees of freedom and this model appeared to be adequate. The cumulative periodogram values for these two models were plotted with no values outside the K-S limits, and a visual comparison with the AR(1) plot clearly indicates a better fit on the AR(2) model.

A comparison of the adequate models is shown in Table 3 below. See also Appendix E-3 for pertinent output in model identification for unemployment rates.

Table IV

Comparison of Adequate Models for Unemployment Rates

Model ARIMA	A (1,0,0)	B (2,0,0)
Coefficients (T-values)	AR(1) .9940 (1273)	AR(1) 1.1322 (1071.85) AR(2) -.1363 (29.18)
ACF/PACF	No significant Lags (NSL)	NSL
Q	22.8	21.5
Significance (α)	.025	.015
Cumulative-Periodogram Plot	Within K-S Limits Always above center line	Very tight about the center line

The ARIMA (2,0,0) model (Model B) was selected as the best model for unemployment rates because it has a smaller Q value, its cumulative periodogram plot is visually better than Model A and it has a higher significance level. Therefore the resulting AR(2) model for unemployment rates is:

$$(1 - 1.1322B + .1363B^2) Z_t = a_t$$

or

$$X_t = 1.1322X_{t-1} - .1363X_{t-2} + a_t \quad (7-3)$$

where X_t is unemployment rate at time t and a_t is the associated white noise residual.

The next phase in the leading indicator modelling process is to filter the output series (accessions) by the ARIMA model for the input (unemployment rates) series.

In other words, the same exact formula as (7-3) above is implied to accessions:

$$Y_t = 1.1322Y_{t-1} - .1363Y_{t-2} + b_t \quad (7-4)$$

The residuals (b_t) in this model are not likely to be white noise as they (a_t) are in the input model. The residuals from the filtered output are then checked for cross correlations with the white noise residuals from the input model. The cross correlation plot aids in the identification of the functional form of the transfer function components. Additionally the simple and partial autocorrelation function of the filtered output residuals are examined for any additional significant ARIMA components to be included in the transfer function.

These steps were applied to accession rates using BMDP. The resulting cross correlation and autocorrelation plots are at Figures 4, 5a and 5b. The cross correlation plot showed no significant positive lags. However, if the 2 S.E. band were tightened slightly there might be significant cross correlations at lags 1, 3, 7 and 8. Thus, from the sample cross correlations between the prewhitened input (unemployment rate) series and the filtered accession rates the preliminary indications were a transfer function of the following form:

$$Y_t = (U_1B^1 + U_2B^3 + U_3B^7 + U_4B^8) X_t + E_t$$

where Y_t and X_t are the respective output and input series with their means removed. E_t is a white noise residual.

PLOT OF SERIAL CORRELATION

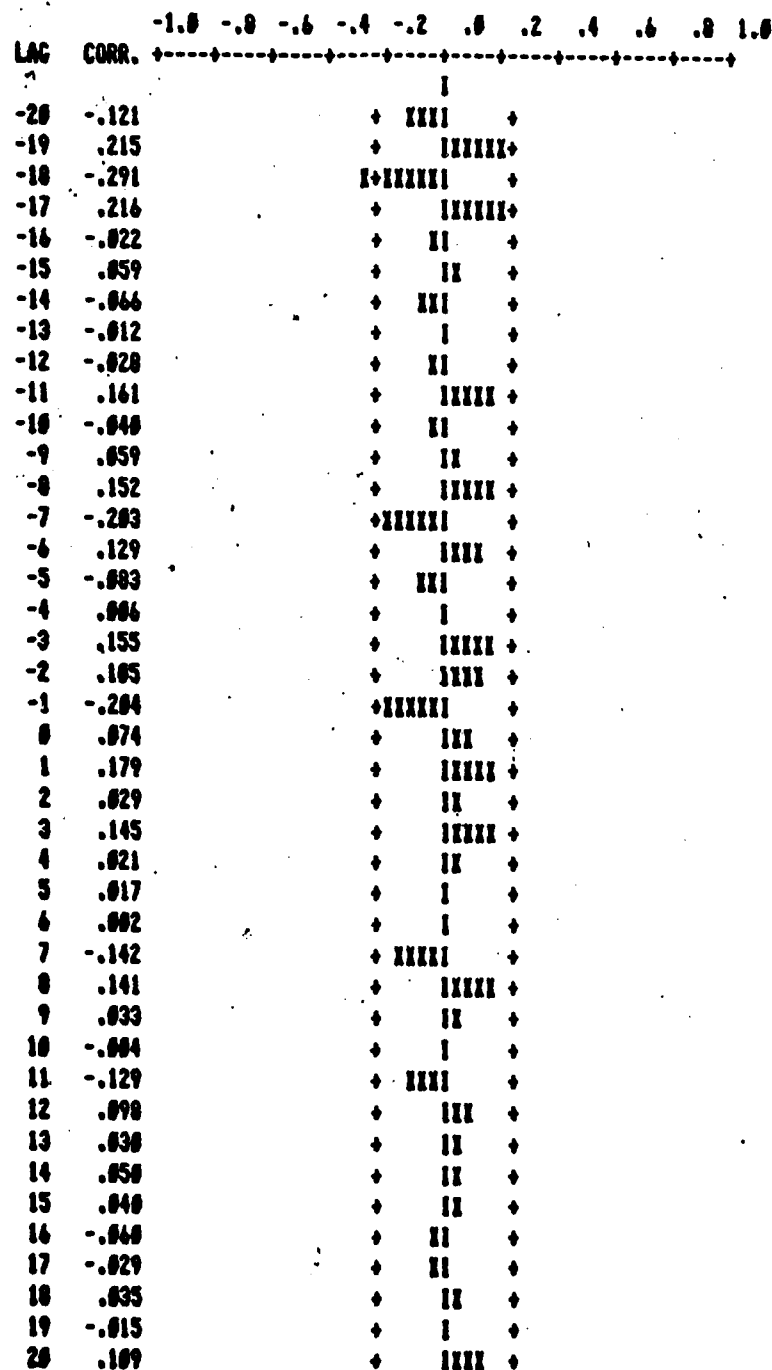


Figure 4
Cross Correlation Plot of Filtered Unemployment Rate Model

AUTOCORRELATIONS

1- 12 -.37 -.15 .12 -.08 .07 .04 -.10 .03 .05 -.09 .11 -.05
ST.E. .11 .13 .13 .13 .13 .13 .13 .13 .13 .13 .13 .13

13- 20 -.06 .35 -.27 -.06 .05 .04 -.02 .06
ST.E. .13 .13 .14 .15 .15 .15 .15 .15

PLOT OF SERIAL CORRELATION

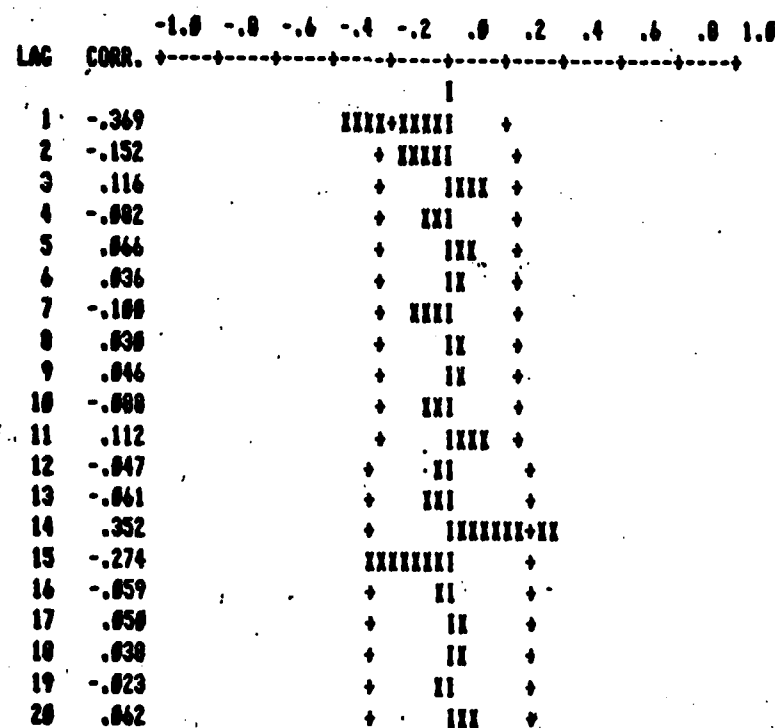


Figure 5a

Simple Autocorrelation Plot of Filtered
Unemployment Rate Model

PARTIAL AUTOCORRELATIONS

1- 12	-.37	-.33	-.11	-.16	-.02	.04	-.05	-.03	.02	-.07	.06	.01
ST.E.	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11
13- 20	-.04	.30	.07	0.0	-.11	.02	-.07	.05				
ST.E.	.11	.11	.11	.11	.11	.11	.11	.11				

PLOT OF SERIAL CORRELATION

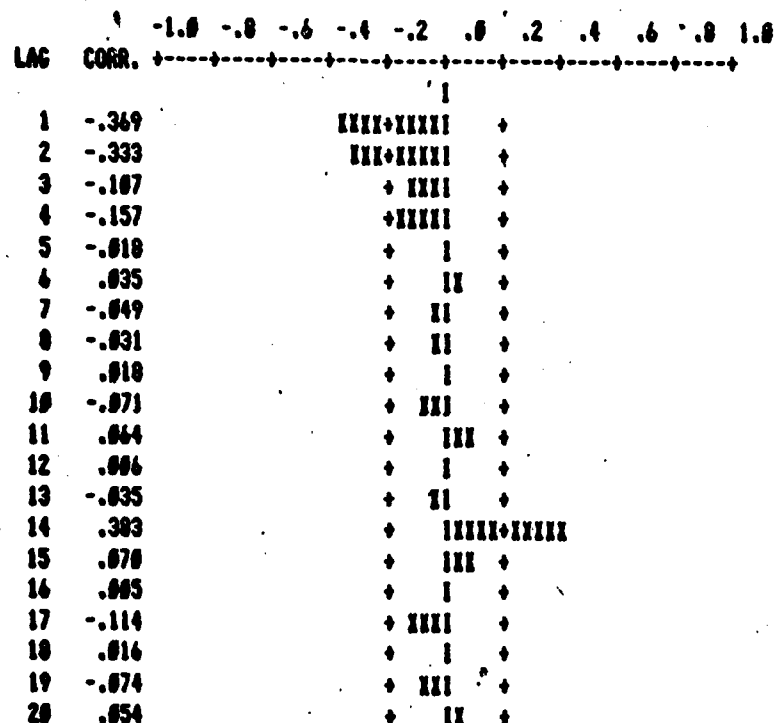


Figure 5b
Partial Autocorrelation Plot of Filtered
Unemployment Rate Model

A full explanation of the derivation of a transfer function model is found in Reference 1. Additionally, the simple autocorrelation function is significant at lags 1 and 14 suggesting a possible MA(1) component in the model while the partial autocorrelation function is significant at lags 1, 2 and 14 suggesting a possible AR(2) component in the model. Attempts to model out these significant lags by using the moving average of order 1 failed.

Fine-tuning the transfer function model by adding an AR(2) model along with the U coefficients at lags 1, 3, 7 and 8 had a remaining significant partial autocorrelation at lag 6. Thus, an autoregressive term of order 6 was added to the model and the model was reestimated, residuals calculated and autocorrelation plots of the residual series examined. The coefficient for the second order autoregressive term and the U coefficient at lag 3 were not significant so that they were dropped from the model. The remaining components, AR orders (1,6) and UP orders (1,7,8) were estimated and the resulting BMDP output is at Appendix E-4.

A summary of the model follows:

<u>Type</u>	<u>Variable</u>	<u>Order</u>	<u>Coefficient Estimate</u>	<u>T-Ratio</u>
AR	ACC13AM	1	.5288	5.96
AR	ACC13AM	6	.4605	5.25
UP	Unemp	1	702.6	4.88
UP	Unemp	7	-441.6	1.91
UP	Unemp	8	378.9	1.64

Both the simple and partial autocorrelation plots are within the two standard error bands. These results lead one to the conclusion that this is a tentative transfer function model. This is almost exactly what we were looking for, a variable that leads accession rates. This model says the important unemployment rates to predict current accession rates are one, seven and eight months back from the time you are trying to predict. It was hoped that by dropping the first lag and only estimating the U order coefficient at lags 7 and 8 the model would still be adequate. This was done, however the 7th U order coefficient was no longer statistically significant, thus, it was dropped. The transfer function model was reevaluated only with AR (1,6) and UP(8) components. In the resulting model the lag at 8 was determined to no longer be statistically significant. Therefore we returned to the AR (1,6), UP (1,7,8) as a tentative transfer function model. The resulting transfer function is:

$$Y_t + (U_1 B^1 + U_2 B^7 + U_3 B^8) X_t + \frac{1}{1 - \phi_1 B^1 - \phi_2 B^6} a_t$$

or

$$Y_t = 702.9X_{t-1} - 441.6X_{t-7} + 378.9X_{t-8} + \frac{1}{1 - .5288B^1 - .4605B^6} a_t$$

Diagnostic Checking

Before accepting the above transfer function as an adequate representation of the system modelled, autocorrelation and cross correlation checks should be applied (Ref 1: 393-397). Both the Q and S criterion are derived in the

same manner as the Portmanteau Q statistic discussed earlier. The first 24 lags of the residual autocorrelation are used in the computation of the Q criterion:

$$Q = m \sum_{K=1}^{24} \hat{r}_{\hat{a}\hat{a}}^2(K)$$

where m is the actual number of residuals available for the computation:

$$Q = 71 (.2752) \cong 12.44$$

Comparison of $Q = 12.44$ with the χ^2 tabled value for $K-p-q$ degrees of freedom (where p and q are from the noise model) shows no grounds for questioning the model's adequacy at an α level of .005.

Using the first 36 values of the cross correlations between the output residuals and the prewhitened input residuals yields the S criterion:

$$S = m \sum_{K=0}^{35} \hat{r}_{\hat{a}\hat{a}}^2(K) = 71(.157994) \cong 11.218$$

Comparison of S with the χ^2 tabled value with $(K + 1) - (r + s + 1)$ degrees of freedom at the .005 level again shows no grounds for questioning the model's adequacy.

Forecasting Under Transfer Function Models

In order to forecast accession rates, it is necessary to provide forecasts of the unemployment rates. This is done using BMDP. Once the unemployment rates are forecasted, the transfer function is used to predict accession rates. A BMDP listing of this output is at Appendix E-5.

A comparison of these results with the results of modelling accession rates alone (Phase I) shows that the forecasts for short lead times under the leading indicator model have a much narrower error band thus increasing the accuracy of the forecast. These results are shown in Table V.

Table V
Comparison of LI Model and Simple
Time Series Forecasts

Period Ahead k	Forecasts Accessions Along ARI(2,1)	SE	Forecasts Leading Indicator	SE-LI
1	4900	599	4777	519
2	4745	740	5045	626
3	4852	792	5969	688
4	4873	878	4802	735
5	4837	966	4494	775
6	4849	1032	4731	811

Model Enhancing

If the reader refers to Appendix E-4 the simple and partial autocorrelations at lag 1 are both large but not significant. An effort was made to reduce the size of this autocorrelation hopefully reducing even further the standard error band on future predictions. Since there were already first and second order autoregressive components in the transfer function, a moving average component of order one (MA(1)) was added to the model. Coefficients were estimated, residuals calculated and the residual series checked for significant simple or partial autocorrelations. Appendix E-6 is a listing of BMDP output for this model.

The model is summarized as follows:

Variable	Type	Order	Coefficient Estimate	T-Ratio
ACC	MA	1	.3169	1.91
ACC	AR	1	.6832	6.64
ACC	AR	6	.3114	3.07
Unemp	UP	1	701.92	5.26
Unemp	UP	7	-493.81	2.04
Unemp	UP	8	426.99	1.93

All of the coefficients were significant at the .05 level and there were no significant simple or partial autocorrelations.

The resulting transfer function model is:

$$Y_t = 701.92X_{t-1} - 493.81X_{t-7} + 426.99X_{t-8} + \frac{(1-.3169B)}{1-.6832B-.3114B^6} a_t$$

Since this is an overfit of a previously calculated model there is no doubt about its adequacy. A comparison between the forecasts of the two models is shown in Table VI.

Table VI

Comparison of Unemployment Rates
Leading Indicator Models

Period Ahead	Model 1		Model 2		Actual
	AR(1,6) UP(1,7,8)	SE	AR(1,6) MA(1) UP(1,7,8)	SE	
1	Forecast	SE	Forecast	SE	
1	4777	519	4612	523.6	
2	5045	626	4912	596.5	
3	4969	688	4822	640.1	
4	4802	735	4696	673.4	
5	4494	775	4419	702.2	
6	4731	811	4708	728.1	

It should be noted that in all cases Model 2's predictions are less than Model 1's and the desired effect of tightening the SE band happened at all predictions except the first.

However, when considering a 2 SE band about Model 1's first prediction it can be said with approximately 95 percent confidence that the true value of the accessions for the next month will lie between 3739 and 5815.

The conclusion reached from this point is that, regardless of the fact that both transfer function models are adequate representations of the data and they have tightened the 2 SE band when compared to the model from Phase I, the models have too wide a standard error band, even on the first prediction, to be models that Army planners can use to predict future accession rates.

Producer Price Index as Input Variable. Since unemployment rates failed to produce a usable leading indicator model, a different type of variable was chosen to model with accessions. The producer price index (PPI) much like the consumer price index is a measure of inflation. PPI was chosen as the independent variable in the leading indicator technique. Since the same modelling process was used as with unemployment rates, only the final results will be discussed in this section. The producer price index was successfully modelled as follows:

$$(1-B)(1-.2985B^3 - .4965B^{12}) X_t = (1+.8789B + .3169B^5) a_t$$

or

$$\frac{(1 - .2985B^3 + .2985B^4 - .4965B^{12} + .4965B^{13})}{(1 + .8789B + .3169B^5)} X_t = a_t$$

This equation was used to filter accessions and there were three transfer function models that were found to successfully model the data. They are:

$$1. Y_t = (73.3B^5 - 70.5B^6) X_t + \frac{(1 + .9072B)}{(1 - .5949B^2 - .2420B^6)} a_t$$

or

$$Y_t = 73.3X_{t-5} - 70.5X_{t-6} + \frac{(1 + .9072B)}{(1 - .5949B^2 - .2410B^6)} a_t$$

$$2. Y_t = X_t + \frac{a_t}{(1 - .7531B - .1119B^6)}$$

$$3. Y_t = (65.5 - 65.2B) X_t + \frac{a_t}{(1 - .7202B - .1522B^2)}$$

or

$$Y_t = 65.5X_t - 65.1X_{t-1} + \frac{a_t}{(1 - .7202B - .1522B^2)}$$

All three of these models have some coefficients that are not statistically significant at the .05 probability level. This causes the standard error bands on the forecasts to be even wider than those in the unemployment model. Additionally, the only model that allows you to look ahead with current values of the PPI is the first and the lag coefficients on X_{t-5} and X_{t-6} are not significant. The other models use values of X_t to predict Y_t . This defeats the purpose of modelling with a leading indicator.

Predictions were made using the three transfer function models and the results are in Table VII.

Table VII

Comparison of PPI Leading Indicator Models

Period Ahead <i>h</i>	Transfer Fn. 1		Transfer Fn. 2		Transfer Fn. 3	
	Forecast	SE	Forecast	SE	Forecast	SE
1	4936	614	4673	619	4874	629
2	4739	819	4462	762	4716	771
3	4870	948	4248	867	4732	833
4	4724	1037	4127	941	4600	862
5	4798	1100	3947	995	4522	877
6	4691	1149	3821	1037	4640	884

The best two standard error band for the first prediction is using transfer function 1 with a band of ± 1228 . For a list of BMDP output see Appendix E-7. Once again this is not a model that would be readily adopted by Army planners.

Prime Rate as Input Variable. The Prime Rate was also chosen as the input variable in the leading indicator model with accession rates remaining the output variable. As with the PPI, only the final results will be discussed.

The prime rate yielded two models:

$$(1-B)(1-.3053B^{14}) X_t = (1+.6640B - .3625B^3 - .5574B^4) a_t$$

or

$$(1-B-.3053B^{14} + .3053B^{15}) X_t = (1 + .6640B - .3625B^3 - .5574B^4) a_t$$

or

$$\frac{(1-B-.3053B^{14} + .3053B^{15})}{(1 + .6640B - .3625B^3 - .5574B^4)} X_t = a_t$$

and the second model:

$$(1-B)(1-.6760B + .3685B^2 + .3756B^4 - .3729B^5 + .2573B^{10})$$

$$.X_t = a_t$$

or

$$(1 - 1.6760B - 1.0445B^2 - .3685B^3 + .3756B^4 - .7485B^5 + .8421B^6 - .4692B^7 + .2573B^{10} - .2573B^{11}) X_t = a_t$$

or

$$X_t - 1.6760X_{t-1} - 1.0445X_{t-2} - .3685X_{t-3} + .3756X_{t-4} - .7485X_{t-5} + .8421X_{t-6} - .4692X_{t-7} + .2573X_{t-10} - .2573X_{t-11} = a_t$$

where in both models X_t is the input variable, prime rate, and a_t is a white noise residual.

These models were used to filter accession rates and they resulted in the corresponding transfer functions:

$$Y_t = X_t + \frac{1}{(1 - .7502B - .1048B^6)} e_t$$

and

$$Y_t = X_t + \frac{(1 + .3455B^6)}{(1 - .7177B)} e_t$$

Neither of these transfer function models are usable because they use values of the input to predict the same time frame's accession. BMDP computer listings for prime rate Leading Indicator Modelling are at Appendix E-8. A summary of the two models' predictions for accessions rates is at Table VIII.

Table VIII

Comparison of Prime Rate Leading Indicator Models

Period Ahead	Model 1		Model 2	
	Forecast	SE	Forecast	SE
1	4674	613	4720	606
2	4356	766	4322	744
3	4167	840	4176	805
4	3970	879	3751	834
5	3828	900	3582	848
6	3788	912	3669	856

Once again the two standard error bands are too wide on the first predictions for either of these models to be considered acceptable.

Results and Conclusions

The objective of modelling using a leading indicator is to find a variable that leads accession rates and to provide a better predictive model than by simply modelling accession rates as a time series. Leading indicator models were developed where accessions lagged behind unemployment rates at 1, 7 and 8 months and behind Producer Price Index at 5 and 6 months. The unemployment model provided a tighter two standard error band than by modelling accessions as a time series. However, in all cases the standard error bands were too wide to provide a realistically usable model for Army planners. The conclusion is that unemployment rates, the producer price index and the prime rate are not reasonable input variables for a leading indicator model. There are many reasons for this; the basic assumption underlying all time series modelling is that the basic

stochastic process inherent in the data is not changing. Currently, unemployment rates are skyrocketing and the prime rate is falling; there may be forces at work that lead these variables which our models fail to account for. However, we are attempting to model nationwide accession rates with nationwide unemployment rates. This may be the wrong way to model accessions. People are affected in various parts of the country by any number of influences to join the Army. The unemployment rate is one such influence. In the South the unemployment rate has been running much lower than in the industrial North East and Mid West. One would expect unemployment rates to have a different effect on accessions based on the local unemployment rate rather than on the national rate.

Recommendation for Future Research

We are led to the obvious conclusion that this subject area needs to be disaggregated and studied on a regional basis. Additionally, the input variables should be considered as output variables and leading indicators for these variables (especially unemployment rates) should be sought. There are a multitude of economy related variables to be found so that continuing this effort with other input variables should not be a difficult task. Finally, there seems to be problems in the predictions for the input variables (they all seem to be going in the wrong direction from the actual predicted values). It is recommended that this subject be studied by applying the frequency domain approach.

VIII. Summary

Research Objectives

The objectives of this research effort were as follows:

1. Enhance the USAREC Enlistment Prediction Model.
2. Study accessions in an attempt to understand what factors influence them.
3. Build a discriminant function to predict whether potential accessions will join the Army or other services.
4. Conduct time series analysis on accessions using Box and Jenkins techniques.
5. Develop leading indicator models to predict accessions based on the following input variables: unemployment rates, producer price index, and the prime rate.
6. Provide to ARI and USAREC useable computer programs to accomplish the above.

Accomplishments

The following are the major accomplishments of this thesis:

1. Enhanced Enlistment Prediction Model.

The predictive ability of the regression model used by USAREC in projecting accessions has been significantly improved through the incorporation of new relationships among the USAREC variables. Running this EPM model is the first phase in USAREC's designation of recruiting missions for each of the 57 District Recruiting Commands (DRC). This enhancement allows USAREC to formulate more accurate quarterly

projections of accession rates and will make all steps after it more exact with the goal of assigning a more precise and feasible recruiting mission to the DRC's.

A comparison of the adjusted R^2 from the USAREC model and the enhanced model is shown below:

<u>Region</u>	<u>USAREC Model</u>	<u>Enhanced Model</u>
NE	.75220	.76185
SE	.73807	.76889
SW	.68286	.71546
MW	.62862	.63073
WEST	.75133	.81231

2. District Recruiting Command (DRC) reorganization of MEPS file and its merger with the USAREC file.

One usable byproduct resulting from this thesis study is the development of a FORTRAN program that will re-code state and county codes on the MEPS file into DRC codes. ARI-PERI-RP has been very interested in having this capability in order that they might be able to perform analysis of the MEPS file based on recruiting regions and districts. An additional FORTRAN program allows researchers to enhance this DRC analysis capability by merging the information on the MEPS file with the data from the USAREC files. Thus, the researchers at ARI-PERI-RP will be able to organize their MEPS file investigation by DRC codes; and as a corollary, a bridge is provided for the exchange of information between ARI and USAREC.

3. Multivariate analysis techniques for examining the variables in the merged MEPS/USAREC (MU) file.

Based on the profile analysis done on the MEPS file and the merged MU file, several characteristic variables were selected and analyzed by Recruiting Region and DRC using both factor and discriminant analysis. The variables that emerged from the profile analysis and the multivariate procedures and output formats used in this study can be employed in the continuing research efforts of both ARI and USAREC.

4. Time Series Analysis of economic variables associated with recruiting.

The results of this study's time series analysis provides USAREC with new tools for examining accession rates based on certain economic indicator variables. Box-Jenkins time series analysis techniques were applied to the USAREC data. In addition, unique procedures and programs were specifically developed in this thesis effort for use on several economic variables available to USAREC. Armed with these programs and procedures, USAREC will be able to carry out extended research into the economic and demographic variables affecting recruiting and accessions.

The objective of the time series analysis was to find variables that lead accession rates. This was done in the unemployment model; unemployment rates were found to lead accessions, i.e., coefficients were significant, by one, seven, and eight months. Also, the producer price index leads accessions by 5 and 6 months. However, there may be a

problem with the leading indicator models since the standard error bands about the predicted values of accessions were large. In this case it will be necessary to see how well the predictions fare over the next six months.

Recommendations for Further Analysis

1. Extend time period.

The results of this thesis effort open doors to several areas of investigation in the area of Army recruiting. The chief recommendation is that the many procedures which are outlined in this study can and should be applied against existing data bases and variables over an extended time period rather than the narrow bands of time which were covered in this thesis. From an extended interval of time, more accurate accession indicators and predictive coefficients can be developed. Since the MEPS sample was limited to one year of data, many USAREC variables did not have much variance in only four quarters. Thus, shifts in such variables as unemployment, percentage of Army recruiters by DRC, and number of blacks available cannot yield solid predictive models when based on only four quarters in the MU file analysis.

2. Add variables to data base and extend studies to Regions and DRC's.

Now that a method is available for ARI to examine the MEPS data using DRC codes, other demographic and economic variables can be obtained from the Bureau of the Census and merged with the MEPS data by DRC. Further expansion of the

variables and analysis in this area can now focus on specific Recruiting Regions and DRC's rather than be limited to the relatively meaningless MEPS ID codes.

3. Perform multivariate analyses on other service components.

The factor and discriminant analysis procedures developed for the study of the MU file can be employed in further research of the variables affecting the National Guard and Reserve components. The data sample of the MEPS file, although very large at 48,520 records, did not have enough records to perform detailed analysis at the DRC level. Much can be learned from applying the multivariate analysis procedures to the other components as was applied to the Regular forces.

4. Extend factor analysis with correlation analysis.

The next step in factor analysis of the MU file would be to assign standardized names to the discovered factors and then run correlation analysis such as the SPSS subroutine PEARSON CORR with the various factors against a dependent variable such as the Army variable. The results should demonstrate how closely the new factors predict the Army variable, that is, whether an individual is "oriented" to join the Army based on the characteristics of the new factors.

5. Perform discriminant analysis on entire data base and study variables' "target" groups.

The next step in discriminant analysis of the MU

file would be to use the entire data base rather than just a sample to develop accurate unstandardized canonical correlation coefficients by DRC. The coefficients can then be used to determine if certain "target" groups are more likely to join the Army or another branch of service. This is beneficial in those cases when a certain "target" group of the population is sought by the Army, such as for instance high school graduate, male hispanics from a given DRC. In this example, by knowing the current unemployment rate, median income, percentage of Army recruiters, etc., one can use the unstandardized coefficients to predict whether or not the "target" group will join the Army over another branch. It could be that decreasing the percentage of Army recruiters only slightly in the equation will have a strong impact on the "target" group deciding to join another branch instead. Several "target" populations with widely varying attributes can be run against this model to determine their likelihoods of joining the Army. Such techniques could be employed when a given Region or DRC is planning an advertising campaign in a given DRC to beef up accessions, e.g., it may be found that the best advertising for the Army should be based on the income variable rather than the unemployment variable in a given DRC.

6. Add variables to discriminant model.

Other variables can also be added to the discriminant model to enhance its predictive capabilities, such as the addition of amount of advertising dollars spent by the

various services. The user of these procedures should be cautious not to approach the use of these variables as competitive tools to draw desired "high quality" enlistments away from the other services. Rather, the aim is to attract the same caliber of personnel into the Army as is enjoyed by the other branches, and to avoid expending scarce resources on the wrong "target" groups.

7. Consider other methods of preparing the data base for further analysis.

Similar analysis as developed in this study can be performed on a different mode of MEPS/USAREC file organization and file merging. One suggestion referred to in Chapter V, Data Base Preparation, is to develop summary totals within the MEPS file by DRC and quarter based on tallies of the attribute variables. For instance, one may tally the number of individuals with AFQT scores over 50 by service by DRC by quarter, or tally a cross combination of several characteristics. These MEPS file tallies could then be merged with the USAREC data base to form a new summary file to be used in further analysis. This merging can use the same FORTRAN routine for state/county to DRC recoding that was employed in the original MU file development.

8. Consider enhancing EPM.

There are logical extensions to the enhancement of the USAREC EPM. In Dale and Gilroy's study (Ref 5), military pay was found to have a significant relationship with accessions. Inclusion of wage differential variable or a percent

annual pay raise variable in the model might further enhance the quality of its output.

9. Perform time series analysis at regional level using leading indicators and spectral analysis.

In the time series analysis, we are led to the obvious conclusion that this subject area needs to be disaggregated and studied on a regional basis. Additionally the input variables should be considered as output variables, and leading indicators for these variables (especially unemployment rates) should be sought after. There is a wealth of available economy-related variables to be considered, so that continuing this effort with other input variables should not be a difficult task. Finally, there seems to be a problem in the predictions for the input variables; they all seem to be in error in the same direction from the actual values. It is recommended that this subject be studied by applying the time domain approach.

Compendium

The overall importance of this thesis effort is that it provides a variety of tools for the study of the many aspects of Army Recruiting. In summary, the tools developed and employed are:

1. State and county recode to DRC,
2. Merge of MEPS and USAREC data bases,
3. Profile of MEPS and USAREC variables important to recruiting,

4. Multivariate analysis of MEPS and USAREC variables,
5. Regression enhancement of the Enlistment Prediction Model,
6. Box-Jenkins Time Series Analysis of USAREC variables, and
7. Unique time series analysis procedures for analysis of leading economic indicators to accession projections.

Thus, this thesis provides many analysis techniques which are applied against data bases that are common to both ARI and USAREC. As a result, researchers examining recruitment and accessions now have an expanded assemblage of tools that can be used to address the many issues facing Army Recruiting.

Bibliography

1. Box, George E. P. and Gwilym M. Jenkins. Time Series Analysis: Forecasting and Control. San Francisco: Holden-Day, Inc., 1976.
2. Cirie, J. A. et al. (ed) Department of Defense and Navy Personnel Supply Models. TR-9, Arlington, Va: Office of Naval Research, May 1981. AD-A100 177.
3. Cohen, Lester and D. E. Reedy. "The Sensitivity of First Term Navy Reenlistment to Changes in Unemployment and Relative Wages." Naval Research Logistics Quarterly, 26(4): 695-709 (December 1979).
4. Cooper, R. V. L. Military Manpower and the All-Volunteer Force. Report R-1450-ARPA, Rand Corporation, September 1977. AD-A044 797.
5. Dale, C. and C. Gilroy. The Effects of the Business Cycle on the Size and Composition of the U.S. Army. PPRG Working Paper 82-1. Army Research Institute, Alexandria, Va.
6. DeRue, J. A. and J. E. Robbin. Application of Demographics to the Army Recruiting Problem. Paper Presented to the Twentieth Annual Operations Research Symposium. Ft. Lee, Va: September 1981.
7. Goodpaster, A. J. and E. H. Lloyd. "Toward a Consensus on Military Service," Washington, D.C.: The Atlantic Council of the United States, June 1982.
8. Fuller, W. A. Introduction to Statistical Time Series. New York: John Wiley and Sons, Inc., 1976.
9. Gray, H. L. et al. A New Approach To ARMA Modeling. TR-126, Research Sponsored by the Office of Naval Research, Arlington, Va: December 1977.
10. Goldberg, L. The Navy Enlisted Supply Study (NESS). CNA 81-11581. Memorandum for Advisory Committee. Alexandria, Va.: Center for Naval Analysis, 22 July 1981.
11. Grinold, R. C. "Manpower Planning with Uncertain Requirements." Operations Research, 24(3): 387-400 (May-June 1976).
12. Hambeurg, M. Statistical Analysis for Decision Making. New York: Harcourt Brace Jovanovich, Inc., 1977.
13. Hillier, F. S. and G. J. Lieberman. Introduction to Operations Research. San Francisco: Holden-Day, Inc., 1980.

14. Holz, B. W. and J. M. Wroth. "Improving Strength Forecasts: Support for Army Manpower Management." Interfaces, 10(6): 37-51 (December 1980).
15. Kendall, Sir Maurice. Multivariate Analysis. New York: Macmillan Publishing Company, Inc., 1980.
16. Klopp, Gerald A. Factors Affecting U.S. Army Recruiting. Research Memorandum 81-3. Ft. Sheridan, Ill.: U.S. Army Recruiting Command, September 1981. AD-A108 536.
17. Kwak, N. K. et al. "A Stochastic Model of Demand Forecasting for Technical Manpower Planning." Management Science, 23: 1089-1097 (June 1977).
18. McNichols, Charles W. An Introduction to Applied Multivariate Data Analysis. AFIT/ENS Course Notes for SM6.85.
19. Morey, R. C. The Impacts of Various Types of Advertising Media, Demographics, and Recruiters on Quality Enlistments: Results from Simultaneous and Heteroscedastic Models. Durham, N.C.: Duke University, July 1980. AD-A087 431.
20. Nie, N. H. et al. Statistical Package for the Social Sciences, 2nd ed. New York: McGraw-Hill Book Co., 1975.
21. N. W. Ayer, Inc. A Study of the Effectiveness of the Army's National Advertising Expenditures. New York: August 1981.
22. Taha, Hamdy A. Operations Research. New York: Macmillan Publishing Company, Inc., 1977.
23. Wallace J. R. Optimal Recruiter Allocation Model (ORAM). Research Memorandum 81-2. Ft. Sheridan, Ill.: U.S. Army Recruiting Command, September 1981. AD-A106 482.
24. Dixon, W. J. et al. Biomedical Computer Programs P-Series (BMDP). Berkely: University of California Press, 1981.

Appendix A-1

Sample of USAREC Data Base and Input Format for the
Associated Variables

82024K	759	896	1986	232	77	216	153	54789386	629	47514462	108	342	225155	133	134	55	35	195	
82025A	17	1595	6117	434	140	625	481	88787422	1191	97617323	710	722	498	76	177	349	49	89	271
82025B	103	769	2390	215	86	488	396119913431	950	79616144	134	660	481126	163	292	51	85	187		
82025C	131	1469	4003	453	128	634	492120628395	1519	125616303	261	909	637	82	253	387	61	120	283	
82025D	207	838	2530	223	82	365	264120690394	823	67516283	89	516	388141	190	240	37	64	176		
82025E	438	922	1644	220	79	336	281100807413	735	60814453	25	515	372110	195	230	54	64	176		
82025F	45	1300	3518	332	124	622	532160799401	1377	113818190	407	860	651	84	233	342	69	137	307	
82025H	267	1125	1859	270	107	450	373129646413	1036	87315419	145	629	477107	170	273	73	66	179		
82025I	363	1192	3687	350	111	499	408155707395	1099	91818190	109	733	534134	220	314	65	101	283		
82025J	434	1272	2322	358	123	434	331	98593402	985	74715224	104	681	479	94	150	306	58	92	233
82025K	733	1317	3038	381	119	416	313	76689414	1006	78915261	26	638	452	89	217	288	62	66	211
82025L	2445	1162	2546	303	113	384	289	65731419	916	73113702	35	590	408131	167	288	86	67	177	
82025M	261	1160	2971	324	94	407	322110812425	926	78616849	147	540	382111	197	257	55	67	188		
82025N	595	1327	4563	356	121	625	491	94666424	1281	102516092	261	722	536127	223	374	94	118	282	
82026A	89	1118	1915	308	87	398	280	77796351	795	59117122	226	563	332	62	97	265	69	62	583
82026B	5731	214	804	114	38	177	158	69831474	341	30517467	13	219	170110	53	70	25	48	200	
82026F	250	1599	3880	532	155	756	575	85612366	1439	112917122	340	872	607103	123	415	71	791158		
82026G	1213	645	2304	218	69	384	261	76669374	807	62515474	50	551	369106	163	254	58	61	252	
82026H	690	782	1898	166	69	350	248122630406	783	58215747	29	589	359	61	133	271	71	56	281	
82026I	1316	886	2261	324	106	542	397	91713281	1204	91317041	86	737	491	96	160	365	61	97	602
82026J	4001	794	2116	261	63	262	193	92641286	634	46414698	13	413	265	85	90	215	63	43	191
82026K	366	1288	1915	344	104	446	325	92836337	1016	77617122	64	569	363	94	117	305	62	76	689
82026L	858	960	1681	291	114	457	337	94688403	1013	80517068	48	696	432	78	113	342	97	92	428

VARIABLES: TIME, QTR, FOM, DRO, AREA, GMA, REACT, HSSNR, RCTFS, NPSMACC, HSDGRACC,
 UNEMP, RCTREX, RCTRSPT, DDMPS, DDDHSDG, INCOME, BMA,
 TOTCON, HSGCON, PROFEN, AIDES, CAT13AM, PSTOTACC, NPSFACC, DRCAIV
 INPUT FORMAT: FIXED(F4.0, I4, 2F1.0, I5, A2.4F5.0, F4.0, F6.0, F5.0, 2F3.1,
 F3.3, 2F6.0, 2F5.0, 2F4.0, F3.1, F4.1, 4F4.0)

Appendix A-2

Male High School Graduate Mental Category I-III A
Army Accession Rates (October 1975 to July 1982)

[illegible]

7510	7511	7512	7513	7514	7515	7516	7517	7518	7519	7520	7521	7522	7523	7524	7525	7526	7527	7528	7529	7530	7531	7532	7533	7534	7535	7536	7537	7538	7539	7540	7541	7542	7543	7544	7545	7546	7547	7548	7549	7550	7551	7552	7553	7554	7555	7556	7557	7558	7559	7560	7561	7562	7563	7564	7565	7566	7567	7568	7569	7570	7571	7572	7573	7574	7575	7576	7577	7578	7579	7580	7581	7582	7583	7584	7585	7586	7587	7588	7589	7590	7591	7592	7593	7594	7595	7596	7597	7598	7599	7600	7601	7602	7603	7604	7605	7606	7607	7608	7609	7610	7611	7612	7613	7614	7615	7616	7617	7618	7619	7620	7621	7622	7623	7624	7625	7626	7627	7628	7629	7630	7631	7632	7633	7634	7635	7636	7637	7638	7639	7640	7641	7642	7643	7644	7645	7646	7647	7648	7649	7650	7651	7652	7653	7654	7655	7656	7657	7658	7659	7660	7661	7662	7663	7664	7665	7666	7667	7668	7669	7670	7671	7672	7673	7674	7675	7676	7677	7678	7679	7680	7681	7682	7683	7684	7685	7686	7687	7688	7689	7690	7691	7692	7693	7694	7695	7696	7697	7698	7699	7700	7701	7702	7703	7704	7705	7706	7707	7708	7709	7710	7711	7712	7713	7714	7715	7716	7717	7718	7719	7720	7721	7722	7723	7724	7725	7726	7727	7728	7729	7730	7731	7732	7733	7734	7735	7736	7737	7738	7739	7740	7741	7742	7743	7744	7745	7746	7747	7748	7749	7750	7751	7752	7753	7754	7755	7756	7757	7758	7759	7760	7761	7762	7763	7764	7765	7766	7767	7768	7769	7770	7771	7772	7773	7774	7775	7776	7777	7778	7779	7780	7781	7782	7783	7784	7785	7786	7787	7788	7789	7790	7791	7792	7793	7794	7795	7796	7797	7798	7799	7800	7801	7802	7803	7804	7805	7806	7807	7808	7809	7810	7811	7812	7813	7814	7815	7816	7817	7818	7819	7820	7821	7822	7823	7824	7825	7826	7827	7828	7829	7830	7831	7832	7833	7834	7835	7836	7837	7838	7839	7840	7841	7842	7843	7844	7845	7846	7847	7848	7849	7850	7851	7852	7853	7854	7855	7856	7857	7858	7859	7860	7861	7862	7863	7864	7865	7866	7867	7868	7869	7870	7871	7872	7873	7874	7875	7876	7877	7878	7879	7880	7881	7882	7883	7884	7885	7886	7887	7888	7889	7890	7891	7892	7893	7894	7895	7896	7897	7898	7899	7900	7901	7902	7903	7904	7905	7906	7907	7908	7909	7910	7911	7912	7913	7914	7915	7916	7917	7918	7919	7920	7921	7922	7923	7924	7925	7926	7927	7928	7929	7930	7931	7932	7933	7934	7935	7936	7937	7938	7939	7940	7941	7942	7943	7944	7945	7946	7947	7948	7949	7950	7951	7952	7953	7954	7955	7956	7957	7958	7959	7960	7961	7962	7963

Appendix A-3

Unemployment Rates (October 1975 to July 1982)

8229	7.6
8212	7.4
8211	7.5
8121	7.4
8102	7.5
8103	7.3
8124	7.3
8125	7.3
8126	7.3
8127	7.3
8128	7.2
8129	7.0
8110	7.6
8111	8.0
8112	8.3
8220	8.8
8221	8.5
8222	8.8
8223	8.8
8224	8.0
8225	5.4
8226	5.5
8207	5.5

[illegible]

Appendix A-4

Producer Price Index (October 1975 to July 1982)

[illegible]

Appendix A-5

Prime Rate (October 1975 to July 1982)

[illegible][illegible]

Appendix A-6

Listing of Time Series Program (TSP)

```

PROGRAM TSARS(INPUT,OUTPUT,TAPES=INPUT,TAPE6=OUTPUT,TAPE1)
COMMON AC(51)
COMMON LU
COMMON MAC
INTEGER MAC,MPAC
CHARACTER IWK(80),IWHAT
CHARACTER TITLE*20
REAL R(40,40),S(40,40),Z(368),ACV(50),PACV(50)
REAL WK(50)
CHARACTER A(-50:50)
CHARACTER B*1
REAL N
REAL CC
CC=0.0
IFLG=1
PRINT *,'HOW LONG IS THE TIME SERIES?'
READ(5,*) LZ
89 REMIND 1
LU=LZ
DO 1 I=1,LZ
  READ(1,*) Z(I)
1 CONTINUE
88 PRINT*, ' ENTER TITLE '
READ(5,102) TITLE
N=0.0
CC=0.0
102 FORMAT(A20)
PRINT *,'DO YOU WANT TO DIFFERENCE OR TRANSFORM (Y/N)?'
READ(5,100) IWHAT
100 FORMAT(1A1)
IF(IWHAT.EQ.'Y') THEN
  PRINT *,'WHAT IS THE ORDER OF THE NON-SEASONAL DIFFERENCE:ID1)=0 '
  READ(5,*) ID1
  PRINT *,'WHAT IS THE ORDER OF THE SEASONAL DIFFERENCING:ID2)=0 '
  READ(5,*) ID2
  PRINT*, 'TRANSFORMATION COEFF: IP=0 (LN),IP>0(Z(I)=Z(I)+IP)'
  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
MAC=LU/2
IF (MAC.GT.45) MAC=45
MPAC=LU/2
IF (MPAC.GT.45) MPAC=45
C
CALL FTAUTO(Z,LU,MAC,MPAC,7,AMEAN,VAR,ACV,AC,PACV,WK)

```

```

WRITE(6,102) TITLE
WRITE(7,103) TITLE
103 FORMAT(1H1,1X,A20)
PRINT*, ' MEAN = ',AMEAN, ' VARIANCE = ',VAR
PRINT*, ' '
WRITE(7,101) AMEAN,VAR
101 FORMAT(/, ' AMEAN =',F12.6, ' VARIANCE = ',F12.6,/)
PRINT*, 'DO YOU WANT TO SEE THE FTAUTO OUTPUT (Y/N)?'
READ(5,100) IWHAT
IF (IWHAT.EQ.'Y') THEN
PRINT*, ' LAG AUTOCOVARANCE AUTOCORRELATION PARTIAL AUTOCORRELATI
ION'
IF (NAC.GT.45) NAC=45
X1=2.0/(SQRT(REAL(LW)))
DO 2 I=1,NAC
IF (ABS(AC(I)).GT.ABS(CC)) CC=AC(I)
IF (ABS(AC(I)).GT.ABS(X1)) THEN
B='+'
ELSE
B='-'
ENDIF
PRINT 7,1,ACV(I),AC(I),B,PACV(I)
WRITE (7,7)1,ACV(I),AC(I),B,PACV(I)
2 CONTINUE
PRINT *, ' '
WRITE (*,500) 'THE APPROXIMATED 2 S.E. BAND IS +/-',X1
500 FORMAT (1X,A35,F10.4)
PRINT *, ' '
PRINT *, '+-DENOTES AUTOCORRELATION OUTSIDE 2 S.E. BAND'
PRINT *, ' CLEAR SCREEN, THEN INPUT ANY CHARACTER FOR AUTOCORRELATI
ION PLOT'
READ (*,2100) B
2100 FORMAT(A1)
PRINT *, ' '
PRINT *, ' '
PRINT *, TITLE
PRINT *, '
AUTOCORRELATION PLOT'
PRINT *, ' '
IF (X1.GT.ABS(CC)) CC=X1
N=ABS(CC)+1.1
X1=ABS(X1)+50/N
WRITE (*,501) 'LAG',ABS(CC)+(-1.1), '-----
|-----'
1-----',ABS(CC)+1.1
501 FORMAT (1X,A3,5X,F6.3,A101,F6.3)
DO 200 I=1,NAC
DO 201 J=-50,50
A(J)='+'
201 CONTINUE

```



```

      A(J)= ' '
209  CONTINUE
      CC=PACV(I)*50.0/M
      CC=CC+.5
      ICC=INT(CC)
      IF (ICC.LT.0.) THEN
        DO 610 J=-50,ICC-1
          A(J)= ' '
610  CONTINUE
        DO 611 J=1,50
          A(J)= ' '
611  CONTINUE
      ELSE
        IF (ICC.EQ.0.) THEN
          DO 612 J=-50,-1
            A(J)= ' '
612  CONTINUE
          DO 613 J=1,50
            A(J)= ' '
613  CONTINUE
        ELSE
          IF (ICC.GT.0.) THEN
            DO 614 J=-50,-1
              A(J)= ' '
614  CONTINUE
            DO 615 J=ICC+1,50
              A(J)= ' '
615  CONTINUE
          ENDIF
        ENDIF
      ENDIF
      A(-11-.5)= 'I'
      A(11+.5)= 'I'
      WRITE (*,2000) I,(A(J),J=-50,50)
200  CONTINUE
      PRINT *, ' '

      IF (IFLG.EQ.1) CALL BARTLT
      ENDIF
C    FOURIER DECOMPOSITION
      PRINT*, ' DO YOU WANT THE PERIODOGRAM? '
      READ(5,100) IMHAT
      IF (IMHAT.EQ.'Y') CALL PGRAM(Z,LH)
      PRINT*, ' '

C    DO R AND S
C
      DO 4 I=51,2,-1
        AC(I)=AC(I-1)
4    CONTINUE

```

```

AC(1)=1.0
NROW=40
MROW=32
IF (LM.LT.32) MROW=LM
NEG=15
IF (LM.LT.30) NEG=LM/2
KOL=10
44 CONTINUE
PRINT*, ' ENTER THE VALUE OF IRHO (0:HIGH FREQ,-1:LOW)? '
READ(5,*) IRHO
IRS=0
CALL RANDS(NXROW,MROW,NEG,KOL,IRHO,AC,R,S,INX,IRS)
PRINT*, ' DO YOU WANT ANOTHER 4 AND S ARRAY?'
READ(5,100) IWHAT
IF (IWHAT.EQ.'Y') GO TO 44
PRINT*, ' DO YOU WANT THE D STATISTIC? '
READ(5,100) IWHAT
5489 IF (IWHAT.EQ.'Y') THEN
    PRINT*, ' ENTER THE MAX AR ORDER '
    READ(5,*) IP
    PRINT*, ' ENTER THE MAX MA ORDER '
    READ(5,*) IQ
    PRINT*, ' DO YOU WANT TO SEE THE D STAT?'
    PRINT*, ' 0=YES, 1=NO=='
    READ(5,*) IPNT
    CALL DSTAT(NXROW,MROW,NEG,R,S,IP,IQ,IPNT)
ENDIF
PRINT*, ' DO YOU WANT ANOTHER D STATISTIC? '
READ(5,100) IWHAT
IF (IWHAT.EQ.'Y') COTO 5489
PRINT*, ' DO YOU WANT FTXL?'
READ(5,100) IWHAT
5490 IF (IWHAT.EQ.'Y') CALL OURNXL(Z,LM)
PRINT*, ' DO YOU WANT ANOTHER FTXL?'
READ(5,100) IWHAT
IF (IWHAT.EQ.'Y') COTO 5490
PRINT*, ' DO YOU WANT ANOTHER RUN?'
READ(5,100) IWHAT
IF (IWHAT.NE.'Y') STOP
PRINT*, ' WHICH DATA? 0=ORIGINAL, 1=CURRENT=='
READ(5,*) IANS
IF (IANS.EQ.0) COTO 89
IF (IANS.NE.0) COTO 88
STOP
END

```

```

SUBROUTINE BARTLT
REAL R(-10:60),VR(10),STD(10)
INTEGER V

```

```

COMMON AC(51)
COMMON LM
COMMON NAC
DO 1 I=-10,0
  R(I)=0.0
1 CONTINUE
DO 2 I=1,NAC
  R(I)=AC(I)
2 CONTINUE
DO 3 I=NAC+1,60
  R(I)=0.0
3 CONTINUE
C REMEMBER R(0)=1
R(0)=1.0
C
C BY BARTLETT'S APPROXIMATION, EQU 2.1.11
DO 5 K=1,10
  X=0.0
  DO 6 V=0,NAC
    X=X+R(V)+2+R(V+K)+R(V-K)-4+R(K)+R(V)+R(V-K)+2+R(V)+2+R(K)+
1+2
6 CONTINUE
  VR(K)=X/FLOAT(LM)
  STD(K)=SORT(VR(K))
5 CONTINUE
PRINT*, ' '
PRINT*, ' '
PRINT*, ' FIRST LINE VAR(R(K)), SECOND LINE STD(R(K)) '
PRINT*, ' '
PRINT*, '      1      2      3      '
1' 4      5      6      '
2' 7      8      9      10'
PRINT 23,(VR(K),K=1,10)
PRINT 23,(STD(K),K=1,10)
23 FORMAT(1X,10(F12.6))
RETURN
END
SUBROUTINE RANDS(NXROW,NROW,NEC,KOL,IRHO,C,R,S,IWK,IRS)
DIMENSION R(NXROW,1),S(NXROW,1),C(1),IWK(1)
CHARACTER IWKAT
DATA 10LK/1H /,1STR/1H*,1ZRD/0/
KOLN1=KOL-1
DO 5 IC=1,KOL
DO 5 IR=1,NROW
  R(IR,IC)=0.0
5 S(IR,IC)=0.0
NM=NROW-NEC
DO 10 I=1,NM
  NECI=NEC+I
  S(NECI,1)=1.0

```

```

10 R(NEC1,1)=C(1)
   DO 20 I=1,NEC
     NEC1=NEC+2-I
     S(I,1)=1.0
20 R(I,1)=C(NEC1)
   IF (IRHO .EQ. 0) COT040
   DO 30 I=1,NROW
     NEC1=I-NEC-1
30 R(I,1)=R(I,1)+(-1)**(NEC1)
40 J1=NROW
   DO 70 IC=2,KOL
     ICH1=IC-1
     J1=J1-1
     DO 60 IR=1,J1
       IRP1=IR+1
       IF (ABS(R(IR,ICH1)) .EQ. 0.0) COT050
       S(IR,IC)=S(IRP1,ICH1)+(R(IRP1,ICH1)/R(IR,ICH1)-1.0)
       COT060
50 S(IR,IC)=-S(IRP1,ICH1)
60 CONTINUE
   J1=J1-1
   DO 70 IR=1,J1
     IRP1=IR+1
70 R(IR,IC)=R(IRP1,ICH1)+(S(IRP1,IC)/S(IR,IC)-1.0)
   IF (IRS.NE.0) RETURN
75 FORMAT(A1)
   PRINT*, ' THE 4 AND S ARRAYS HAVE BEEN CRUNCHED.'
   PRINT*, ' DO YOU ACTUALLY WANT TO SEE THEM?'
   READ(5,75) IWHAT
   IF (IWHAT.NE.'Y') RETURN
   IF (IRHO .EQ. 0) COT080
   WRITE(6,200)
   WRITE(7,200)
   COT090
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,NROW
     IRN=IR-NEC-1
     DO 100 IC=1,KOL
       INK(IC)=IDLK
100 IF (IR.EQ.NEC+2-IC) INK(IC)=ISTR
       WRITE(6,230) IRN,(R(IR,K),INK(K),K=1,KOL)
       WRITE(7,230) IRN,(R(IR,K),INK(K),K=1,KOL)
110 CONTINUE
   PRINT*, ' TYPE ANY CHARACTER TO CONTINUE==>'
   READ(5,75) IWHAT
   WRITE(6,240) IZRO,(IC,IC=1,KOLM1)
   WRITE(7,240) IZRO,(IC,IC=1,KOLM1)

```



```

DO 130 IR=1,NROW
  IRN=IR-NEC-1
  DO 120 IC=1,KOL
    INK(IC)=IBLK
    IF (IR.EQ.NEC+2-IC) INK(IC)=ISTR
120 IF (IR.EQ.NEC+3-IC) INK(IC)=ISTR
    WRITE(6,230) IRN,(S(IR,K),INK(K),K=1,KOL)
    WRITE(7,230) IRN,(S(IR,K),INK(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,7HR-ARRAY//3H K,11(9X,I2))
230 FORMAT(2H (,I3,IH),11(1X,F9.4,A1))
240 FORMAT(//30X,7HS-ARRAY//3H K,11(9X,I2))
END
SUBROUTINE DSTAT(NXROW,NROW,NEC,R,S,IP,IQ,IPNT)
C
C .....
C
C DESCRIPTION OF PARAMETERS
C NXROW - ROW DIMENSION OF R AND S ARRAYS IN CALLING PROGRAM
C (INPUT)
C NROW - NUMBER OF ROWS TO WHICH R AND S WERE CALCULATED.(INPUT)
C NEC - NUMBER OF ROWS OF NEGATIVE LAG IN R AND S ARRAYS(INPUT)
C R - R ARRAY. DIMENSIONED NXROW 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.
C (INPUT)
C IP - (INPUT)MAXIMUM ORDER OF AUTOREGRESSION PERMITTED.
C (OUTPUT) ORDER OF AUTOREGRESSION SELECTED.
C IQ - (INPUT)MAXIMUM ORDER OF MOVING AVERAGE PERMITTED.
C (OUTPUT) ORDER OF AUTOREGRESSION SELECTED.
C IPNT - PRINT CONTROL PARAMETER (INPUT)
C IPNT = 0 D STAT VALUES ARE PRINTED
C IPNT NE 0 PRINTING IS SUPPRESSED.
C WITH IPNT = 0 THE WRITE STATEMENTS REQUIRE THE INPUT VALUE
C OF IQ TO BE LESS THAN TEN.
C
C
C NOTE
C NEC MUST BE GREATER THAN OR EQUAL TO IP+IQ+3, FOR IP AND
C IQ THEIR INPUT VALUES. FURTHERMORE NROW MUST BE GREATER THAN
C OR EQUAL TO NEC+IP+IQ+4, FOR IP AND IQ EQUAL TO THEIR INPUT
C VALUES. IF (IP+1)*(IQ+1) IS GREATER THAN 50(WHERE IP AND IQ ARE
C AT THEIR INPUT VALUES) THEN THE DIMENSION OF STAT MUST BE CHANGED
C ACCORDINGLY.
C
C .....

```

```

C
  DIMENSION R(MIROW,1),S(MIROW,1),STAT(50)
  DATA IPR/6/,IZRO/0/
  JPP=IP+1
  JQQ=IQ+1
  IQP=JPP+JQQ
  DO 40 I=1,JPP
  JP=I-1
  DO 40 J=1,JQQ
  JQ=J-1
  JK=JQQ*(I-1)+J
  ISUB2=NEG-JP+JQ+2
  ISUB1=ISUB2-1
  IP1=IP+1
  IN1=I-1
  BOT=(S(ISUB2,I)+S(ISUB1,IP1))*2
  IF(I,CT,1) GO TO 20
  DO 10 JI=1,3
  NECH=NEG-JP-JQ-JI+1
  NECP=NEG-JP+JQ+JI+1
10  BOT=BOT+R(NECH,I)*2+R(NECP,I)*2
  GO TO 35
20  ISUB3=ISUB2+1
  BOT=BOT/(S(ISUB3,IN1)+S(ISUB2,I))*2
  DO 30 JI=1,3
  NECH=NEG-JP-JQ-JI+1
  NECP=NEG-JP+JQ+JI+1
  NECH1=NECH+1
  NECP1=NECP+1
30  BOT=BOT+(R(NECH,I)/R(NECH1,IN1))*2+(R(NECP,I)/R(NECP1,IN1))*2
35  NEG0=NEG-JP-JQ
  NEG1=NEG0+1
  ARC=S(NEG0,IP1)/(BOT+S(NEG1,I))
40  STAT(JK)=ABS(ARC)
  INX=1
  XMX=STAT(1)
  DO 50 I=1,IQP
  IF(STAT(I).LT.XMX) GO TO 50
  INX=I
  XMX=STAT(I)
50  CONTINUE
  IP=(INX-1)/JQQ
  IQ=INX-(IP+JQQ)-1
  IF(IPNT.NE.0) RETURN
  WRITE(IPR,100)
  WRITE(7,100)
  JQQ=JQQ-1
  WRITE(7,110) IZRO,(I,I=1,JQQ)
  WRITE(IPR,110) IZRO,(I,I=1,JQQ)
  DO 40 J=1,JPP

```

```

JMI=J-1
IST=JMI*(JQ+1)+1
IEND=IST+JQ
WRITE(7,120) JMI,(STAT(I),I=IST,IEND)
60 WRITE(IPR,120) JMI,(STAT(I),I=IST,IEND)
WRITE(7,130) IP,IQ
WRITE(IPR,130) IP,IQ
RETURN
100 FORMAT(///50X,'D STATISTIC'//29X,'ORDER OF MA')
110 FORMAT(' ORDER OF AR ',10(4X,I3,4X))
120 FORMAT(/4X,I2,6X,10(1X,E10.4))
130 FORMAT('/' ORDER OF AUTOREGRESSION SELECTED ',I4/
C' ORDER OF MOVING AVERAGE SELECTED ',I4)
END

```

```

SUBROUTINE PCRAM(Z,LW)
DIMENSION Z(368)
REAL INTNCTY
SINT=0.0
PI=3.141592654
PRINT*, ' LW= ',LW
PRINT*, ' HOW MANY INTENSITY VALUES DO YOU WANT TO SEE?'
PRINT*, ' 0 = DEFAULT OF 45; N .LT. LW/2 ==)'
READ(5,*) N
IF (N.EQ.0) N=45
IF (N.GT.LW-1) N=45
WRITE(6,70)
WRITE(7,70)
DO 20 I=1,N
  A=0.
  B=0.
  DO 10 IT=1,LW
    XARC=2.0*PI*FLOAT(IT)*FLOAT(IT)/FLOAT(LW)
    A=A + Z(IT)*COS(XARC)
    B=B + Z(IT)*SIN(XARC)
10  CONTINUE
  A=2.*A/FLOAT(LW)
  B=2.*B/FLOAT(LW)
  INTNCTY=(FLOAT(LW)/2.)*(A*A + B*B)
  FQ=1.0*I/LW
  P=1.0/FQ
  WRITE(6,77) I,FQ,P,INTNCTY
  WRITE(7,77) I,FQ,P,INTNCTY
  SINT=SINT+INTNCTY
20 CONTINUE
77 FORMAT(1X,I3,2X,F5.3,2X,F7.3,2X,F10.3)
70 FORMAT(2X,'I',5X,'FQ',6X,'P',15X,'INTNCTY')
PRINT*, '
WRITE (6,2631) SINT/N
WRITE (7,2631) SINT/N

```

```

2631 FORMAT(1X,'AVERAGE INTENSITY=',F20.10)
      RETURN
      END

      SUBROUTINE OURNXL(Z,LW)
      DIMENSION Z(368)
      INTEGER IND(8),IER
      REAL ARPS(6),PNAS(6),CR(24),AA(740)
      CHARACTER IWHAT
      IND(1)=LW
      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 W/O CHANGE TO DIGITS==>'
      READ(5,*) II
      IND(8)=II
      PRINT*, ' DO YOU WANT TO INPUT ESTIMATIONS FOR THE COEFFICIENTS?'
      READ(5,100) IWHAT
      IF(IWHAT.EQ.'Y') THEN
        IND(7)=1
        IF(IP.EQ.0) GO TO 152
        PRINT*, ' INPUT AR ESTIMATES INDIVIDUALLY'
        DO 151 I=1,IP
          PRINT*, ' ?'
          READ(5,*) ARPS(I)
151      CONTINUE
152      IF(IQ.EQ.0) GO TO 154
        PRINT*, ' INPUT MA ESTIMATES INDIVIDUALLY'
        DO 153 I=1,IQ
          PRINT*, ' ?'
          READ(5,*) PNAS(I)
153      CONTINUE
154      ENDIF
100  FORMAT(1A1)
      CALL FTHXL(Z,IND,ARPS,PNAS,PNAC,UNV,CR,AA,IER)
1001 FORMAT(/,' IND(5)= ',I3,' IER= ',I3,/,
.      ' UNV= ',F8.2,' PNAC= ',F12.6)

```

```

1002 FORMAT(/,' ARPS VALUES')
1003 FORMAT(/,' PHAS VALUES')
      WRITE(6,1001) IND(5),IER,UNV,PHAC
      WRITE(7,1001) IND(5),IER,UNV,PHAC
      WRITE(6,1002)
      WRITE(7,1002)
      DO 20 I=1,IP
        WRITE(6,*) ARPS(I)
        WRITE(7,*) ARPS(I)
20    CONTINUE
      WRITE(6,1003)
      WRITE(7,1003)
      DO 40 I=1,IQ
        WRITE(6,*) PHAS(I)
        WRITE(7,*) PHAS(I)
40    CONTINUE
      RETURN
      END

```

Appendix A-7

Military Entrance Processing Station Codes

Status Code

- A = Enlisted into military service.
- B = Enlisted into military service and shipped to Basic Training location or duty station.
- C = Shipped to Basic Training location or duty station.
- D = Qualified but not yet enlisted into military service.

Entry Status

- 0 = Enlistment without delayed entry status. That is, Enlistment or induction into the active force without delay status, or reservist or National Guard (not delayed enlistment program enlistee) ordered to active duty or enlisted for active duty or reserve enlistment.
- 1 = Enlistment from delay program. That is, enlistment in active force from an authorized delay program to include returning delayed reservists.
- 2 = Reservist ordered from delay program. That is, reservists ordered to active duty from a delay status.
- 3 = Enlistment into delay program. That is, Enlistment into an authorized delay program, such as delayed enlistment programs.

Appendix B-1

USAREC Model

..... MULTIPLE REGRESSION
 DEPENDENT VARIABLE... CAT144
 VARIABLE(S) ENTERED ON STEP NUMBER 17.. ADICUST
 MULTIPLE R .30546 ANALYSIS OF VARIANCE OF SUM OF SQUARES MEAN SQUARE F SIGNIFICANCE
 R SQUARE .24493 REGRESSION 11. 1881531.85420 152880.45947 68.37130 .00
 ADJUSTED R SQUARE .23807 RESIDUAL 252. 583428.33568 2235.82793
 STD DEVIATION 47.28354 COEFF OF VARIABILITY 25.0 FCI

----- VARIABLES IN THE EQUATION -----					----- VARIABLES NOT IN THE EQUATION -----				
VARIABLE	B	STD ERROR B	F	BETA ELASTICITY	VARIABLE	PARTIAL TOLERANCE	F	SIGNIFICANCE	
REACT	-.1094626E-01	.22302516E-02	21.30554 .000	-.2244588 -.15797	MSNR	.01724	.14094	.7459162E-0	.785
ECTPS	3.5475159	.28582695	154.04314 .000	.6404053 .603273	UNEMP	-.05318	.41525	.82222730	.348
PROTEN	-8.4181485	1.2765973	47.71320 .000	-.313238 -.27532	ACTRES	-.00236	.77071	.1068336E-0	.774
INCOME	-.11255333E-01	.1670429E-02	45.55352 .000	-.269319 -.05421	DOGRUR	-.00653	.67299	.1052302E-0	.220
QVVR	-.6.119508	10.351446	53.67278 .000	-.367946 -.19797	AREA	.01118	.31815	.3391631E-0	.860
QVWR	-.49.216753	8.9447255	30.27832 .000	-.2339748 -.05910	GRA	-.02293	.13335	.13237257	.717
QVWR	-.51.272391	9.6075096	28.460016 .000	-.2476233 -.07357					
URCUDV	-.15573477	.44471096E-01	12.26320 .001	-.1443251 -.13774					
ALVES	.22.43426	.28454442	8.5174557 .024	.6639502 .38350					
GRA	.78640129E-01	.17797551E-01	19.62262 .020	.1921729 .15115					
ADICUST	.25.177451	.69753136E-01	7.9424034 .025	.1400526 .12091					
(CONSTANT)	294.00253	37.627332	61.051658 .000						

FINAL MODEL SE REGION USAREC MODEL

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

DEPENDENT VARIABLE: CAT3AN
 VARIABLES ENTERED ON STEP NUMBER 10... ACTAS

MULTIPLE R		ANALYSIS OF VARIANCE		DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.8103	REGRESSION	10.	132397.1243	13239.71243		49.24115	.00
ADJUSTED R SQUARE	.82862	RESIDUAL	275.	735024.02610	2687.36099			
STD DEVIATION	51.83375	COEFF OF VARIABILITY	21.4 PCT					

VARIABLES IN THE EQUATION				VARIABLES NOT IN THE EQUATION			
VARIABLE	B	STD ERROR B	F	VARIABLE	PARTIAL TOLERANCE	F	SIGNIFICANCE
WUWGR	.7953120	.15028579	28.28134	WUWGR	.01913	.28744	.5927332
GT1KA	-148.44820	10.835168	187.79114	ACTEX	.01232	.81231	.4157749E-0
Q2UAP	-108.29175	10.380135	108.55621	BWA	-.01739	.53297	.0868107E-0
Q3UAR	-73.864324	9.7881595	57.219556	FRGEM	.02212	.68753	.1347297
INCUM	-.3122305E-01	.33187500E-02	87.950368	AIGES	.01193	.52810	.3903375E-0
UNEAP	18.913205	3.1681873	76.091595	APEN	-.07550	.73505	1.6173671
ANV1ST	.21122514	.64291057E-01	10.797539	QRA	-.02135	.21391	.12712013
SEACT	.04222357E-02	.36073001E-02	3.2362870				.722
BRCAUV	-.53353555E-01	.40427360E-01	4.9959939				
AL113	.40440054	.26815492	3.0643874				
CONSTANT	432.44314	36.291412	141.98736				

0

FINAL MODEL TO REGRESS USAREG MODEL

..... MULTIPLE REGRESSION
 UNDEPENDENT VARIABLE... CALIOM
 VARIABLE(S) ENTERED ON STEP NUMBER 12.. AIDS
 MULTIPLE R .8300
 R SQUARE .70024
 ADJUSTED R SQUARE .68286
 STD DEVIATION 34.10281
 ANALYSIS OF VARIANCE
 REGRESSION 12. 562365.37927
 RESIDUAL 207. 240741.35300
 COEFF OF VARIABILITY 21.4 PCT
 MEAN SQUARE 4683.78161
 F 40.23553
 SIGNIFICANCE .00

VARIABLES IN THE EQUATION				VARIABLES NOT IN THE EQUATION			
VARIABLE	B	STD ERROR B	F	VARIABLE	PARTIAL TOLERANCE	F	SIGNIFICANCE
RCIRS	2.3401023	.34474314	42.222795	JNEP	-.05049	.55390	.52636879
INCONE	-.1034453E-01	.17019487E-02	86.206641	PROFEM	.03547	.24358	.5947778
Q1VAR	-.74.244125	7.7821367	91.017829	DORDER	-.02046	.35825	.6636568E-0
QRA	-.33424306E-01	.15643286E-01	4.5634552	QACR00	.02654	.69172	.14521748
AREA	.19765530E-01	.46026183E-02	16.479858	QRA	-.02408	.23246	.11351473
Q2VAR	-.34.911437	7.3452891	22.460847				.750
ADJUST	.23957546	.73142396E-01	10.722413				
Q3VAR	-.13.718775	7.2074658	3.5614407				
RCIREX	.51557512	.26563340	3.9697330				
MSERR	.21663905	.10541336	4.1990310				
REACT	-.39411318E-02	.24810354E-02	2.5533412				
AIDS	-.23721218	.17522593	2.1546802				
CONSTANT	132.58913	39.824761	12.285574				
			.001				

FINAL MODEL BY REVISION 04/05/80

..... MULTIPLE REGRESSION
 INDEPENDENT VARIABLE... CATISAN
 VARIABLE(S) ENTERED ON STEP NUMBER 11.. AREA
 MULTIPLE R .87477 ANALYSIS OF VARIANCE DF SUM OF SQUARES F SIGNIFICANC
 R SQUARE .76522 REGRESSION 11. 1425812.28753 129619.29887 55.11094
 ADJUSTED R SQUARE .75133 RESIDUAL 186. 437466.46500 2351.97024
 STD DEVIATION 48.49712 COEFF OF VARIABILITY 22.8 PCT

VARIABLES IN THE EQUATION				VARIABLES NOT IN THE EQUATION			
VARIABLE	B	STD ERROR B	F	VARIABLE	PARTIAL TOLERANCE	F	SIGNIFICANCE
PCIRS	3.3608338	.40216561	70.665915	HSSMR	.07164	.19446	.95442034
INCOME	-.27658120E-01	.24955793E-02	122.62957	REACT	-.00173	.47617	.55152705E-0
QVAR	-.11353475	11.018321	103.69466	RCRREA	.06257	.66373	.73497039
UNEMP	14.944775	2.6297826	32.517475	QAN	-.00678	.32360	.63160695E-0
BKCADV	.84625633E-01	.23225559E-01	13.276129	PROFEM	-.04753	.61146	.47533186
GSVAR	-.57553817	10.461350	30.243318	AISES	.01341	.47176	.62725934E-0
QVAR	-.65.937183	10.605190	38.656618				.803
ADVOCST	.43252014	.83197698E-01	27.027255				
QAN	-.96757880E-01	.23468509E-01	16.969216				
QDPCR	-.35557554	.13114364	3.7975429				
AREA	.29592276E-02	.17596865E-02	2.6752754				
(CONSTANT)	336.92213	37.742264	79.629901				
			0				

FINAL MODEL TEST REGION USAREC MODEL

***** MULTIPLE REGRESSION *****									
DEPENDENT VARIABLE... CAT13AN									
VARIABLE(S) ENTERED ON STEP NUMBER 19... AIDES									
MULTIPLE R	.87383	ANALYSIS OF VARIANCE		DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE	
R SQUARE	.76358	REGRESSION		13.	1689416.2257	145339.74920	67.07964	.00	
ADJUSTED R SQUARE	.75220	RESIDUAL		270.	585002.12391	2166.67453			
STD DEVIATION	46.54755	COEFF OF VARIABILITY		22.2 PCT					
----- VARIABLES IN THE EQUATION -----									
VARIABLE	B	STD ERROR B	F	BETA	ELASTICITY	VARIABLE	PARTIAL TOLERANCE	F	SIGNIFICANCE
INCOME	-.22370814E-01	.25056564E-02	94.356441	-.4379290		MSAR	-.02803	.22901	.22065802
ACTRS	3.2026993	.29600928	117.06281	-1.41491		REACT	-.02932	.30738	.11112793
UNEMP	12.327221	2.5730503	22.960793	1.21958		PROPEN	.00841	.13462	.15048210E-0
Q3VAN	-121.34055	8.5313441	202.29122	.41761		ORCAUV	.07723	.59319	1.0139124
Q1VAR	-125.65040	9.1756806	187.37898	-.13249					.205
Q2VAR	-110.77634	8.5943764	166.13561	-.16242					
Q0RCR	-.8220434	.14021708	34.370722	-.5275720					
Q0UCOST	.13128780	.70557314E-01	3.452395	-.14319					
BNA	-.84334325E-01	.18572637E-01	20.018710	-.4071150					
QNA	.55215244E-01	.19638343E-01	7.7053566	.0785929					
ACTPEX	1.3254629	.44729672	8.7033796	.07300					
AREX	-.57760330E-01	.3.455316E-01	.003	-.2129259					
AIDES	.38742306	.26256712	2.1771595	-.19291					
(CONSTANT)	224.27350	56.609133	15.585501	-.76352					
			.141	.23065					
			.000	.47206					
			.070	-.04046					
			.141	.0501017					
			.000	.04363					

FINAL MODEL NE REGION PEARED MODEL

Appendix B-2

Improved USAREC Model

..... MULTIPLE REGRESSION
 DEPENDENT VARIABLE... L13AR
 VARIABLE(S) ENTERED ON STEP NUMBER 13.. LPROPER
 MULTIPLE R .87908 ANALYSIS OF VARIANCE DF SUM OF SQUARES MEAN SQUARE F SIGNIFICANCE
 R SQUARE .77279 REGRESSION 13. 41.76285 3.21253 70.63898 .00
 ADJUSTED R SQUARE .76185 RESIDUAL 270. 12.27909 .04548
 STD DEVIATION .21326 COEFF OF VARIABILITY 4.1 PDI

VARIABLES IN THE EQUATION				VARIABLES NOT IN THE EQUATION			
VARIABLE	B	STD ERROR B	F	VARIABLE	PARTIAL TOLERANCE	F	SIGNIFICANCE
L13AR	-1.6030799	.11736937	186.55236	LHSSAR	.00037	.22361	.36504108E-0
LRCIRS	1.1517242	.10407546	122.46172	LBRA	-.04005	.21407	.43209897
LREACT	-.74521345E-01	.42002845E-01	3.1477786	LAIDES	.03580	.57243	.34525626
LUMENP	.40823456	.80348819E-01	25.814248	LGHA	.07939	.15172	1.7063006
LBRCADV	.67332976E-01	.31833361E-01	3.7121293				.193
Q3VAR	-.52987158	.45348278E-01	136.52735				
Q1VAR	-.54866416	.50132613E-01	117.69017				
Q2VAR	-.46843495	.45146953E-01	107.65686				
LRCIREX	.40506391	.14828823	7.4616301				
LAREA	.11003162	.32685972E-01	11.332148				
LBORCR	-.30811928	.85589906E-01	12.959632				
LABUCOST	.11133927	.34239866E-01	10.573837				
LPROPER	-.35836174	.14787327	5.8730527				
(CONSTANT)	14.922809	1.4415355	107.16438				
			0				

FINAL MODEL RE REG:CM MODEL 4

VARIABLES IN THE EQUATION				VARIABLES NOT IN THE EQUATION			
VARIABLE	B	STD ERROR B	F SIGNIFICANCE	BETA ELASTICITY	PARTIAL TOLERANCE	F SIGNIFICANCE	
REACT	-.6896913E-02	.2170257E-02	10.018403	-.1502338			
ACTRS	4.5397922	.46144378	96.790862	-.10575	.00150	.68528	
QMA	.10824980	.38507720E-01	7.9824022	.8195332	.05419	.21485	
PROPEN	-.6.0484711	1.1160614	29.370748	1.34719	-.01712	.10475	
INCORE	-.18562413E-01	.26931643E-02	47.505422	.2568355			
DENSITY	-.04094063	.06711393E-01	44.844412	.43183			
Q1UAR	-.79.650973	10.155351	61.528953	-.2249849			
Q2UAR	-.50.150480	8.5467440	34.436934	-.54988			
Q3UAR	-.57.855483	9.2004207	29.543370	-.4615815			
AREA	-.32002557	.66117867E-01	23.427809	-1.08493			
ADUCOST	.28643062	.07696728E-01	9.3452312	-.644543			
MSMR	.4036389	.16315730	6.1118673	-.56512			
BRACDU	-.10219096	.43034714E-01	5.4101564	-.3847225			
UREMP	5.0189816	1.8389166	7.4491576	-.11478			
ATRES	.75660075	.28240693	7.1271452	-.2279080			
(CONSTANT)	288.62084	51.060280	31.213326	-.06022			
				-.2794185			
				-.08336			
				-.4534320			
				-.51930			
				.1655747			
				.13690			
				.2019253			
				.46646			
				-.0947041			
				-.09030			
				.1658502			
				.18944			
				.0938334			
				.07708			

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..... MULTIPLE REGRESSION
 DEPENDENT VARIABLE.. L13AN
 VARIABLE(S) ENTERED ON STEP NUMBER 10.. LPROPEM

MULTIPLE R	.85143	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.72520	REGRESSION	10.	28.99952	2.89995	55.17676	.00
ADJUSTED R SQUARE	.71213	RESIDUAL	209.	10.98451	.05236		
STD DEVIATION	.22925	COEFF OF VARIABILITY	4.6 PCT				

VARIABLES IN THE EQUATION				VARIABLES NOT IN THE EQUATION			
VARIABLE	B	STD ERROR B	F SIGNIFICANCE	VARIABLE	PARTIAL TOLERANCE	F SIGNIFICANCE	
LACTAS	1.1105429	.14182359	61.315993	LREACT	-.07838	.37214	1.2858013
LINCONE	-1.4559199	.13530718	115.43841	LUNENP	-.00789	.66728	.12944385E-0
WIVAR	-.33584799	.50388784E-01	113.09616	LBOORCR	.02973	.34139	.18401856
LONA	-.17958338	.26303970E-01	46.611136	LAIDES	-.07615	.66674	.12131243
BZVAR	-.24004113	.48346419E-01	24.651463	LARCADU	-.03958	.68362	.74102176
LADUCOST	.14012615	.41931274E-01	11.167663	LONA	-.05942	.25325	.73622384
Q3UAR	-.12744800	.47682568E-01	7.1440877	LAREA	.09662	.34502	1.7299978
LACTREX	.34265808	.13655454	6.2966519				.190
LWSSNR	.57148051	.21128449	7.3158979				
LPROPEM	.24967558	.11951308	4.3643674				
(CONSTANT)	9.3707748	1.8213880	26.449520				

FINAL MODEL SU REGIM MODEL 4

..... MULTIPLE REGRESSION
 DEPENDENT VARIABLE.. L3AM

VARIABLE(S) ENTERED ON STEP NUMBER 8.. LREACT

MULTIPLE R		.00049		ANALYSIS OF VARIANCE		DF		SUM OF SQUARES		MEAN SQUARE		F		SIGNIFICANCE	
R SQUARE		.44110		REGRESSION		8.		24.24177		3.03022		61.04940		.00	
ADJUSTED R SQUARE		.43073		RESIDUAL		277.		13.57121		.04899					
STD DEVIATION		.22134		COEFF OF VARIABILITY		4.1 PCT									

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

VARIABLE	B	STD ERROR B	F	BETA	ELASTICITY	VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
LPOBCLR	.50979458	.00787311E-01	40.360161	.372776	.46442	LPOBCLR	.00770	.32753	1.6351724E-0	.898
Q1VAR	-.46071211	.40586003E-01	184.92780	-.8092584	-.03320	LRCITEX	-.03697	.73998	.37774026	.539
Q2VAR	-.43842833	.45485653E-01	92.906981	-.536998	-.02203	LBMA	.08105	.61613	1.8250458	.178
Q3VAR	-.30474335	.43511717E-01	49.051921	-.3512235	-.01276	LPROPEM	.03998	.74488	.44176252	.507
LINCONE	-1.7221304	.18495915	86.672285	-.6879902	-3.01203	LAIDES	-.01449	.52535	.57996332E-0	.810
LUNEP	.53053049	.60919475E-01	75.841739	.5545380	.17877	LORCADV	-.06310	.76810	1.1032410	.294
LADVLOST	.10153861	.33201447E-01	9.3539463	.1511931	.08971	LBMA	-.02117	.32552	.12378545	.725
LREACT	.11922444	.41726369E-01	8.1641196	.1819169	.16773	LRCITRS	.06384	.28977	1.1296253	.289
(CONSTANT)	17.257143	1.5931863	117.32880			LAREA	-.00578	.75477	.92349145E-0	.924

FINAL MODEL NW REGION MODEL 4

..... MULTIPLE REGRESSION
 DEPENDENT VARIABLE.. LIJAN

VARIABLE(S) ENTERED ON STEP NUMBER 13.. LCRTEX

MULTIPLE R	.90672	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.82214	REGRESSION	11.	57.81467	5.25588	78.15806	.00
ADJUSTED R SQUARE	.81162	RESIDUAL	184.	12.50790	.06725		
STD DEVIATION	.25932	COEFF OF VARIABILITY	5.0 PCT				

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

VARIABLE	B	STD ERROR B	F	BETA	ELASTICITY	VARIABLE	PARTIAL	TOLERANCE	F	SIGNIFICANCE
B1VAR	-.6212834	.60638859E-01	104.97463	-.4642921	-.03245	LHSSNR	-.07796	.05517	1.1313210	.289
LINCUNE	-1.7655211	.19524888	82.043351	-.4152715	-.321653	LREACT	-.00317	.31867	.18551085E-0	.966
LACTRS	.89271132	.16683189	28.632808	.6641834	.72846	LPROPEH	-.06730	.70228	.84182899	.360
LUMERP	.41810569	.97351799E-01	18.445253	.1484947	.15294	LBOORCR	.01271	.07597	.58038517E-0	.810
LADVCOST	.30963068	.51564207E-01	36.057140	.3766475	.26746	LAIBES	.01610	.39414	.47993997E-0	.825
B2VAR	-.38263242	.58157970E-01	43.285761	-.2859433	-.01999	LORCADV	.05269	.65248	.51512061	.474
B3VAR	-.34210332	.57327505E-01	39.896880	-.2546270	-.01576					
LAREA	.57695635E-01	.18074753E-01	10.189225	.1351781	.07227					
LONA	.01391242E-01	.40120511E-01	4.1154984	.1499075	.06281					
LONA	-.24162680	.11385148	4.5041499	-.2225757	-.31193					
LCRTEX	.25631469	.15889945	2.6019494	-.0612400	.21016					
(CONSTANT)	16.198915	2.0153640	64.904607	.000						

FINAL MODEL BEST REGION MODEL 4

Appendix B-3

Enhanced USAREC Model SPSS Program

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Appendix C-1

Codes Used in Multivariate Analyses Tables

<u>Abbreviation</u>	<u>Multivariate Analysis Variables</u>
Acces	DODNP & DODHS (See definitions below)
AFQT	Armed Forces Qualification Test Score
Age	Age of applicant
AirF	Air Force applicant
Army	Army applicant
ArmyR	Army Recruiters as percent of DOD by DRC
Black	Black applicant
BMA	Black Military Available
Coldg	Associates Degree or higher
DODHS	DOD High School Diploma Male Accessions
DODNP	DOD Non-Prior Service Male Accessions
Hispa	Hispanic applicant
HSDip	High School Diploma, less than College Degree
HSS	High School Senior
Incom	Median Disposable Family Income
Marin	Marine applicant
Marri	Married applicant
Month	Month of earliest transaction on applicant
Navy	Navy applicant
NoDip	No High School Diploma
Prior	Prior Service applicant
QMA	Qualified Military Available
Sex	Male, Female applicant
Unemp	DRC Overall Unemployment
White	White applicant
#MHSS	Number of Male High School Seniors

District Recruiting Commands (DRC's)

<u>NERRC</u>	<u>SERRC</u>	<u>SWRRC</u>
1A Albany	3A Atlanta	4A Albuquerque
1B Baltimore	3B Beckley	4C Dallas
1C Boston	3C Charlotte	4D Denver
1D Concord	3D Columbia	4E Houston
1E Harrisburg	3E Jacksonville	4F Jackson
1F Ft Monmouth	3F Louisville	4G Kansas City
1G New Haven	3G Miami	4H Little Rock
1H Newburgh	3H Montgomery	4I New Orleans
1I Long Island	3I Nashville	4J Oklahoma City
1J Niagara Falls	3J Raleigh	4K San Antonio
1K Philadelphia	3K Richmond	
1L Pittsburgh	3L San Juan	
1N Syracuse		

<u>NWRRC</u>	<u>WRRC</u>
5A Chicago	6A Salt Lake City
5B Cincinnati	6E San Francisco
5C Cleveland	6F Honolulu
5D Columbus	6G Los Angeles
5E Des Moines	6H Phoenix
5F Detroit	6I Portland
5H Indianapolis	6J Sacramento
5I Lansing	6K Santa Ana
5J Milwaukee	6L Seattle
5K Minneapolis	
5L Omaha	
5M Peoria	
5N St Louis	

General Codes Used in Multivariate Analysis

Component Codes

REG = Regular Forces

RSV = Reserve Forces

Collective Codes

NAT = National level, all Regions, all Components

all = all Regions, one Component

PS,F = Prior Service and Female records included
in analysis

Regional Codes

1 = NE = Northeast Region Recruiting Command (NERRC)

3 = SE = Southeast Region Recruiting Command (SERRC)

4 = SW = Southwest Region Recruiting Command (SWRRC)

5 = MW = Midwest Region Recruiting Command (MWRRC)

6 = WEST = Western Region Recruiting Command (WRRRC)

Factor Analysis Table Codes

X = the DRC (or Region) row is associated with the factor column, i.e., the DRC or Region in the given "X" row possesses the particular factor in the column above the "X".

++,+,-, or -- = a given variable in the signed row is associated with the factor in the signed column.

++ = 50 to 99 percent of the variable is like the positive pole of the factor.

+ = 25 to 50 percent of the variable is like the positive pole of the factor.

-- = 50 to 90 percent of the variable is like the negative pole of the factor.

- = 25 to 50 percent of the variable is like the negative pole of the factor.

Appendix C-2

Factor Analysis Tables by DRC

REGULAR	FACTORS											
	1	2	3	4	5	6	7	8	9	0	1	2
Army												
Navy												
Airf												
Marin												
NoDip												
HSS												
HSDip												
ColDg												
Age												
AFQT												
Black												
White												
Hispa												
Marri												
Month												
Incom												
#ESS												
ArmyR												
Unemp												
Acces												
DRC 1A 78	X											
DRC 1B 86												
DRC 1C 83												
DRC 1D 80												
DRC 1E 81												
DRC 1F 83												
DRC 1G 83												
DRC 1H 85												
DRC 1I 84												
DRC 1J 79												
DRC 1K 83												
DRC 1L 86												
DRC 1N 81												

REGULAR

REGULAR		1										2										3										4										
FACTORS		1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1
ARMY																																										
NAVY																																										
AIRF																																										
MARIN																																										
NO DIP																																										
HSS																																										
HSDIP																																										
COLDG																																										
AGE																																										
AFQT																																										
BLACK																																										
WHITE																																										
HISPA																																										
MARRI																																										
MONTH																																										
INCOM																																										
#MISS																																										
ARMYR																																										
UNEMP																																										
ACCES																																										
DRC 3A 86																																										
DRC 3B 84																																										
DRC 3C 84																																										
DRC 3D 86																																										
DRC 3E 82																																										
DRC 3F 81																																										
DRC 3G 85																																										
DRC 3H 82																																										
DRC 3I 80																																										
DRC 3J 84																																										
DRC 3K 86																																										
DRC 3L 80																																										

REGULAR	FACTORS																								
	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5
Army																									
Navy																									
AirF																									
Marin																									
NoDip																									
HSS																									
HSDip																									
ColDg																									
Age																									
AFQT																									
Black																									
White																									
Hispa																									
Marri																									
Month																									
Incom																									
#MHSS																									
ArmyR																									
Unemp																									
Access																									
DRC 5A 81																									
DRC 5B 83																									
DRC 5C 80																									
DRC 5D 83																									
DRC 5E 86																									
DRC 5F 82																									
DRC 5H 81																									
DRC 5I 86																									
DRC 5J 83																									
DRC 5K 79																									
DRC 5L 84																									
DRC 5M 79																									
DRC 5N 90																									

REGULAR	FACTORS									
	1	2	3	4	5	6	7	8	9	0
Army										
Navy										
AirF										
Marin										
NoDip										
HSS										
HSDip										
ColDg										
Age										
AFQT										
Black										
White										
Hispa										
Marri										
Month										
Incom										
#HSS										
ArmyR										
Unemp										
Acces										
DRC 6A 80										
DRC 6E 78										
DRC 6F 82										
DRC 6G 82										
DRC 6H 80										
DRC 6I 83										
DRC 6J 76										
DRC 6K 81										
DRC 6L 80										

Appendix C-3

Factor Analysis Table by Region for Regular Forces

REGULAR

REGULAR										1										2										3										4										5										6										7										8										9										10										11										12										13										14										15										16										17										18										19										20										21										22										23										24										25										26										27										28										29										30										31										32										33										34										35										36										37										38										39										40										41										42										43										44										45										46										47										48										49										50										51										52										53										54										55										56										57										58										59										60										61										62										63										64										65										66										67										68										69										70										71										72										73										74										75										76										77										78										79										80										81										82										83										84										85										86										87										88										89										90										91										92										93										94										95										96										97										98										99										100										101										102										103										104										105										106										107										108										109										110										111										112										113										114										115										116										117										118										119										120										121										122										123										124										125										126										127										128										129										130										131										132										133										134										135										136										137										138										139										140										141										142										143										144										145										146										147										148										149										150										151										152										153										154										155										156										157										158										159										160										161										162										163										164										165										166										167										168										169										170										171										172										173										174										175										176										177										178										179										180										181										182										183										184										185										186										187										188										189										190										191										192										193										194										195										196										197										198										199										200										201										202										203										204										205										206										207										208										209										210										211										212										213										214										215										216										217										218										219										220										221										222										223										224										225										226										227										228										229										230										231										232										233										234										235										236										237										238										239										240										241										242										243										244										245										246										247										248										249										250										251										252										253										254										255										256										257										258										259										260										261										262										263										264										265										266										267										268										269										270										271										272										273										274										275										276										277										278										279										280										281										282										283										284										285										286										287										288										289										290										291										292										293										294										295										296										297										298										299										300										301										302										303										304										305										306										307										308										309										310										311										312										313										314										315										316										317										318										319										320										321										322										323										324										325										326										327										328										329										330										331										332										333										334										335										336										337										338										339										340										341										342										343										344										345										346										347										348										349										350										351										352										353										354										355										356										357										358										359										360										361										362										363										364										365										366										367										368										369										370										371										372										373										374										375										376										377										378										379										380										381										382										383										384										385										386										387										388										389										390										391										392					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Appendix C-4

Factor Analysis Table by Region for Reserve Forces

RESERVE

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RSV1, PS, F 74																																								
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RSV3, PS, F 75																																								
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RSV4, PS, F 75																																								
RSV4																																								
RSV5, PS, F 75																																								
RSV5																																								
RSV6, PS, F 78																																								
RSV6																																								

Appendix C-5

Discriminating Power of Discriminant Functions by DRC
(No Accession Variables)

Discriminating Power of Discriminant Functions
(No Accession Variables)

DRC	Canonical Correlation	Wilks' Lambda	Chi-Squared	Degrees of Freedom	Significance
1A	.536	.713	38.41	5	.0000
1B	.411	.831	50.34	7	.0000
1C	.365	.866	28.52	6	.0001
1D	.459	.789	20.74	7	.0042
1E	.345	.881	26.11	5	.0001
1F	.454	.794	32.84	5	.0000
1G	.466	.783	53.22	5	.0000
1H	.464	.785	27.51	3	.0000
1I	.529	.720	44.98	8	.0000
1J	.307	.906	13.83	3	.0032
1K	.401	.839	37.85	7	.0000
1L	.443	.804	31.38	4	.0000
1N	.468	.781	36.91	8	.0000
3A	.460	.788	54.90	6	.0000
3B	.616	.620	20.52	6	.0022
3C	.525	.724	46.60	7	.0000
3D	.524	.726	56.11	4	.0000
3E	.423	.821	61.19	10	.0000
3F	.351	.877	15.44	7	.0307
3G	.474	.776	38.34	8	.0000
3H	.455	.793	39.22	6	.0000
3I	.324	.895	17.08	6	.0090
3J	.461	.788	29.14	6	.0001
3K	.355	.874	22.22	3	.0001

DRC	Canonical Correlation	Wilks' Lambda	Chi-Squared	Degrees of Freedom	Significance
3L	.538	.711	18.08	4	.0012
4A	.440	.807	18.79	5	.0021
4C	.402	.838	18.52	6	.0051
4D	.296	.912	12.56	4	.0136
4E	.546	.702	35.01	6	.0000
4F	.397	.842	18.17	4	.0011
4G	.410	.832	28.68	5	.0000
4H	.535	.714	37.58	7	.0000
4I	.452	.795	11.82	3	.0080
4J	.263	.931	5.17	2	.0756
4K	.425	.819	18.46	5	.0024
5A	.346	.881	21.12	6	.0017
5B	.288	.917	13.91	3	.0030
5C	.347	.879	37.55	2	.0000
5D	.444	.803	37.38	4	.0000
5E	.351	.876	11.86	4	.0184
5F	.482	.767	47.01	9	.0000
5H	.482	.768	53.82	6	.0000
5I	.309	.905	18.07	4	.0012
5J	.436	.810	26.82	8	.0008
5K	.324	.895	17.16	5	.0042
5L	.410	.832	22.06	6	.0012
5M	.329	.892	19.51	2	.0001
5N	.496	.754	53.91	8	.0000
6A	.493	.757	25.42	7	.0006

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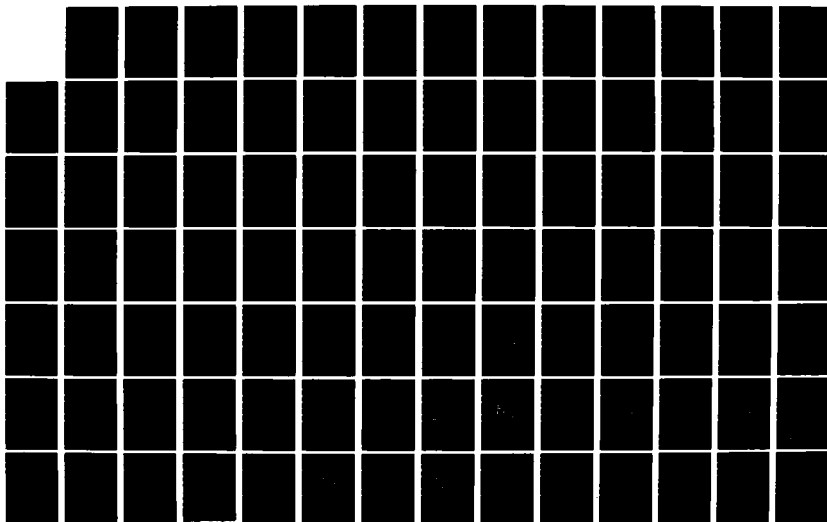
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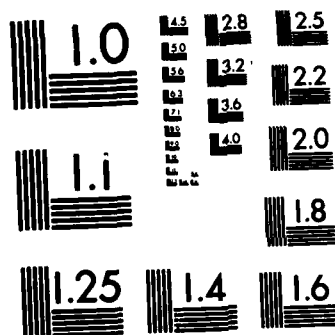
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DRC	Canonical Correlation	Wilks' Lambda	Chi-Squared	Degrees of Freedom	Significance
6E	.299	.911	4.77	2	.0921
6F	.404	.837	38.66	4	.0000
6G	.412	.830	21.81	6	.0013
6H	.330	.891	10.80	5	.0555
6I	.447	.800	34.94	6	.0000
6J	.481	.769	17.35	6	.0081
6K	.338	.886	16.91	5	.0047
6L	.480	.770	26.79	7	.0004

Appendix C-6

Discriminating Power of Discriminant Functions by DRC
(With DOD Accession Variables)

Discriminating Power of Discriminant Functions
(With DOD Accession Variables)

DRC	Canonical Correlation	Wilks' Lambda	Chi-Squared	Degrees of Freedom	Significance
1F	.457	.791	32.34	5	.0000
1I	.551	.697	49.11	10	.0000
1N	.485	.765	39.75	9	.0000
3A	.492	.758	63.81	8	.0000
3E	.422	.822	60.94	9	.0000
3I	.334	.889	18.11	7	.0115
3L	.553	.694	19.17	5	.0018
4C	.399	.841	18.19	6	.0058
4D	.328	.892	15.54	5	.0083
4E	.542	.706	34.66	5	.0000
4F	.447	.800	23.37	6	.0007
4K	.444	.803	20.23	6	.0025
5F	.479	.771	46.29	8	.0000
5H	.487	.763	55.03	7	.0000
5J	.431	.814	26.25	7	.0005
5K	.392	.847	25.31	10	.0048
5L	.386	.851	19.48	4	.0006
5M	.395	.844	28.60	4	.0000
5N	.500	.750	54.87	8	.0000
6A	.503	.747	26.73	7	.0004
6L	.505	.745	29.90	9	.0005

Appendix C-7

Discriminating Power of Discriminant Functions by Region
(No Accession Variables)

Discriminating Power of Discriminant Functions by Region
(No Accession Variables)

	Canonical Correlation	Wilks' Lambda	Chi-Squared	Degrees of Freedom	Significance
All PS,F	.352	.876	1903.5	15	0
All	.333	.889	1260.2	14	0
REG all PS,F	.378	.857	1766.0	16	0
REG all	.333	.889	1020.6	13	0
RSV1 PS,F	.493	.757	145.47	11	.0000
RSV1	.468	.781	99.57	9	.0000
RSV3 PS,F	.645	.584	147.32	11	.0000
RSV3	.600	.639	89.43	8	.0000
RSV4 PS,F	.520	.730	63.86	10	.0000
RSV4	.459	.789	35.74	8	.0000
RSV5 PS,F	.577	.667	175.24	10	0
RSV5	.569	.676	132.53	7	.0000
RSV6 PS,F	.617	.619	115.47	15	.0000
RSV6	.530	.719	65.10	11	.0000
REG1 PS,F	.380	.855	443.98	13	0
REG1	.332	.890	253.97	10	0
REG3 PS,F	.430	.815	525.72	13	0
REG3	.393	.845	318.80	8	0
REG4 PS,F	.380	.856	231.95	12	0
REG4	.373	.861	168.31	8	0
REG5 PS,F	.346	.880	373.20	9	0
REG5	.297	.912	207.03	11	0
REG6 PS,F	.337	.886	179.99	12	0
REG6	.267	.929	83.14	6	.0000

Appendix C-8

Discriminating Power of Discriminant Functions by Region
(With DOD Accession Variables)

Discriminating Power of Discriminant Functions by Region
(With DOD Accession Variables)

	Canonical Correlation	Wilks' Lambda	Chi-Squared	Degrees of Freedom	Significance
REG all PS,F	.380	.855	1787.8	17	0
REG all	.336	.887	1038.9	12	0
RSV1 PS,F	.501	.749	150.70	13	.0000
RSV3 PS,F	.645	.584	147.32	11	.0000
RSV5 PS,F	.579	.665	176.32	11	0
REG1	.337	.886	263.00	9	0
REG3 PS,F	.431	.814	528.79	11	0
REG3	.396	.843	323.21	10	0
REG5	.302	.909	213.53	11	0
REG6	.274	.925	87.66	9	.0000

Appendix C-9

Standardized Canonical Discriminant Function Coefficients

by DRC

(No Accessions Variables)

STANDARDIZED CANONICAL DISCRIMINANT FUNCTION COEFFICIENTS
(NO ACCESSIONS VARIABLES)

DRC	Month	AFQT	NoDip	HSS	HSDip	ColDg	Age	White	Black
1A	1.11	-.46	.87				-.28		
1B		-.73				.23	.46	-.95	-.70
1C		-.68				.45	.53	.27	
1D	-1.25	-.31	.83			.58	-.36		
1E		-.45			-.47	.56	.44		
1F		-.55					.55		
1G		-.71			-.48		.49	-.31	
1H		-.87				.56			
1I	.47	-.50			-.38		.51	-.84	-.58
1J				.45			.99		.31
1K		-.49	.55				.50	-.20	-1.03
1L		-.91					.28		.31
1N	-1.67	-.68	.26			.28	.47		-.39
3A		-.98			-.34	.18	.38		
3B		-.83	.58			.42	.38		.31
3C	1.18		.55			-.17	.31	-.77	
3D		-.95		.38			.36		
3E	-1.10	-.38		.28	-.34		.40	-.88	-.48
3F		-.57	.38				.51		-.37
3G	-1.27	-.65	.24				.56		
3H		-.64			-.54	-.62	.53	-.23	
3I		-.86			-.38	.44	.49		-.29
3J		-.57				-.45	.28	-1.24	-.83
3K		-.75				-.28			.32

STANDARDIZED CANONICAL DISCRIMINANT FUNCTION COEFFICIENTS
(NO ACCESSIONS VARIABLES)

DRC	Hispa	Marri	#MHSS	Unemp	ArmyR	Incom	Centroids	
							Non-Army	Army
1A						-.75	-.417	.950
1B		-.18				.27	-.390	.518
1C				-.35		.30	-.279	.546
1D		-.34				1.03	-.353	.741
1E					-.49		-.251	.535
1F	.21			.27		.31	-.304	.841
1G	-.20						-.359	.764
1H				.24			-.291	.926
1I	-.39	-.32					-.440	.871
1J							-.224	.458
1K	-.38		.43				-.257	.740
1L		.28					-.329	.730
1N					.23	-1.87	-.396	.700
3A		.15			.16		-.538	.494
3B					.60		-.734	.798
3C		.34				-.73	-.500	.751
3D				.38			-.575	.650
3E				.51	.33	.62	-.406	.534
3F		.47		.51		-.40	-.363	.381
3G	-.30	.26		.66		1.03	-.403	.708
3H			.20				-.422	.612
3I		-.42					-.258	.449
3J					.28		-.495	.536
3K							-.331	.431

DRC	Month	AFQT	NoDip	HSS	HSDip	ColDg	Age	White	Black
3L		-.34			-.87		.76		
4A					-.82		.78		.50
4C	-.99				-.54				.46
4D		-.44					.58		
4E		-.89	.47					-.20	
4F		-.79	.59				.34		
4G		-.74	.36			-.29	.43		.37
4H		-.48	.64			.46	-.22	.90	1.34
4I		-.70		.49					
4J			.65					-.86	
4K		-.76			-.68		.95		-.36
5A		-.52	.58	.36			.61		
5B		-.72	-.40						
5C			.10				.24		
5D		-.94			-.41	.45			
5E			.68				-.47		
5F	.43	-.68		.59	.23	.42	.36	-1.06	-1.29
5H		-.35	.71			.32		-.43	
5I		-.77	.81		.41		.30		
5J		-.28	.25				.81		
5K	.41	-.54	.71						
5L	-.91	-.34				.52		-.63	-.37
5M		-.91			-.44				
5N	-1.18	-.67			-.28	.26	.59	-.29	
6A		-1.09		.45	.32		.69	.44	-.41
6E		-.72							

DRC	Hispa	Marri	#MHSS	Unemp	ArmyR	Incom	Centroids	
							Non-Army	Army
3L				.29			-1.358	.289
4A	.48	-.46					-.425	.552
4C			-.57		-.85	1.78	-.349	.543
4D					-.52		-.253	.374
4E		.36		.42	-.31		-.531	.784
4F						.56	-.384	.478
4G							-.365	.548
4H				-.32			-.571	.690
4I					.45		-.362	.686
4J							-.259	.280
4K		-.29					-.357	.605
5A	.27		-.34				-.316	.424
5B				.55			-.271	.330
5C							-.299	.455
5D		.32					-.482	.505
5E		.50			-.52		-.279	.493
5F				-.48			-.434	.691
5H		.39		-.33			-.439	.680
5I							-.253	.412
5J	-.25	-.31	-1.44		-2.31	1.07	-.410	.564
5K	.42	.36					-.294	.394
5L				1.29			-.382	.519
5M							-.221	.544
5N			.30	1.27			-.526	.613
6A			.27				-.479	.654

DRC	Month	AFQT	NoDip	HSS	HSDip	Goldg	Age	White	Black
6F		-.82			-.57		.39	.44	
6G		-.94	-.26				.26		
6H		-.47	.65				.61	.59	
6I			.33	.85			.91	-.51	-.32
6J					-.43	.35	.49	-.70	-.59
6K		-.69					.33	.66	.57
6L		-.64		.66				-.62	-.36

DRC	Hispa	Marri	#MHSS	Unemp	ArmyR	Incom	Centroids	
							Non-Army	Army
6E				.69			-.307	.307
6F							-.331	.584
6G			.62	.84		-1.13	-.400	.504
6H				.37			-.230	.521
6I	-.25						-.341	.722
6J	.54						-.315	.929
6K			-.61				-.264	.481
6L		.29	.50		-.69		-.344	.853

Appendix C-10

Standardized Canonical Discriminant Function Coefficients

by DRC

(With DOD Accession Variables)

Standardized Canonical Discriminant Function Coefficients
(With DOD Accession Variables)

DRC	Month	AFQT	NoDip	HSS	HSDip	ColDg	Age	White	Black	Hispa
1F		-.55					-.55			.21
1I		-.56			-.32	.17	.46	-.79	-.57	-.40
1N	-1.24	-.67	.22			.26	.46		-.39	
3A	-.73	-.92			-.28	.17	.39			
3E	-.77	-.39		.27	-.35		.40	-.87	-.47	
3I		-.85			-.35	.40	.48		-.29	
3L		-.41			-.81		.74			-.28
4C	-1.01				-.54				.46	
4D		-.37	.58				.49			
4E		-.93	.45							
4F		-.74	.55				.38			
4K		-.73			-.64		.87		-.32	
5F		-.69		.59	.22	.42	.37	-1.06	-1.30	
5H		-.33	.71			.32		-.44		
5J		-.31	.26				.81			-.26
5K		-.31	.76	.39		-.32	.45	.44		.49
5L		-.30				.54		-.27		
5M		-.66			-.48					
5N	-1.16	-.66			-.27	.25	.59	-.30		
6A		-1.10		.45	.31		.67	.45	-.39	
6L		-.56		.56				-.59	-.30	

Standardized Canonical Discriminant Function Coefficients
(With DOD Accession Variables)

DRC	Marri	#MHSS	Unemp	ArmyR	DODNP	DODHS	Incom	<u>Centroids</u>	
								Non-Army	Army
1F						.29	.32	-.31	.85
1I	-.32			-.36		.50		-.47	.92
1N			.29		-.57		1.66	-.41	.73
3A	.17	.86			.69			-.59	.54
3E			1.38		-.83			-.41	.53
3I	-.43					-.56		-.27	.46
3L					-.38			-1.41	.30
4C				-.77		.38	1.29	-.35	.54
4D				-1.04	.74			-.28	.42
4E	.38		.65		-.48			-.53	.78
4F				-1.58	-1.25		1.42	-.44	.55
4K	-.29					.32		-.38	.64
5F					-.47			-.43	.68
5H	.37		-.61			.33		-.45	.69
5J	-.32		-1.93		2.19			-.41	.56
5K	.26		.65			-.80		-.37	.49
5L						.71		-.36	.48
5M				.58	.95			-.27	.67
5N			1.62			-.45		-.53	.62
6A					.36			-.49	.67
6L	.36	1.77		-.47	1.10		-1.03	-.37	.91

Appendix C-11

Standardized Canonical Discriminant Function Coefficients
by Region
(No Accession Variables)

Standardized Canonical Discriminant Function Coefficients
(Region, No Accession Variables)

	Prior	Sex	Month	AFQT	NoDip	HSS	HSDip	Coldg	Age	White	Black
All PS,F	.26	.29	.16	-.47	.52	.22			.41	-.16	.18
All			.15	-.71	.50	.21		.03	.42	-.08	.13
REG PS,F											
all	.35	.25	.19	-.66		-.08	-.35	.06	.35	-.11	.12
REG all			.17	-.76		-.07	-.43	.05	.46	-.10	.89
RSV1 PS,F	.27	.34	.19	-.23	.39		-.48		.48		
RSV1			.17			-.32	-1.01		.21		
RSV3 PS,F	.47	.63		-.27	.46				.37		.31
RSV3				-.28	.50	.15			.27		.16
RSV4 PS,F	.29	.61		-.41	.46				.44		
RSV4			.38	-.62	.43	-.23			.37		
RSV5 PS,F	.41	.38	.27	-.53			-.69		.29		
RSV5				-.29			-.81		.28		.28
RSV6 PS,F	.61	.43	.27	-.32	.35		-.44		.17	.21	
RSV6			.19	-.40	.86				.26		-.17
REG1 PS,F	.38	.32	.26	-.58	.09		-.22	.14	.32	-.28	
REG1			.20	-.68			-.45	.10	.45	-.31	
REG3 PS,F	.34	.19	.20	-.67			-.30	-.08	.33	-.29	
REG3				-.77		.09	-.29		.40	-.20	
REG4 PS,F	.30	.23	.21	-.69	.35				.42	-.25	
REG4				-.79	.17		-.28		.45	-.33	
REG5 PS,F	.44	.24	.27	-.67	-.36		-.94		.29		
REG5			.18	-.72	-.29	-.63	-1.05		.40		
REG6 PS,F	.54	.19		-.57		.11	-.16		.48		.09
REG6				-.73		.29	-.25		.64		

Standardized Canonical Discriminant Function Coefficients
(Region, No Accession Variables)

	Hispa	Marri	QMA	#MHSS	Unemp	ArmyR	Incom	BMA	<u>Centroids</u>	
									Non-Army	Army
All PS,F		.07		-.03	.12	.05	-.18	-.08	-.36	.39
All		.07		-.06	.12	.05	-.18	-.06	-.30	.41
REG PS,F all	-.06		-.05	-.11	.07	.06	-.13		-.36	.46
REG all		.03		-.07	.11	.05	-.16		-.28	.44
RSV1 PS,F	.15		-.10		.30		-.24		-.83	.39
RSV1	.16		-.14	-.13	.31		-.36		-.66	.42
RSV3 PS,F			-.12	.23	.35		.14	-.71	-1.01	.70
RSV3			-.18	.22				-1.06	-.71	.78
RSV4 PS,F	-.17		.44	.35		.37		-.21	-.69	.53
RSV4	.19			.26		.38			-.54	.48
RSV5 PS,F			-.22			-.11	-.37	.28	-1.13	.44
RSV5			-.28				-.53	.32	-.93	.51
RSVPS,F	.16	.22	.15	-.50	-.25	.35		.59	-.80	.76
RSV6	-.18		.29	-.71	-.28		.26	.73	-.51	.76
REG1 PS,F	-.07	.10				.07	-.13		-.72	.53
REG1	-.08	.11			-.09		-.08		-.24	.51
REG3 PS,F	-.06			.12	-.13		-.13	-.16	-.48	.47
REG3	-.07	.14			.28				-.39	.47
REG4 PS,F	-.09		.14	.18	.09	.18			-.38	.45
REG4			.13		.14			-.32	-.35	.47
REG5 PS,F			.07						-.33	.41
REG5	.08	.12	.09			-.15	-.11		-.26	.37
REG6 PS,F	-.08	-.19		-.36			.21	.29	-.30	.43
REG6				-.16			.27		-.22	.35

Appendix C-12

Standardized Canonical Discriminant Function Coefficients

by Region

(With DOD Accession Variables)

Standardized Canonical Discriminant Function Coefficients
(Region, With DOD Accession Variables)

	Prior	Sex	Month	AFQT	NoDip	HSS	HSDip	ColDg
REG all PS,F	.34	.24	.16	-.66	-.22	-.27	-.60	
REG all			.12	-.76	-.18	-.25	-.64	
RSV1 PS,F	.28	.33	.21	-.18	.38		-.46	
RSV3 PS,F	.47	.63		-.27	.46			
RSV5 PS,F	.40	.38	.26	-.53			-.69	
REG1				-.67			-.45	.09
REG3 PS,F	.33	.19	.17	-.67			-.30	-.08
REG3				-.78		.09	-.29	
REG5				-.72		-.37	-.69	.08
REG6				-.73		.27	-.24	

	Age	White	Black	Hispa	Marri	QMA	#MHSS	Unemp
REG all PS,F	.35	-.10	.13	-.05		-.03	-.15	
REG all	.46	-.08	.09				-.14	
RSV1 PS,F	.45	-.14		.12		-.16		.32
RSV3 PS,F	.37		.31			-.12	.23	.35
RSV5 PS,F	.30					-.25		
REG1	.46	-.29			.11			-.21
REG3 PS,F	.33	-.28						
REG3	.40	-.21		-.06				.24
REG5	.40			.09	.13			
REG6	.64	.15					-.28	-.16

Standardized Canonical Discriminant Function Coefficients
(Region, With DOD Accession Variables)

	ArmyR	Incom	BMA	DODNP	DODHS	<u>Centroids</u>	
						Non-Army	Army
REG all PS,F	.10	-.10	-.15		.16	-.37	.46
REG all	.13	-.09			.19	-.29	.44
RSV1 PS,F		-.27		-.20		-.84	.39
RSV3 PS,F		.14	-.71	.18		-1.01	.70
RSV5 PS,F	-.13	-.35	.32	-.12		-1.14	.44
REG1				-.45	.69	-.25	.52
REG3 PS,F	.36		-.11	.21		-.48	.48
REG3			-.12	.15		-.39	.47
REG5	-.11	-.09		-.52	.56	-.27	.38
REG6		.26			.25	-.22	.36

Appendix C-13

Percentages of Cases Correctly Classified
into Army and Non-Army by DRC
(No Accession Variables)

Percentages of Cases Correctly Classified into Army and Non-Army
(No Accession Variables)

DRC	<u>Analysis Cases</u>			<u>Random Sample</u>		
	Non-Army	Army	Total	Non-Army	Army	Total
1A	75.6	55.6	69.5	72.8	36.1	62.5
1B	65.2	70.6	67.5	69.5	58.7	65.0
1C	67.4	62.3	65.7	63.9	54.1	61.1
1D	76.2	56.7	69.9	74.6	43.9	63.4
1E	72.0	49.3	64.8	66.4	50.0	61.4
1F	72.2	64.1	70.1	70.0	54.1	66.2
1G	74.8	74.6	74.8	73.3	56.9	68.6
1H	74.2	71.4	73.5	71.9	64.5	70.1
1I	81.1	72.9	78.3	65.1	59.2	63.2
1J	69.8	51.1	63.6	65.2	51.2	61.3
1K	72.6	56.1	68.3	76.9	63.6	73.0
1L	67.6	65.2	66.9	75.4	58.3	71.5
1N	74.7	67.9	72.3	63.9	62.5	63.4
3A	68.1	78.9	73.7	66.9	70.4	68.5
3B	80.0	73.9	77.1	59.4	73.3	66.1
3C	83.3	63.3	75.3	62.2	64.5	63.1
3D	69.5	72.6	71.0	60.4	72.7	66.3
3E	68.3	66.4	67.5	65.5	59.0	62.6
3F	73.0	63.3	68.3	66.2	61.7	64.1
3G	77.0	64.9	72.6	61.7	57.4	60.3
3H	69.9	67.6	69.0	79.4	72.0	76.0
3I	65.3	62.1	64.2	60.2	61.0	60.6
3J	68.2	67.2	67.7	63.8	64.2	64.0

DRC	<u>Analysis Cases</u>			<u>Random Sample</u>		
	Non-Army	Army	Total	Non-Army	Army	Total
3K	62.1	67.1	64.3	69.1	65.8	67.6
3L	100.0	78.7	82.5	84.2	69.4	72.8
4A	65.4	72.5	68.5	46.2	68.1	55.4
4C	64.2	69.8	66.4	69.3	42.0	58.4
4D	69.0	59.6	65.3	67.0	69.2	68.0
4E	80.6	78.6	79.8	67.5	61.8	65.3
4F	62.3	73.5	67.3	73.0	61.3	67.2
4G	65.6	65.6	65.6	61.2	62.5	61.8
4H	73.4	81.1	76.9	66.7	65.5	66.1
4I	69.4	68.4	69.1	63.0	56.0	60.6
4J	69.2	52.8	61.3	65.7	51.5	61.0
4K	75.4	72.2	74.2	76.1	57.4	68.6
5A	72.4	56.2	65.5	62.4	64.3	63.3
5B	61.1	59.5	60.4	63.0	62.3	62.7
5C	87.6	41.0	69.2	88.2	43.9	71.6
5D	66.3	74.1	70.1	63.0	72.2	67.0
5E	71.7	55.9	66.0	70.0	45.5	60.5
5F	74.3	71.8	73.4	74.6	45.9	63.3
5H	78.7	64.6	73.2	79.5	52.1	67.1
5I	63.2	55.6	60.3	68.6	60.6	65.6
5J	74.0	67.9	71.4	65.5	48.3	58.5
5K	65.9	61.8	64.2	64.8	51.4	58.8
5L	62.5	64.2	63.2	51.3	63.6	56.3
5M	63.4	60.0	62.4	60.0	61.9	60.7
5N	71.7	67.0	69.5	68.9	59.3	64.9
6A	75.0	70.7	73.2	64.9	43.6	57.8

DRC	<u>Analysis Cases</u>			<u>Random Sample</u>		
	Non-Army	Army	Total	Non-Army	Army	Total
6E	63.0	51.9	57.4	59.4	63.2	61.4
6F	68.8	70.0	69.2	53.1	65.1	57.5
6G	76.5	64.8	71.3	67.1	34.0	53.5
6H	57.4	60.0	58.2	52.6	52.4	52.5
6I	72.7	63.5	69.8	64.9	54.9	60.7
6J	94.3	50.0	83.1	91.5	34.8	77.7
6K	74.2	62.7	70.1	69.0	56.4	64.5
6L	70.2	67.7	75.9	58.7	49.0	54.8

Appendix C-14

Percentages of Cases Correctly Classified
into Army and Non-Army by DRC
(With DOD Accession Variables)

Percentages of Cases Correctly Classified into Army and Non-Army
(With DOD Accession Variables)

DRC	<u>Analysis Cases</u>			<u>Random Sample</u>		
	Non-Army	Army	Total	Non-Army	Army	Total
1F	74.1	71.8	73.5	67.5	54.1	64.3
1I	78.9	75.0	77.6	61.3	55.1	59.4
1N	74.7	71.4	73.6	63.9	62.5	63.4
3A	69.9	78.9	74.6	64.6	67.6	66.0
3E	70.0	67.9	69.1	66.1	57.6	62.3
3I	68.3	58.6	64.8	54.2	59.8	57.0
3L	100.0	76.6	80.7	78.9	74.2	75.3
4C	64.2	69.8	66.4	68.0	42.0	57.6
4D	70.2	56.1	64.5	67.0	64.6	66.0
4E	79.0	81.0	79.8	70.0	63.4	67.8
4F	62.3	71.4	66.4	74.6	53.2	64.0
4K	68.9	69.4	69.1	74.6	51.1	65.3
5F	75.2	74.6	75.0	74.6	47.3	63.8
5H	78.7	64.6	73.2	76.9	53.1	66.2
5J	74.0	66.1	70.7	66.7	48.3	59.2
5K	74.7	63.2	69.8	71.4	47.3	60.6
5L	59.7	67.9	63.2	46.2	67.3	54.8
5M	66.7	64.0	65.9	60.9	55.6	59.0
5N	72.6	70.3	71.6	68.9	59.3	64.9
6A	73.2	73.2	73.2	62.3	46.2	56.9
6L	75.3	64.5	72.2	56.0	55.1	55.7

Appendix C-15

Percentages of Cases Correctly Classified
into Army and Non-Army by Region
(No Accession Variables)

Percentages of Cases Correctly Classified into Army and Non-Army by Region
(No Accession Variables)

	<u>Analysis Cases</u>			<u>Random Sample</u>		
	Non-Army	Army	Total	Non-Army	Army	Total
All PS,F	63.6	68.6	66.2	63.8	68.7	66.4
All	62.4	67.4	65.0	62.2	67.0	64.7
REG all PS,F	68.6	65.1	67.0	68.9	65.3	67.4
REG all	64.3	65.0	64.6	64.3	62.1	63.4
RSV1 PS,F	72.2	73.4	73.0	71.0	73.8	63.4
RSV1	68.8	72.7	71.2	70.6	70.2	70.4
RSV3 PS,F	90.4	74.1	80.8	82.1	71.1	70.4
RSV3	83.3	71.4	77.7	75.9	64.9	71.0
RSV4 PS,F	80.2	68.1	73.3	77.1	71.3	73.2
RSV4	67.6	69.9	68.8	62.8	65.5	64.2
RSV5 PS,F	82.9	79.8	80.7	77.6	78.5	78.3
RSV5	75.4	78.8	77.6	77.2	71.4	73.5
RSV6 PS,F	79.5	77.3	78.4	74.0	81.6	77.8
RSV6	76.4	69.5	73.7	69.5	74.7	71.8
REG1 PS,F	69.8	63.4	67.4	73.4	62.3	69.4
REG1	65.8	61.7	64.5	64.9	61.6	63.9
REG3 PS,F	71.0	70.1	70.6	71.4	69.6	70.5
REG3	68.0	66.9	67.5	66.9	69.9	68.3
REG4 PS,F	68.6	65.3	67.1	68.3	69.7	69.0
REG4	63.7	68.5	65.8	64.1	61.9	63.3
REG5 PS,F	66.5	64.6	65.6	67.1	62.2	64.9
REG5	64.1	62.0	63.3	63.5	58.9	61.6
REG6 PS,F	69.6	59.6	65.5	68.6	56.9	63.7
REG6	65.4	58.4	62.7	66.0	60.6	64.1

Appendix C-16

Percentages of Cases Correctly Classified
into Army and Non-Army by Region
(With DOD Accession Variables)

Percentages of Cases Correctly Classified into Army and Non-Army by Region
(With DOD Accession Variables)

	<u>Analysis Cases</u>			<u>Random Sample</u>		
	Non-Army	Army	Total	Non-Army	Army	Total
REG all PS,F	68.2	65.0	66.7	68.8	65.7	67.4
REG all	64.3	65.1	64.6	64.0	61.9	63.2
RSV1 PS,F	72.8	73.7	73.4	72.3	72.3	72.3
RSV3 PS,F	90.4	74.1	80.8	82.1	71.1	75.9
RSV5 PS,F	82.9	79.5	80.5	76.1	77.3	77.0
REG1	66.7	61.1	64.9	63.1	62.4	62.9
REG3 PS,F	70.0	69.6	69.8	72.5	69.5	70.9
REG3	67.7	66.6	67.2	67.1	68.8	67.9
REG5	63.4	62.1	62.9	63.1	58.5	61.3
REG6	64.8	60.3	63.1	65.3	61.9	64.1

Appendix C-17

FORTRAN Program for Condensing
Critical Variables from MEPS File

```

10      PROGRAM SHRINK(TAPE1= /690, TAPE2= /72, OUTPUT)
        K=0
        READ(1,1) STATUS, SERV, PSERV, STAC01, SEX,
        RACE, ETHNIC, STAC02, MARSTA, YRMOB,
        YRSED, EDCERT, MENTCAT, AFQT, ENSTAT,
        DATE1, DATE2, DATE3, DATE4, DATE5,
        DATE6, DATE7, DATE8, DATE9, DATE10
1      FORMAT(T14,A1,T16,A2,T56,A1,T58,A5,T70,A1,
        T71,A1,T72,A1,T73,A5,T83,A1,T88,A4,
        T96,A2,T98,A1,T120,A2,T128,A2,T202,A1,
        T272,A4,T296,A4,T320,A4,T344,A4,T368,A4,
        T392,A4,T416,A4,T440,A4,T464,A4,T488,A4)
        IF(EOF(1)) 100,200
200     K=K+1
        WRITE(2,2) STATUS, SERV, PSERV, STAC01, SEX,
        RACE, ETHNIC, STAC02, MARSTA, YRMOB,
        YRSED, EDCERT, MENTCAT, AFQT, ENSTAT,
        DATE1, DATE2, DATE3, DATE4, DATE5,
        DATE6, DATE7, DATE8, DATE9, DATE10
2      FORMAT(A1,A2,A1,A5,A1,
        A1,A1,A5,A1,A4,
        A2,A1,A2,A2,A1,
        10A4)
        GO TO 10
        PRINT *,K
        STOP
        END

```

Appendix C-18

FORTTRAN Program for Recoding

MEPS State and County Codes to USAREC DRC Codes

```

PROGRAM RECODE
INTEGER ICOUNH, ICOUNN, IBIRTH, IYRSED, IDATE(10), ODATE
CHARACTER ISTATC, ISERV, ISERV, IPRIOR, ISTANH2,
- ISEX, TRACE, IETHN1, ISTANH2, IMARI,
- IEDCER, IMCAT2, IAFOT2, IESTAT, ODRCC=2
- INTEGER OSTATC, OSERV, OSERV, OMCAT, ORACE,
- OEDCER, OENTRY, OACT, OAGE, OSEX, ORACE,
- OHSIP, OMARI, OPRIOR
OPEN(1, FILE='SHRINK')
OPEN(2, FILE='RECODE')
K=0
L=0
10 READ(1,1,END=999) ISTATC, ISERV, ISERV, IPRIOR, ISTAN, ICOUNH,
- ISEX, TRACE, IETHN1, ISTAN, ICOUNN, IMARI,
- IBIRTH, IYRSED, IEDCER, IMCAT, IAFOT, IESTAT,
- IDATE(1), IDATE(2), IDATE(3), IDATE(4), IDATE(5),
- IDATE(6), IDATE(7), IDATE(8), IDATE(9), IDATE(10)
1 FORMAT(A1,A1,A1,A1,A2,I3,
- A1,A1,A1,A2,I3,A1,
- I4,I2,A1,A2,A2,A1,
- I0I4)
L=L+1
IF(ISTATC.EQ.'A')GOTO20
IF(ISTATC.EQ.'B')GOTO20
IF(ISTATC.EQ.'C')GOTO20
IF(ISTATC.EQ.'D')GOTO20
GOTO10
K=K+1
OSTATC=0
IF(ISTATC.EQ.'D')THEN
OSTATC=1
GOTO205
ENDIF
IF(ISTATC.EQ.'A')THEN
OSTATC=2
IF(ISTATC.EQ.'0')OSTATC=3
ENDIF
IF(OSTATC.EQ.0)THEN
IF(ISTATC.EQ.'2')THEN
OSTATC=4
ELSEIF(ISTATC.EQ.'1')THEN
OSTATC=5
ELSEIF(ISTATC.EQ.'0')THEN
OSTATC=6
ENDIF
ENDIF
205 OSERV=2
IF(ISERV.EQ.'M')OSERV=1
IF(ISERV.EQ.'N')OSERV=3
IF(ISERV.EQ.'F')OSERV=4
OSERV=0
IF(ISERV.EQ.'G')OSERV=1
IF(ISERV.EQ.'U')OSERV=2
IF(ISERV.EQ.'R')OSERV=3
IF(ISTAN.EQ.'')ISTAN=ISTAN
IF(ISTAN.EQ.'0')ISTAN=ISTAN
IF(ISTAN.EQ.'0')ISTAN=ISTAN
ENDIF
IF(ISTAN.EQ.'6')GOTO211
IF(ISTAN.EQ.'06')THEN
ODRCC='6I'
IF(ICOUNN.EQ. 1)ODRCC='6A'
IF(ICOUNN.EQ. 4)ODRCC='6A'
IF(ICOUNN.EQ. 13)ODRCC='6A'
IF(ICOUNN.EQ. 53)ODRCC='6A'
IF(ICOUNN.EQ. 69)ODRCC='6A'
IF(ICOUNN.EQ. 81)ODRCC='6A'
IF(ICOUNN.EQ. 85)ODRCC='6A'
IF(ICOUNN.EQ. 87)ODRCC='6A'
ENDIF
IF(ISTAN.EQ.'00')ISTAN=ISTAN
IF(ICOUNN.EQ.0)ICOUNN=ICOUNN
ODRCC='IN'
IF(ISTAN.EQ.'36')THEN
ODRCC='1A'
IF(ICOUNN.EQ. 1)ODRCC='1A'
IF(ICOUNN.EQ. 19)ODRCC='1A'
IF(ICOUNN.EQ. 21)ODRCC='1A'
IF(ICOUNN.EQ. 25)ODRCC='1A'
IF(ICOUNN.EQ. 27)ODRCC='1A'
IF(ICOUNN.EQ. 31)ODRCC='1A'
IF(ICOUNN.EQ. 33)ODRCC='1A'
IF(ICOUNN.EQ. 35)ODRCC='1A'
IF(ICOUNN.EQ. 39)ODRCC='1A'
IF(ICOUNN.EQ. 41)ODRCC='1A'
IF(ICOUNN.EQ. 57)ODRCC='1A'
IF(ICOUNN.EQ. 77)ODRCC='1A'
IF(ICOUNN.EQ. 83)ODRCC='1A'
IF(ICOUNN.EQ. 91)ODRCC='1A'
IF(ICOUNN.EQ. 93)ODRCC='1A'
IF(ICOUNN.EQ. 95)ODRCC='1A'
IF(ICOUNN.EQ. 11)ODRCC='1A'
IF(ICOUNN.EQ. 113)ODRCC='1A'
IF(ICOUNN.EQ. 115)ODRCC='1A'
IF(ICOUNN.EQ. 3)ODRCC='1J'
IF(ICOUNN.EQ. 9)ODRCC='1J'
IF(ICOUNN.EQ. 13)ODRCC='1J'
IF(ICOUNN.EQ. 29)ODRCC='1J'
IF(ICOUNN.EQ. 37)ODRCC='1J'
IF(ICOUNN.EQ. 51)ODRCC='1J'
IF(ICOUNN.EQ. 55)ODRCC='1J'
IF(ICOUNN.EQ. 63)ODRCC='1J'
IF(ICOUNN.EQ. 73)ODRCC='1J'
IF(ICOUNN.EQ. 121)ODRCC='1J'
IF(ICOUNN.EQ. 5)ODRCC='1H'
IF(ICOUNN.EQ. 71)ODRCC='1H'
IF(ICOUNN.EQ. 79)ODRCC='1H'
IF(ICOUNN.EQ. 87)ODRCC='1H'
IF(ICOUNN.EQ. 105)ODRCC='1H'
IF(ICOUNN.EQ. 119)ODRCC='1H'
IF(ICOUNN.EQ. 47)ODRCC='1G'
IF(ICOUNN.EQ. 59)ODRCC='1G'
IF(ICOUNN.EQ. 81)ODRCC='1G'
IF(ICOUNN.EQ. 85)ODRCC='1G'
IF(ICOUNN.EQ. 103)ODRCC='1G'
GOTO230
ENDIF
211

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IF(ICOINN.EQ.165)ODRC='59'
IF(ICOINN.EQ.13)ODRC='1L'
IF(ICOINN.EQ.67)ODRC='1L'
IF(ICOINN.EQ.81)ODRC='1L'
IF(ICOINN.EQ.111)ODRC='1L'
GOTO230

```

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ENDIF

```

```

IF(I1STAN.EQ.'42')THEN

```

```

ODRC='1E'
IF(ICOINN.EQ.3)ODRC='1L'
IF(ICOINN.EQ.5)ODRC='1L'
IF(ICOINN.EQ.7)ODRC='1L'
IF(ICOINN.EQ.19)ODRC='1L'
IF(ICOINN.EQ.21)ODRC='1L'
IF(ICOINN.EQ.23)ODRC='1L'
IF(ICOINN.EQ.31)ODRC='1L'
IF(ICOINN.EQ.33)ODRC='1L'
IF(ICOINN.EQ.39)ODRC='1L'
IF(ICOINN.EQ.47)ODRC='1L'
IF(ICOINN.EQ.51)ODRC='1L'
IF(ICOINN.EQ.53)ODRC='1L'
IF(ICOINN.EQ.59)ODRC='1L'
IF(ICOINN.EQ.63)ODRC='1L'
IF(ICOINN.EQ.65)ODRC='1L'
IF(ICOINN.EQ.73)ODRC='1L'
IF(ICOINN.EQ.85)ODRC='1L'
IF(ICOINN.EQ.111)ODRC='1L'
IF(ICOINN.EQ.121)ODRC='1L'
IF(ICOINN.EQ.125)ODRC='1L'
IF(ICOINN.EQ.129)ODRC='1L'
IF(ICOINN.EQ.17)ODRC='1K'
IF(ICOINN.EQ.29)ODRC='1K'
IF(ICOINN.EQ.45)ODRC='1K'
IF(ICOINN.EQ.91)ODRC='1K'
IF(ICOINN.EQ.101)ODRC='1K'
IF(ICOINN.EQ.49)ODRC='1J'
IF(ICOINN.EQ.83)ODRC='1J'
IF(ICOINN.EQ.123)ODRC='1J'
GOTO230

```

```

ENDIF

```

```

IF(I1STAN.EQ.'12')THEN

```

```

ODRC='3E'
IF(ICOINN.EQ.11)ODRC='3G'
IF(ICOINN.EQ.15)ODRC='3G'
IF(ICOINN.EQ.21)ODRC='3G'
IF(ICOINN.EQ.25)ODRC='3G'
IF(ICOINN.EQ.27)ODRC='3G'
IF(ICOINN.EQ.43)ODRC='3G'
IF(ICOINN.EQ.49)ODRC='3G'
IF(ICOINN.EQ.51)ODRC='3G'
IF(ICOINN.EQ.55)ODRC='3G'
IF(ICOINN.EQ.61)ODRC='3G'
IF(ICOINN.EQ.71)ODRC='3G'
IF(ICOINN.EQ.81)ODRC='3G'
IF(ICOINN.EQ.85)ODRC='3G'
IF(ICOINN.EQ.87)ODRC='3G'
IF(ICOINN.EQ.93)ODRC='3G'
IF(ICOINN.EQ.99)ODRC='3G'

```

```

IF(ICOINN.EQ.27)ODRC='6F'
IF(ICOINN.EQ.37)ODRC='6F'
IF(ICOINN.EQ.51)ODRC='6F'
IF(ICOINN.EQ.79)ODRC='6F'
IF(ICOINN.EQ.83)ODRC='6F'
IF(ICOINN.EQ.111)ODRC='6F'
IF(ICOINN.EQ.25)ODRC='6K'
IF(ICOINN.EQ.59)ODRC='6K'
IF(ICOINN.EQ.65)ODRC='6K'
IF(ICOINN.EQ.71)ODRC='6K'
IF(ICOINN.EQ.73)ODRC='6K'
GOTO230

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```

ENDIF

```

```

IF(I1STAN.EQ.'39')THEN

```

```

ODRC='5D'
IF(ICOINN.EQ.5)ODRC='5C'
IF(ICOINN.EQ.7)ODRC='5C'
IF(ICOINN.EQ.19)ODRC='5C'
IF(ICOINN.EQ.29)ODRC='5C'
IF(ICOINN.EQ.35)ODRC='5C'
IF(ICOINN.EQ.39)ODRC='5C'
IF(ICOINN.EQ.43)ODRC='5C'
IF(ICOINN.EQ.51)ODRC='5C'
IF(ICOINN.EQ.55)ODRC='5C'
IF(ICOINN.EQ.69)ODRC='5C'
IF(ICOINN.EQ.77)ODRC='5C'
IF(ICOINN.EQ.85)ODRC='5C'
IF(ICOINN.EQ.93)ODRC='5C'
IF(ICOINN.EQ.99)ODRC='5C'
IF(ICOINN.EQ.99)ODRC='5C'
IF(ICOINN.EQ.103)ODRC='5C'
IF(ICOINN.EQ.123)ODRC='5C'
IF(ICOINN.EQ.125)ODRC='5C'
IF(ICOINN.EQ.133)ODRC='5C'
IF(ICOINN.EQ.143)ODRC='5C'
IF(ICOINN.EQ.147)ODRC='5C'
IF(ICOINN.EQ.151)ODRC='5C'
IF(ICOINN.EQ.153)ODRC='5C'
IF(ICOINN.EQ.155)ODRC='5C'
IF(ICOINN.EQ.157)ODRC='5C'
IF(ICOINN.EQ.169)ODRC='5C'
IF(ICOINN.EQ.171)ODRC='5C'
IF(ICOINN.EQ.173)ODRC='5C'
IF(ICOINN.EQ.1)ODRC='5B'
IF(ICOINN.EQ.15)ODRC='5B'
IF(ICOINN.EQ.17)ODRC='5B'
IF(ICOINN.EQ.25)ODRC='5B'
IF(ICOINN.EQ.27)ODRC='5B'
IF(ICOINN.EQ.37)ODRC='5B'
IF(ICOINN.EQ.57)ODRC='5B'
IF(ICOINN.EQ.61)ODRC='5B'
IF(ICOINN.EQ.71)ODRC='5B'
IF(ICOINN.EQ.109)ODRC='5B'
IF(ICOINN.EQ.113)ODRC='5B'
IF(ICOINN.EQ.135)ODRC='5B'
IF(ICOINN.EQ.149)ODRC='5B'

```



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IF(ICOUNN.EQ.183)ODRC='5H'
IF(ICOUNN.EQ.31)ODRC='5A'
IF(ICOUNN.EQ.43)ODRC='5A'
IF(ICOUNN.EQ.57)ODRC='5A'
IF(ICOUNN.EQ.127)ODRC='4F'
GOTO230
ENDIF
IF(ISTAN.EQ.'48')THEN
  ODRS='4C'
  IF(ICOUNN.EQ.7)ODRC='4K'
  IF(ICOUNN.EQ.13)ODRC='4K'
  IF(ICOUNN.EQ.19)ODRC='4K'
  IF(ICOUNN.EQ.21)ODRC='4K'
  IF(ICOUNN.EQ.25)ODRC='4K'
  IF(ICOUNN.EQ.29)ODRC='4K'
  IF(ICOUNN.EQ.31)ODRC='4K'
  IF(ICOUNN.EQ.47)ODRC='4K'
  IF(ICOUNN.EQ.53)ODRC='4K'
  IF(ICOUNN.EQ.55)ODRC='4K'
  IF(ICOUNN.EQ.57)ODRC='4K'
  IF(ICOUNN.EQ.61)ODRC='4K'
  IF(ICOUNN.EQ.91)ODRC='4K'
  IF(ICOUNN.EQ.95)ODRC='4K'
  IF(ICOUNN.EQ.105)ODRC='4K'
  IF(ICOUNN.EQ.123)ODRC='4K'
  IF(ICOUNN.EQ.127)ODRC='4K'
  IF(ICOUNN.EQ.131)ODRC='4K'
  IF(ICOUNN.EQ.137)ODRC='4K'
  IF(ICOUNN.EQ.163)ODRC='4K'
  IF(ICOUNN.EQ.171)ODRC='4K'
  IF(ICOUNN.EQ.175)ODRC='4K'
  IF(ICOUNN.EQ.177)ODRC='4K'
  IF(ICOUNN.EQ.187)ODRC='4K'
  IF(ICOUNN.EQ.209)ODRC='4K'
  IF(ICOUNN.EQ.215)ODRC='4K'
  IF(ICOUNN.EQ.235)ODRC='4K'
  IF(ICOUNN.EQ.247)ODRC='4K'
  IF(ICOUNN.EQ.249)ODRC='4K'
  IF(ICOUNN.EQ.255)ODRC='4K'
  IF(ICOUNN.EQ.259)ODRC='4K'
  IF(ICOUNN.EQ.261)ODRC='4K'
  IF(ICOUNN.EQ.265)ODRC='4K'
  IF(ICOUNN.EQ.267)ODRC='4K'
  IF(ICOUNN.EQ.271)ODRC='4K'
  IF(ICOUNN.EQ.273)ODRC='4K'
  IF(ICOUNN.EQ.281)ODRC='4K'
  IF(ICOUNN.EQ.283)ODRC='4K'
  IF(ICOUNN.EQ.285)ODRC='4K'
  IF(ICOUNN.EQ.287)ODRC='4K'
  IF(ICOUNN.EQ.297)ODRC='4K'
  IF(ICOUNN.EQ.299)ODRC='4K'
  IF(ICOUNN.EQ.307)ODRC='4K'
  IF(ICOUNN.EQ.311)ODRC='4K'
  IF(ICOUNN.EQ.319)ODRC='4K'
  IF(ICOUNN.EQ.323)ODRC='4K'
  IF(ICOUNN.EQ.325)ODRC='4K'
  IF(ICOUNN.EQ.327)ODRC='4K'
  IF(ICOUNN.EQ.355)ODRC='4K'

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IF(ICOUNN.EQ.111)ODRC='3G'
IF(ICOUNN.EQ.115)ODRC='3G'
IF(ICOUNN.EQ.5)ODRC='3H'
IF(ICOUNN.EQ.13)ODRC='3H'
IF(ICOUNN.EQ.33)ODRC='3H'
IF(ICOUNN.EQ.45)ODRC='3H'
IF(ICOUNN.EQ.59)ODRC='3H'
IF(ICOUNN.EQ.63)ODRC='3H'
IF(ICOUNN.EQ.91)ODRC='3H'
IF(ICOUNN.EQ.113)ODRC='3H'
IF(ICOUNN.EQ.131)ODRC='3H'
IF(ICOUNN.EQ.133)ODRC='3H'
GOTO230
ENDIF
IF(ISTAN.EQ.'17')THEN
  ODRS='5N'
  IF(ICOUNN.EQ.7)ODRC='5H'
  IF(ICOUNN.EQ.11)ODRC='5H'
  IF(ICOUNN.EQ.15)ODRC='5H'
  IF(ICOUNN.EQ.19)ODRC='5H'
  IF(ICOUNN.EQ.37)ODRC='5H'
  IF(ICOUNN.EQ.39)ODRC='5H'
  IF(ICOUNN.EQ.41)ODRC='5H'
  IF(ICOUNN.EQ.53)ODRC='5H'
  IF(ICOUNN.EQ.57)ODRC='5H'
  IF(ICOUNN.EQ.63)ODRC='5H'
  IF(ICOUNN.EQ.75)ODRC='5H'
  IF(ICOUNN.EQ.85)ODRC='5H'
  IF(ICOUNN.EQ.89)ODRC='5H'
  IF(ICOUNN.EQ.91)ODRC='5H'
  IF(ICOUNN.EQ.93)ODRC='5H'
  IF(ICOUNN.EQ.95)ODRC='5H'
  IF(ICOUNN.EQ.99)ODRC='5H'
  IF(ICOUNN.EQ.103)ODRC='5H'
  IF(ICOUNN.EQ.105)ODRC='5H'
  IF(ICOUNN.EQ.111)ODRC='5H'
  IF(ICOUNN.EQ.113)ODRC='5H'
  IF(ICOUNN.EQ.123)ODRC='5H'
  IF(ICOUNN.EQ.141)ODRC='5H'
  IF(ICOUNN.EQ.143)ODRC='5H'
  IF(ICOUNN.EQ.147)ODRC='5H'
  IF(ICOUNN.EQ.155)ODRC='5H'
  IF(ICOUNN.EQ.175)ODRC='5H'
  IF(ICOUNN.EQ.177)ODRC='5H'
  IF(ICOUNN.EQ.179)ODRC='5H'
  IF(ICOUNN.EQ.187)ODRC='5H'
  IF(ICOUNN.EQ.195)ODRC='5H'
  IF(ICOUNN.EQ.197)ODRC='5H'
  IF(ICOUNN.EQ.201)ODRC='5H'
  IF(ICOUNN.EQ.203)ODRC='5H'
  IF(ICOUNN.EQ.71)ODRC='5E'
  IF(ICOUNN.EQ.73)ODRC='5E'
  IF(ICOUNN.EQ.131)ODRC='5E'
  IF(ICOUNN.EQ.161)ODRC='5E'
  IF(ICOUNN.EQ.23)ODRC='5H'
  IF(ICOUNN.EQ.33)ODRC='5H'
  IF(ICOUNN.EQ.45)ODRC='5H'

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IF(ICOUNN.EQ.383)ODRC='4K'
IF(ICOUNN.EQ.385)ODRC='4K'
IF(ICOUNN.EQ.391)ODRC='4K'
IF(ICOUNN.EQ.409)ODRC='4K'
IF(ICOUNN.EQ.411)ODRC='4K'
IF(ICOUNN.EQ.413)ODRC='4K'
IF(ICOUNN.EQ.427)ODRC='4K'
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IF(ICOUNN.EQ.451)ODRC='4K'
IF(ICOUNN.EQ.453)ODRC='4K'
IF(ICOUNN.EQ.463)ODRC='4K'
IF(ICOUNN.EQ.465)ODRC='4K'
IF(ICOUNN.EQ.469)ODRC='4K'
IF(ICOUNN.EQ.479)ODRC='4K'
IF(ICOUNN.EQ.489)ODRC='4K'
IF(ICOUNN.EQ.491)ODRC='4K'
IF(ICOUNN.EQ.493)ODRC='4K'
IF(ICOUNN.EQ.505)ODRC='4K'
IF(ICOUNN.EQ.507)ODRC='4K'
IF(ICOUNN.EQ.3)ODRC='4A'
IF(ICOUNN.EQ.17)ODRC='4A'
IF(ICOUNN.EQ.33)ODRC='4A'
IF(ICOUNN.EQ.43)ODRC='4A'
IF(ICOUNN.EQ.79)ODRC='4A'
IF(ICOUNN.EQ.103)ODRC='4A'
IF(ICOUNN.EQ.107)ODRC='4A'
IF(ICOUNN.EQ.109)ODRC='4A'
IF(ICOUNN.EQ.115)ODRC='4A'
IF(ICOUNN.EQ.125)ODRC='4A'
IF(ICOUNN.EQ.135)ODRC='4A'
IF(ICOUNN.EQ.141)ODRC='4A'
IF(ICOUNN.EQ.153)ODRC='4A'
IF(ICOUNN.EQ.165)ODRC='4A'
IF(ICOUNN.EQ.169)ODRC='4A'
IF(ICOUNN.EQ.173)ODRC='4A'
IF(ICOUNN.EQ.189)ODRC='4A'
IF(ICOUNN.EQ.219)ODRC='4A'
IF(ICOUNN.EQ.227)ODRC='4A'
IF(ICOUNN.EQ.229)ODRC='4A'
IF(ICOUNN.EQ.243)ODRC='4A'
IF(ICOUNN.EQ.263)ODRC='4A'
IF(ICOUNN.EQ.269)ODRC='4A'
IF(ICOUNN.EQ.273)ODRC='4A'
IF(ICOUNN.EQ.279)ODRC='4A'
IF(ICOUNN.EQ.301)ODRC='4A'
IF(ICOUNN.EQ.303)ODRC='4A'
IF(ICOUNN.EQ.305)ODRC='4A'
IF(ICOUNN.EQ.317)ODRC='4A'
IF(ICOUNN.EQ.329)ODRC='4A'
IF(ICOUNN.EQ.371)ODRC='4A'
IF(ICOUNN.EQ.377)ODRC='4A'
IF(ICOUNN.EQ.389)ODRC='4A'
IF(ICOUNN.EQ.433)ODRC='4A'
IF(ICOUNN.EQ.445)ODRC='4A'
IF(ICOUNN.EQ.451)ODRC='4A'
IF(ICOUNN.EQ.475)ODRC='4A'
IF(ICOUNN.EQ.495)ODRC='4A'

IF(ICOUNN.EQ.501)ODRC='4A'
IF(ICOUNN.EQ.5)ODRC='4E'
IF(ICOUNN.EQ.15)ODRC='4E'
IF(ICOUNN.EQ.39)ODRC='4E'
IF(ICOUNN.EQ.41)ODRC='4E'
IF(ICOUNN.EQ.51)ODRC='4E'
IF(ICOUNN.EQ.71)ODRC='4E'
IF(ICOUNN.EQ.89)ODRC='4E'
IF(ICOUNN.EQ.149)ODRC='4E'
IF(ICOUNN.EQ.157)ODRC='4E'
IF(ICOUNN.EQ.185)ODRC='4E'
IF(ICOUNN.EQ.199)ODRC='4E'
IF(ICOUNN.EQ.201)ODRC='4E'
IF(ICOUNN.EQ.225)ODRC='4E'
IF(ICOUNN.EQ.239)ODRC='4E'
IF(ICOUNN.EQ.241)ODRC='4E'
IF(ICOUNN.EQ.245)ODRC='4E'
IF(ICOUNN.EQ.289)ODRC='4E'
IF(ICOUNN.EQ.291)ODRC='4E'
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IF(ICOUNN.EQ.321)ODRC='4E'
IF(ICOUNN.EQ.339)ODRC='4E'
IF(ICOUNN.EQ.347)ODRC='4E'
IF(ICOUNN.EQ.351)ODRC='4E'
IF(ICOUNN.EQ.361)ODRC='4E'
IF(ICOUNN.EQ.395)ODRC='4E'
IF(ICOUNN.EQ.403)ODRC='4E'
IF(ICOUNN.EQ.405)ODRC='4E'
IF(ICOUNN.EQ.407)ODRC='4E'
IF(ICOUNN.EQ.455)ODRC='4E'
IF(ICOUNN.EQ.457)ODRC='4E'
IF(ICOUNN.EQ.471)ODRC='4E'
IF(ICOUNN.EQ.473)ODRC='4E'
IF(ICOUNN.EQ.477)ODRC='4E'
IF(ICOUNN.EQ.481)ODRC='4E'
IF(ICOUNN.EQ.11)ODRC='4J'
IF(ICOUNN.EQ.45)ODRC='4J'
IF(ICOUNN.EQ.65)ODRC='4J'
IF(ICOUNN.EQ.69)ODRC='4J'
IF(ICOUNN.EQ.75)ODRC='4J'
IF(ICOUNN.EQ.87)ODRC='4J'
IF(ICOUNN.EQ.101)ODRC='4J'
IF(ICOUNN.EQ.111)ODRC='4J'
IF(ICOUNN.EQ.129)ODRC='4J'
IF(ICOUNN.EQ.117)ODRC='4J'
IF(ICOUNN.EQ.179)ODRC='4J'
IF(ICOUNN.EQ.191)ODRC='4J'
IF(ICOUNN.EQ.195)ODRC='4J'
IF(ICOUNN.EQ.205)ODRC='4J'
IF(ICOUNN.EQ.211)ODRC='4J'
IF(ICOUNN.EQ.233)ODRC='4J'
IF(ICOUNN.EQ.295)ODRC='4J'
IF(ICOUNN.EQ.311)ODRC='4J'
IF(ICOUNN.EQ.345)ODRC='4J'
IF(ICOUNN.EQ.357)ODRC='4J'
IF(ICOUNN.EQ.359)ODRC='4J'

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IF(ICOINN.EQ. 63)ODRC='3J'
IF(ICOINN.EQ. 65)ODRC='3J'
IF(ICOINN.EQ. 69)ODRC='3J'
IF(ICOINN.EQ. 73)ODRC='3J'
IF(ICOINN.EQ. 77)ODRC='3J'
IF(ICOINN.EQ. 79)ODRC='3J'
IF(ICOINN.EQ. 83)ODRC='3J'
IF(ICOINN.EQ. 85)ODRC='3J'
IF(ICOINN.EQ. 91)ODRC='3J'
IF(ICOINN.EQ. 93)ODRC='3J'
IF(ICOINN.EQ. 95)ODRC='3J'
IF(ICOINN.EQ. 101)ODRC='3J'
IF(ICOINN.EQ. 103)ODRC='3J'
IF(ICOINN.EQ. 105)ODRC='3J'
IF(ICOINN.EQ. 107)ODRC='3J'
IF(ICOINN.EQ. 117)ODRC='3J'
IF(ICOINN.EQ. 125)ODRC='3J'
IF(ICOINN.EQ. 127)ODRC='3J'
IF(ICOINN.EQ. 129)ODRC='3J'
IF(ICOINN.EQ. 131)ODRC='3J'
IF(ICOINN.EQ. 133)ODRC='3J'
IF(ICOINN.EQ. 135)ODRC='3J'
IF(ICOINN.EQ. 137)ODRC='3J'
IF(ICOINN.EQ. 141)ODRC='3J'
IF(ICOINN.EQ. 143)ODRC='3J'
IF(ICOINN.EQ. 147)ODRC='3J'
IF(ICOINN.EQ. 155)ODRC='3J'
IF(ICOINN.EQ. 163)ODRC='3J'
IF(ICOINN.EQ. 165)ODRC='3J'
IF(ICOINN.EQ. 177)ODRC='3J'
IF(ICOINN.EQ. 181)ODRC='3J'
IF(ICOINN.EQ. 183)ODRC='3J'
IF(ICOINN.EQ. 185)ODRC='3J'
IF(ICOINN.EQ. 187)ODRC='3J'
IF(ICOINN.EQ. 191)ODRC='3J'
IF(ICOINN.EQ. 195)ODRC='3J'
IF(ICOINN.EQ. 29)ODRC='3K'
IF(ICOINN.EQ. 41)ODRC='3K'
IF(ICOINN.EQ. 53)ODRC='3K'
IF(ICOINN.EQ. 139)ODRC='3K'
IF(ICOINN.EQ. 143)ODRC='3K'
GOTO230
ENDIF
IF(ISTAN.EQ.'13')THEN
  ODR='3A'
  IF(ICOINN.EQ. 1)ODRC='3E'
  IF(ICOINN.EQ. 3)ODRC='3E'
  IF(ICOINN.EQ. 5)ODRC='3E'
  IF(ICOINN.EQ. 19)ODRC='3E'
  IF(ICOINN.EQ. 25)ODRC='3E'
  IF(ICOINN.EQ. 27)ODRC='3E'
  IF(ICOINN.EQ. 39)ODRC='3E'
  IF(ICOINN.EQ. 49)ODRC='3E'
  IF(ICOINN.EQ. 65)ODRC='3E'
  IF(ICOINN.EQ. 69)ODRC='3E'
  IF(ICOINN.EQ. 75)ODRC='3E'
  IF(ICOINN.EQ. 101)ODRC='3E'
  IF(ICOINN.EQ. 109)ODRC='3E'

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IF(ICOINN.EQ. 369)ODRC='4J'
IF(ICOINN.EQ. 375)ODRC='4J'
IF(ICOINN.EQ. 381)ODRC='4J'
IF(ICOINN.EQ. 393)ODRC='4J'
IF(ICOINN.EQ. 421)ODRC='4J'
IF(ICOINN.EQ. 437)ODRC='4J'
IF(ICOINN.EQ. 483)ODRC='4J'
IF(ICOINN.EQ. 37)ODRC='4H'
IF(ICOINN.EQ. 67)ODRC='4H'
IF(ICOINN.EQ. 183)ODRC='4H'
IF(ICOINN.EQ. 203)ODRC='4H'
IF(ICOINN.EQ. 315)ODRC='4H'
IF(ICOINN.EQ. 365)ODRC='4H'
IF(ICOINN.EQ. 401)ODRC='4H'
IF(ICOINN.EQ. 419)ODRC='4H'
GOTO230
ENDIF
ODR='5I'
IF(ICOINN.EQ. 3)ODRC='5J'
IF(ICOINN.EQ. 13)ODRC='5J'
IF(ICOINN.EQ. 41)ODRC='5J'
IF(ICOINN.EQ. 43)ODRC='5J'
IF(ICOINN.EQ. 53)ODRC='5J'
IF(ICOINN.EQ. 61)ODRC='5J'
IF(ICOINN.EQ. 71)ODRC='5J'
IF(ICOINN.EQ. 83)ODRC='5J'
IF(ICOINN.EQ. 103)ODRC='5J'
IF(ICOINN.EQ. 109)ODRC='5J'
IF(ICOINN.EQ. 131)ODRC='5J'
IF(ICOINN.EQ. 153)ODRC='5J'
IF(ICOINN.EQ. 91)ODRC='5F'
IF(ICOINN.EQ. 93)ODRC='5F'
IF(ICOINN.EQ. 99)ODRC='5F'
IF(ICOINN.EQ. 115)ODRC='5F'
IF(ICOINN.EQ. 125)ODRC='5F'
IF(ICOINN.EQ. 161)ODRC='5F'
IF(ICOINN.EQ. 163)ODRC='5F'
IF(ICOINN.EQ. 21)ODRC='5M'
IF(ICOINN.EQ. 27)ODRC='5M'
GOTO230
ENDIF
IF(ISTAN.EQ.'37')THEN
  ODR='3C'
  IF(ICOINN.EQ. 1)ODRC='3J'
  IF(ICOINN.EQ. 13)ODRC='3J'
  IF(ICOINN.EQ. 15)ODRC='3J'
  IF(ICOINN.EQ. 17)ODRC='3J'
  IF(ICOINN.EQ. 19)ODRC='3J'
  IF(ICOINN.EQ. 31)ODRC='3J'
  IF(ICOINN.EQ. 33)ODRC='3J'
  IF(ICOINN.EQ. 37)ODRC='3J'
  IF(ICOINN.EQ. 47)ODRC='3J'
  IF(ICOINN.EQ. 49)ODRC='3J'
  IF(ICOINN.EQ. 51)ODRC='3J'
  IF(ICOINN.EQ. 55)ODRC='3J'
  IF(ICOINN.EQ. 61)ODRC='3J'

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IF(ICOINN.EQ.101)ODRC='3F'
IF(ICOINN.EQ.117)ODRC='3F'
IF(ICOINN.EQ.123)ODRC='3F'
IF(ICOINN.EQ.125)ODRC='3F'
IF(ICOINN.EQ.129)ODRC='3F'
IF(ICOINN.EQ.143)ODRC='3F'
IF(ICOINN.EQ.147)ODRC='3F'
IF(ICOINN.EQ.156)ODRC='3F'
IF(ICOINN.EQ.163)ODRC='3F'
IF(ICOINN.EQ.173)ODRC='3F'
IF(ICOINN.EQ.175)ODRC='3F'
IF(ICOINN.EQ.39)ODRC='5H'
IF(ICOINN.EQ.89)ODRC='5H'
IF(ICOINN.EQ.91)ODRC='5H'
IF(ICOINN.EQ.99)ODRC='5H'
IF(ICOINN.EQ.127)ODRC='5H'
IF(ICOINN.EQ.141)ODRC='5H'
IF(ICOINN.EQ.149)ODRC='5H'
IF(ICOINN.EQ.29)ODRC='5B'
IF(ICOINN.EQ.49)ODRC='5B'
IF(ICOINN.EQ.115)ODRC='5B'
IF(ICOINN.EQ.137)ODRC='5B'
GOTO230

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ENDIF
IF(ISTAN.EQ.'51')THEN

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ODRC='3K'
IF(ICOINN.EQ.1)ODRC='1B'
IF(ICOINN.EQ.43)ODRC='1B'
IF(ICOINN.EQ.59)ODRC='1B'
IF(ICOINN.EQ.61)ODRC='1B'
IF(ICOINN.EQ.69)ODRC='1B'
IF(ICOINN.EQ.107)ODRC='1B'
IF(ICOINN.EQ.131)ODRC='1B'
IF(ICOINN.EQ.153)ODRC='1B'
IF(ICOINN.EQ.171)ODRC='1B'
IF(ICOINN.EQ.187)ODRC='1B'
IF(ICOINN.EQ.21)ODRC='3B'
IF(ICOINN.EQ.27)ODRC='3B'
IF(ICOINN.EQ.35)ODRC='3B'
IF(ICOINN.EQ.71)ODRC='3B'
IF(ICOINN.EQ.77)ODRC='3B'
IF(ICOINN.EQ.155)ODRC='3B'
IF(ICOINN.EQ.173)ODRC='3B'
IF(ICOINN.EQ.185)ODRC='3B'
IF(ICOINN.EQ.197)ODRC='3B'
IF(ICOINN.EQ.51)ODRC='31'
IF(ICOINN.EQ.105)ODRC='31'
IF(ICOINN.EQ.167)ODRC='31'
IF(ICOINN.EQ.169)ODRC='31'
IF(ICOINN.EQ.191)ODRC='31'
IF(ICOINN.EQ.195)ODRC='31'
GOTO230

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ENDIF
IF(ISTAN.EQ.'24')THEN
ODRC='1B'
IF(ICOINN.EQ.1)ODRC='1L'
IF(ICOINN.EQ.23)ODRC='1L'
GOTO230

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IF(ICOINN.EQ.127)ODRC='3E'
IF(ICOINN.EQ.131)ODRC='3E'
IF(ICOINN.EQ.161)ODRC='3E'
IF(ICOINN.EQ.173)ODRC='3E'
IF(ICOINN.EQ.179)ODRC='3E'
IF(ICOINN.EQ.183)ODRC='3E'
IF(ICOINN.EQ.185)ODRC='3E'
IF(ICOINN.EQ.191)ODRC='3E'
IF(ICOINN.EQ.209)ODRC='3E'
IF(ICOINN.EQ.229)ODRC='3E'
IF(ICOINN.EQ.267)ODRC='3E'
IF(ICOINN.EQ.275)ODRC='3E'
IF(ICOINN.EQ.279)ODRC='3E'
IF(ICOINN.EQ.299)ODRC='3E'
IF(ICOINN.EQ.305)ODRC='3E'
IF(ICOINN.EQ.29)ODRC='3D'
IF(ICOINN.EQ.31)ODRC='3D'
IF(ICOINN.EQ.33)ODRC='3D'
IF(ICOINN.EQ.43)ODRC='3D'
IF(ICOINN.EQ.51)ODRC='3D'
IF(ICOINN.EQ.73)ODRC='3D'
IF(ICOINN.EQ.103)ODRC='3D'
IF(ICOINN.EQ.107)ODRC='3D'
IF(ICOINN.EQ.163)ODRC='3D'
IF(ICOINN.EQ.165)ODRC='3D'
IF(ICOINN.EQ.181)ODRC='3D'
IF(ICOINN.EQ.189)ODRC='3D'
IF(ICOINN.EQ.245)ODRC='3D'
IF(ICOINN.EQ.251)ODRC='3D'
GOTO230

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ENDIF
IF(ISTAN.EQ.'34')THEN

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ODRC='1K'
IF(ICOINN.EQ.1)ODRC='1K'
IF(ICOINN.EQ.5)ODRC='1K'
IF(ICOINN.EQ.7)ODRC='1K'
IF(ICOINN.EQ.9)ODRC='1K'
IF(ICOINN.EQ.11)ODRC='1K'
IF(ICOINN.EQ.15)ODRC='1K'
IF(ICOINN.EQ.21)ODRC='1K'
IF(ICOINN.EQ.33)ODRC='1K'
IF(ICOINN.EQ.3)ODRC='1H'
IF(ICOINN.EQ.31)ODRC='1H'
IF(ICOINN.EQ.37)ODRC='1H'
GOTO230

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ENDIF
IF(ISTAN.EQ.'18')THEN
ODRC='5H'
IF(ICOINN.EQ.19)ODRC='3F'
IF(ICOINN.EQ.25)ODRC='3F'
IF(ICOINN.EQ.27)ODRC='3F'
IF(ICOINN.EQ.37)ODRC='3F'
IF(ICOINN.EQ.43)ODRC='3F'
IF(ICOINN.EQ.51)ODRC='3F'
IF(ICOINN.EQ.61)ODRC='3F'
IF(ICOINN.EQ.77)ODRC='3F'
IF(ICOINN.EQ.83)ODRC='3F'

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ENDIF
IF(ISTAN.EQ.'25')THEN
  ODRC='1C'
  IF(ICOUNN.EQ. 3)ODRC='1F'
  IF(ICOUNN.EQ. 11)ODRC='1F'
  IF(ICOUNN.EQ. 13)ODRC='1F'
  IF(ICOUNN.EQ. 15)ODRC='1F'
  GOT0230
ENDIF
IF(ISTAN.EQ.'45')THEN
  ODRC='3D'
  IF(ICOUNN.EQ. 21)ODRC='3C'
  IF(ICOUNN.EQ. 23)ODRC='3C'
  IF(ICOUNN.EQ. 25)ODRC='3C'
  IF(ICOUNN.EQ. 57)ODRC='3C'
  IF(ICOUNN.EQ. 91)ODRC='3C'
  GOT0230
ENDIF
IF(ISTAN.EQ.'29')THEN
  ODRC='4C'
  IF(ICOUNN.EQ. 7)ODRC='5N'
  IF(ICOUNN.EQ. 17)ODRC='5N'
  IF(ICOUNN.EQ. 19)ODRC='5N'
  IF(ICOUNN.EQ. 23)ODRC='5N'
  IF(ICOUNN.EQ. 27)ODRC='5N'
  IF(ICOUNN.EQ. 29)ODRC='5N'
  IF(ICOUNN.EQ. 31)ODRC='5N'
  IF(ICOUNN.EQ. 35)ODRC='5N'
  IF(ICOUNN.EQ. 45)ODRC='5N'
  IF(ICOUNN.EQ. 51)ODRC='5N'
  IF(ICOUNN.EQ. 55)ODRC='5N'
  IF(ICOUNN.EQ. 65)ODRC='5N'
  IF(ICOUNN.EQ. 71)ODRC='5N'
  IF(ICOUNN.EQ. 73)ODRC='5N'
  IF(ICOUNN.EQ. 91)ODRC='5N'
  IF(ICOUNN.EQ. 93)ODRC='5N'
  IF(ICOUNN.EQ. 99)ODRC='5N'
  IF(ICOUNN.EQ. 103)ODRC='5N'
  IF(ICOUNN.EQ. 105)ODRC='5N'
  IF(ICOUNN.EQ. 111)ODRC='5N'
  IF(ICOUNN.EQ. 113)ODRC='5N'
  IF(ICOUNN.EQ. 123)ODRC='5N'
  IF(ICOUNN.EQ. 125)ODRC='5N'
  IF(ICOUNN.EQ. 127)ODRC='5N'
  IF(ICOUNN.EQ. 131)ODRC='5N'
  IF(ICOUNN.EQ. 135)ODRC='5N'
  IF(ICOUNN.EQ. 137)ODRC='5N'
  IF(ICOUNN.EQ. 139)ODRC='5N'
  IF(ICOUNN.EQ. 143)ODRC='5N'
  IF(ICOUNN.EQ. 149)ODRC='5N'
  IF(ICOUNN.EQ. 151)ODRC='5N'
  IF(ICOUNN.EQ. 157)ODRC='5N'
  IF(ICOUNN.EQ. 161)ODRC='5N'
  IF(ICOUNN.EQ. 163)ODRC='5N'
  IF(ICOUNN.EQ. 169)ODRC='5N'
  IF(ICOUNN.EQ. 173)ODRC='5N'

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IF(ICOUNN.EQ.179)ODRC='5N'
IF(ICOUNN.EQ.181)ODRC='5N'
IF(ICOUNN.EQ.183)ODRC='5N'
IF(ICOUNN.EQ.187)ODRC='5N'
IF(ICOUNN.EQ.189)ODRC='5N'
IF(ICOUNN.EQ.193)ODRC='5N'
IF(ICOUNN.EQ.199)ODRC='5N'
IF(ICOUNN.EQ.201)ODRC='5N'
IF(ICOUNN.EQ.203)ODRC='5N'
IF(ICOUNN.EQ.205)ODRC='5N'
IF(ICOUNN.EQ.207)ODRC='5N'
IF(ICOUNN.EQ.215)ODRC='5N'
IF(ICOUNN.EQ.219)ODRC='5N'
IF(ICOUNN.EQ.221)ODRC='5N'
IF(ICOUNN.EQ.223)ODRC='5N'
IF(ICOUNN.EQ. 69)ODRC='4F'
IF(ICOUNN.EQ.155)ODRC='4F'
GOT0230
ENDIF
IF(ISTAN.EQ.'1')GOT0212
IF(ISTAN.EQ.'01')THEN
  ODRC='3N'
  IF(ICOUNN.EQ. 33)ODRC='31'
  IF(ICOUNN.EQ. 59)ODRC='31'
  IF(ICOUNN.EQ. 71)ODRC='31'
  IF(ICOUNN.EQ. 77)ODRC='31'
  IF(ICOUNN.EQ. 79)ODRC='31'
  IF(ICOUNN.EQ. 83)ODRC='31'
  IF(ICOUNN.EQ. 89)ODRC='31'
  IF(ICOUNN.EQ. 95)ODRC='31'
  IF(ICOUNN.EQ.103)ODRC='31'
  GOT0230
ENDIF
IF(ISTAN.EQ.'55')THEN
  ODRC='5J'
  IF(ICOUNN.EQ. 3)ODRC='5K'
  IF(ICOUNN.EQ. 5)ODRC='5K'
  IF(ICOUNN.EQ. 7)ODRC='5K'
  IF(ICOUNN.EQ. 11)ODRC='5K'
  IF(ICOUNN.EQ. 13)ODRC='5K'
  IF(ICOUNN.EQ. 17)ODRC='5K'
  IF(ICOUNN.EQ. 19)ODRC='5K'
  IF(ICOUNN.EQ. 23)ODRC='5K'
  IF(ICOUNN.EQ. 31)ODRC='5K'
  IF(ICOUNN.EQ. 51)ODRC='5K'
  IF(ICOUNN.EQ. 53)ODRC='5K'
  IF(ICOUNN.EQ. 63)ODRC='5K'
  IF(ICOUNN.EQ. 81)ODRC='5K'
  IF(ICOUNN.EQ. 91)ODRC='5K'
  IF(ICOUNN.EQ. 93)ODRC='5K'
  IF(ICOUNN.EQ. 95)ODRC='5K'
  IF(ICOUNN.EQ. 99)ODRC='5K'
  IF(ICOUNN.EQ.107)ODRC='5K'
  IF(ICOUNN.EQ.109)ODRC='5K'
  IF(ICOUNN.EQ.113)ODRC='5K'
  IF(ICOUNN.EQ.119)ODRC='5K'
  IF(ICOUNN.EQ.121)ODRC='5K'

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212

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IF(ICOINN.EQ.123)ODRC='5K'
IF(ICOINN.EQ.129)ODRC='5K'
IF(ICOINN.EQ.43)ODRC='5E'
GOTO230

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ENDIF
IF(ISTAN.EQ.'47')THEN
  ODR='3I'

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IF(ICOINN.EQ.5)ODRC='4F'
IF(ICOINN.EQ.17)ODRC='4F'
IF(ICOINN.EQ.23)ODRC='4F'
IF(ICOINN.EQ.33)ODRC='4F'
IF(ICOINN.EQ.39)ODRC='4F'
IF(ICOINN.EQ.45)ODRC='4F'
IF(ICOINN.EQ.47)ODRC='4F'
IF(ICOINN.EQ.53)ODRC='4F'
IF(ICOINN.EQ.69)ODRC='4F'
IF(ICOINN.EQ.71)ODRC='4F'
IF(ICOINN.EQ.75)ODRC='4F'
IF(ICOINN.EQ.77)ODRC='4F'
IF(ICOINN.EQ.79)ODRC='4F'
IF(ICOINN.EQ.95)ODRC='4F'
IF(ICOINN.EQ.97)ODRC='4F'
IF(ICOINN.EQ.109)ODRC='4F'
IF(ICOINN.EQ.113)ODRC='4F'
IF(ICOINN.EQ.131)ODRC='4F'
IF(ICOINN.EQ.157)ODRC='4F'
IF(ICOINN.EQ.167)ODRC='4F'
IF(ICOINN.EQ.183)ODRC='4F'
GOTO230

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ENDIF
IF(ISTAN.EQ.'21')THEN
  ODR='3F'

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IF(ICOINN.EQ.3)ODRC='3I'
IF(ICOINN.EQ.9)ODRC='3I'
IF(ICOINN.EQ.13)ODRC='3I'
IF(ICOINN.EQ.31)ODRC='3I'
IF(ICOINN.EQ.33)ODRC='3I'
IF(ICOINN.EQ.47)ODRC='3I'
IF(ICOINN.EQ.55)ODRC='3I'
IF(ICOINN.EQ.57)ODRC='3I'
IF(ICOINN.EQ.95)ODRC='3I'
IF(ICOINN.EQ.119)ODRC='3I'
IF(ICOINN.EQ.121)ODRC='3I'
IF(ICOINN.EQ.131)ODRC='3I'
IF(ICOINN.EQ.133)ODRC='3I'
IF(ICOINN.EQ.141)ODRC='3I'
IF(ICOINN.EQ.169)ODRC='3I'
IF(ICOINN.EQ.171)ODRC='3I'
IF(ICOINN.EQ.193)ODRC='3I'
IF(ICOINN.EQ.213)ODRC='3I'
IF(ICOINN.EQ.219)ODRC='3I'
IF(ICOINN.EQ.221)ODRC='3I'
IF(ICOINN.EQ.227)ODRC='3I'
IF(ICOINN.EQ.235)ODRC='3I'
IF(ICOINN.EQ.11)ODRC='5B'
IF(ICOINN.EQ.15)ODRC='5B'
IF(ICOINN.EQ.23)ODRC='5B'

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IF(ICOINN.EQ.37)ODRC='5B'
IF(ICOINN.EQ.69)ODRC='5B'
IF(ICOINN.EQ.97)ODRC='5B'
IF(ICOINN.EQ.117)ODRC='5B'
IF(ICOINN.EQ.135)ODRC='5B'
IF(ICOINN.EQ.161)ODRC='5B'
IF(ICOINN.EQ.181)ODRC='5B'
IF(ICOINN.EQ.191)ODRC='5B'
IF(ICOINN.EQ.201)ODRC='5B'
IF(ICOINN.EQ.205)ODRC='5B'
IF(ICOINN.EQ.19)ODRC='3B'
IF(ICOINN.EQ.43)ODRC='3B'
IF(ICOINN.EQ.63)ODRC='3B'
IF(ICOINN.EQ.71)ODRC='3B'
IF(ICOINN.EQ.89)ODRC='3B'
IF(ICOINN.EQ.115)ODRC='3B'
IF(ICOINN.EQ.127)ODRC='3B'
IF(ICOINN.EQ.153)ODRC='3B'
IF(ICOINN.EQ.155)ODRC='3B'
IF(ICOINN.EQ.165)ODRC='3B'
IF(ICOINN.EQ.175)ODRC='3B'
IF(ICOINN.EQ.195)ODRC='3B'
IF(ICOINN.EQ.7)ODRC='4F'
IF(ICOINN.EQ.37)ODRC='4F'
IF(ICOINN.EQ.39)ODRC='4F'
IF(ICOINN.EQ.73)ODRC='4F'
IF(ICOINN.EQ.83)ODRC='4F'
IF(ICOINN.EQ.105)ODRC='4F'
IF(ICOINN.EQ.139)ODRC='4F'
IF(ICOINN.EQ.143)ODRC='4F'
IF(ICOINN.EQ.145)ODRC='4F'
IF(ICOINN.EQ.157)ODRC='4F'
GOTO230

```

```

ENDIF
IF(ISTAN.EQ.'R0')THEN
  ODR='3L'
GOTO230

```

```

ENDIF
IF(ISTAN.EQ.'53')THEN
  ODR='6L'

```

```

IF(ICOINN.EQ.11)ODRC='6H'
IF(ICOINN.EQ.15)ODRC='6H'
IF(ICOINN.EQ.39)ODRC='6H'
IF(ICOINN.EQ.59)ODRC='6H'
IF(ICOINN.EQ.69)ODRC='6H'
GOTO230

```

```

ENDIF
IF(ISTAN.EQ.'27')THEN
  ODR='5K'

```

```

IF(ICOINN.EQ.5)ODRC='5L'
IF(ICOINN.EQ.7)ODRC='5L'
IF(ICOINN.EQ.11)ODRC='5L'
IF(ICOINN.EQ.27)ODRC='5L'
IF(ICOINN.EQ.29)ODRC='5L'
IF(ICOINN.EQ.33)ODRC='5L'
IF(ICOINN.EQ.41)ODRC='5L'
IF(ICOINN.EQ.51)ODRC='5L'
IF(ICOINN.EQ.57)ODRC='5L'

```

```

IF(ICUNN.EQ.63)ODRC='5L'
IF(ICUNN.EQ.69)ODRC='5L'
IF(ICUNN.EQ.73)ODRC='5L'
IF(ICUNN.EQ.77)ODRC='5L'
IF(ICUNN.EQ.81)ODRC='5L'
IF(ICUNN.EQ.87)ODRC='5L'
IF(ICUNN.EQ.89)ODRC='5L'
IF(ICUNN.EQ.101)ODRC='5L'
IF(ICUNN.EQ.105)ODRC='5L'
IF(ICUNN.EQ.107)ODRC='5L'
IF(ICUNN.EQ.111)ODRC='5L'
IF(ICUNN.EQ.113)ODRC='5L'
IF(ICUNN.EQ.117)ODRC='5L'
IF(ICUNN.EQ.119)ODRC='5L'
IF(ICUNN.EQ.121)ODRC='5L'
IF(ICUNN.EQ.125)ODRC='5L'
IF(ICUNN.EQ.133)ODRC='5L'
IF(ICUNN.EQ.135)ODRC='5L'
IF(ICUNN.EQ.149)ODRC='5L'
IF(ICUNN.EQ.155)ODRC='5L'
IF(ICUNN.EQ.159)ODRC='5L'
IF(ICUNN.EQ.167)ODRC='5L'
GOTO230

```

```

ENDIF
IF(IISTAN.EQ.'4')GOTO213
IF(IISTAN.EQ.'04')THEN
ODRC='6G'
GOTO230

```

213

```

ENDIF
IF(IISTAN.EQ.'22')THEN
ODRC='4H'

```

```

IF(ICUNN.EQ.1)ODRC='4I'
IF(ICUNN.EQ.5)ODRC='4I'
IF(ICUNN.EQ.7)ODRC='4I'
IF(ICUNN.EQ.33)ODRC='4I'
IF(ICUNN.EQ.37)ODRC='4I'
IF(ICUNN.EQ.39)ODRC='4I'
IF(ICUNN.EQ.45)ODRC='4I'
IF(ICUNN.EQ.47)ODRC='4I'
IF(ICUNN.EQ.51)ODRC='4I'
IF(ICUNN.EQ.55)ODRC='4I'
IF(ICUNN.EQ.57)ODRC='4I'
IF(ICUNN.EQ.63)ODRC='4I'
IF(ICUNN.EQ.71)ODRC='4I'
IF(ICUNN.EQ.75)ODRC='4I'
IF(ICUNN.EQ.77)ODRC='4I'
IF(ICUNN.EQ.87)ODRC='4I'
IF(ICUNN.EQ.89)ODRC='4I'
IF(ICUNN.EQ.91)ODRC='4I'
IF(ICUNN.EQ.93)ODRC='4I'
IF(ICUNN.EQ.95)ODRC='4I'
IF(ICUNN.EQ.97)ODRC='4I'
IF(ICUNN.EQ.99)ODRC='4I'
IF(ICUNN.EQ.101)ODRC='4I'
IF(ICUNN.EQ.103)ODRC='4I'
IF(ICUNN.EQ.105)ODRC='4I'
IF(ICUNN.EQ.109)ODRC='4I'

```

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```

IF(ICUNN.EQ.113)ODRC='4I'
IF(ICUNN.EQ.117)ODRC='4I'
IF(ICUNN.EQ.121)ODRC='4I'
IF(ICUNN.EQ.126)ODRC='4I'
IF(ICUNN.EQ.3)ODRC='4E'
IF(ICUNN.EQ.11)ODRC='4E'
IF(ICUNN.EQ.19)ODRC='4E'
IF(ICUNN.EQ.23)ODRC='4E'
IF(ICUNN.EQ.53)ODRC='4E'
GOTO230

```

```

ENDIF
IF(IISTAN.EQ.'9')GOTO214
IF(IISTAN.EQ.'09')THEN
ODRC='1F'
GOTO230

```

214

```

ENDIF
IF(IISTAN.EQ.'28')THEN
ODRC='4F'
IF(ICUNN.EQ.45)ODRC='4I'
IF(ICUNN.EQ.47)ODRC='4I'
IF(ICUNN.EQ.59)ODRC='4I'
IF(ICUNN.EQ.109)ODRC='4I'
GOTO230

```

```

ENDIF
IF(IISTAN.EQ.'8')GOTO215
IF(IISTAN.EQ.'08')THEN
ODRC='4D'
GOTO230

```

215

```

ENDIF
IF(IISTAN.EQ.'19')THEN
ODRC='5E'
IF(ICUNN.EQ.1)ODRC='5L'
IF(ICUNN.EQ.9)ODRC='5L'
IF(ICUNN.EQ.21)ODRC='5L'
IF(ICUNN.EQ.27)ODRC='5L'
IF(ICUNN.EQ.29)ODRC='5L'
IF(ICUNN.EQ.35)ODRC='5L'
IF(ICUNN.EQ.43)ODRC='5L'
IF(ICUNN.EQ.47)ODRC='5L'
IF(ICUNN.EQ.59)ODRC='5L'
IF(ICUNN.EQ.71)ODRC='5L'
IF(ICUNN.EQ.85)ODRC='5L'
IF(ICUNN.EQ.93)ODRC='5L'
IF(ICUNN.EQ.119)ODRC='5L'
IF(ICUNN.EQ.129)ODRC='5L'
IF(ICUNN.EQ.133)ODRC='5L'
IF(ICUNN.EQ.137)ODRC='5L'
IF(ICUNN.EQ.141)ODRC='5L'
IF(ICUNN.EQ.143)ODRC='5L'
IF(ICUNN.EQ.145)ODRC='5L'
IF(ICUNN.EQ.149)ODRC='5L'
IF(ICUNN.EQ.156)ODRC='5L'
IF(ICUNN.EQ.161)ODRC='5L'
IF(ICUNN.EQ.165)ODRC='5L'
IF(ICUNN.EQ.167)ODRC='5L'
IF(ICUNN.EQ.173)ODRC='5L'
IF(ICUNN.EQ.193)ODRC='5L'
GOTO230

```

```

ENDIF
IF(IISTAN.EQ.'54') THEN
  ODRG='3B'
  IF(ICOUNN.EQ. 9) ODRG='1L'
  IF(ICOUNN.EQ. 17) ODRG='1L'
  IF(ICOUNN.EQ. 23) ODRG='1L'
  IF(ICOUNN.EQ. 27) ODRG='1L'
  IF(ICOUNN.EQ. 29) ODRG='1L'
  IF(ICOUNN.EQ. 31) ODRG='1L'
  IF(ICOUNN.EQ. 33) ODRG='1L'
  IF(ICOUNN.EQ. 41) ODRG='1L'
  IF(ICOUNN.EQ. 49) ODRG='1L'
  IF(ICOUNN.EQ. 51) ODRG='1L'
  IF(ICOUNN.EQ. 57) ODRG='1L'
  IF(ICOUNN.EQ. 61) ODRG='1L'
  IF(ICOUNN.EQ. 69) ODRG='1L'
  IF(ICOUNN.EQ. 71) ODRG='1L'
  IF(ICOUNN.EQ. 77) ODRG='1L'
  IF(ICOUNN.EQ. 83) ODRG='1L'
  IF(ICOUNN.EQ. 91) ODRG='1L'
  IF(ICOUNN.EQ. 93) ODRG='1L'
  IF(ICOUNN.EQ. 95) ODRG='1L'
  IF(ICOUNN.EQ. 97) ODRG='1L'
  IF(ICOUNN.EQ. 103) ODRG='1L'
  IF(ICOUNN.EQ. 73) ODRG='5D'
  IF(ICOUNN.EQ. 85) ODRG='5D'
  IF(ICOUNN.EQ. 105) ODRG='5D'
  IF(ICOUNN.EQ. 107) ODRG='5D'
  IF(ICOUNN.EQ. 3) ODRG='1B'
  IF(ICOUNN.EQ. 37) ODRG='1B'
  IF(ICOUNN.EQ. 65) ODRG='1B'
  GOT0230
ENDIF
IF(IISTAN.EQ.'5') GOT0216
IF(IISTAN.EQ.'05') THEN
  ODRG='4H'
  IF(ICOUNN.EQ. 21) ODRG='4F'
  IF(ICOUNN.EQ. 31) ODRG='4F'
  IF(ICOUNN.EQ. 35) ODRG='4F'
  IF(ICOUNN.EQ. 37) ODRG='4F'
  IF(ICOUNN.EQ. 55) ODRG='4F'
  IF(ICOUNN.EQ. 77) ODRG='4F'
  IF(ICOUNN.EQ. 93) ODRG='4F'
  IF(ICOUNN.EQ. 107) ODRG='4F'
  IF(ICOUNN.EQ. 111) ODRG='4F'
  IF(ICOUNN.EQ. 123) ODRG='4F'
  GOT0230
ENDIF
IF(IISTAN.EQ.'41') THEN
  ODRG='6H'
  IF(ICOUNN.EQ. 1) ODRG='6J'
  IF(ICOUNN.EQ. 23) ODRG='6J'
  IF(ICOUNN.EQ. 25) ODRG='6J'
  IF(ICOUNN.EQ. 45) ODRG='6J'
  IF(ICOUNN.EQ. 61) ODRG='6J'
  IF(ICOUNN.EQ. 63) ODRG='6J'
  GOT0230

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ENDIF
IF(IISTAN.EQ.'40') THEN
  ODRG='4J'
  IF(ICOUNN.EQ. 1) ODRG='4H'
  IF(ICOUNN.EQ. 75) ODRG='4H'
  IF(ICOUNN.EQ. 135) ODRG='4H'
  GOT0230
ENDIF
IF(IISTAN.EQ.'23') THEN
  ODRG='1D'
  GOT0230
ENDIF
IF(IISTAN.EQ.'35') THEN
  ODRG='4A'
  GOT0230
ENDIF
IF(IISTAN.EQ.'33') THEN
  ODRG='1D'
  GOT0230
ENDIF
IF(IISTAN.EQ.'20') THEN
  ODRG='4G'
  IF(ICOUNN.EQ. 23) ODRG='4D'
  IF(ICOUNN.EQ. 39) ODRG='4D'
  IF(ICOUNN.EQ. 55) ODRG='4D'
  IF(ICOUNN.EQ. 63) ODRG='4D'
  IF(ICOUNN.EQ. 71) ODRG='4D'
  IF(ICOUNN.EQ. 75) ODRG='4D'
  IF(ICOUNN.EQ. 93) ODRG='4D'
  IF(ICOUNN.EQ. 101) ODRG='4D'
  IF(ICOUNN.EQ. 109) ODRG='4D'
  IF(ICOUNN.EQ. 153) ODRG='4D'
  IF(ICOUNN.EQ. 171) ODRG='4D'
  IF(ICOUNN.EQ. 179) ODRG='4D'
  IF(ICOUNN.EQ. 181) ODRG='4D'
  IF(ICOUNN.EQ. 193) ODRG='4D'
  IF(ICOUNN.EQ. 199) ODRG='4D'
  IF(ICOUNN.EQ. 203) ODRG='4D'
  IF(ICOUNN.EQ. 67) ODRG='4J'
  IF(ICOUNN.EQ. 81) ODRG='4J'
  IF(ICOUNN.EQ. 119) ODRG='4J'
  IF(ICOUNN.EQ. 129) ODRG='4J'
  IF(ICOUNN.EQ. 175) ODRG='4J'
  IF(ICOUNN.EQ. 187) ODRG='4J'
  IF(ICOUNN.EQ. 189) ODRG='4J'
  GOT0230
ENDIF
IF(IISTAN.EQ.'31') THEN
  ODRG='5L'
  IF(ICOUNN.EQ. 5) ODRG='4D'
  IF(ICOUNN.EQ. 7) ODRG='4D'
  IF(ICOUNN.EQ. 13) ODRG='4D'
  IF(ICOUNN.EQ. 29) ODRG='4D'
  IF(ICOUNN.EQ. 33) ODRG='4D'
  IF(ICOUNN.EQ. 45) ODRG='4D'
  IF(ICOUNN.EQ. 49) ODRG='4D'
  IF(ICOUNN.EQ. 57) ODRG='4D'
  IF(ICOUNN.EQ. 69) ODRG='4D'

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IF(ICOUNN.EQ. 75)ODRC='4D'
IF(ICOUNN.EQ. 85)ODRC='4D'
IF(ICOUNN.EQ. 87)ODRC='4D'
IF(ICOUNN.EQ. 101)ODRC='4D'
IF(ICOUNN.EQ. 105)ODRC='4D'
IF(ICOUNN.EQ. 123)ODRC='4D'
IF(ICOUNN.EQ. 135)ODRC='4D'
IF(ICOUNN.EQ. 145)ODRC='4D'
IF(ICOUNN.EQ. 157)ODRC='4D'
IF(ICOUNN.EQ. 161)ODRC='4D'
IF(ICOUNN.EQ. 165)ODRC='4D'
GOTO230
ENDIF
IF(IISTAN.EQ.'15')THEN
ODRC='6E'
GOTO230
ENDIF
IF(IISTAN.EQ.'49')THEN
ODRC='6J'
GOTO230
ENDIF
IF(IISTAN.EQ.'10')THEN
ODRC='18'
IF(ICOUNN.EQ. 3)ODRC='1K'
GOTO230
ENDIF
IF(IISTAN.EQ.'44')THEN
ODRC='1C'
GOTO230
ENDIF
IF(IISTAN.EQ.'11')THEN
ODRC='18'
GOTO230
ENDIF
IF(IISTAN.EQ.'16')THEN
ODRC='6J'
IF(ICOUNN.EQ. 9)ODRC='6L'
IF(ICOUNN.EQ. 17)ODRC='6L'
IF(ICOUNN.EQ. 21)ODRC='6L'
IF(ICOUNN.EQ. 35)ODRC='6L'
IF(ICOUNN.EQ. 49)ODRC='6L'
IF(ICOUNN.EQ. 55)ODRC='6L'
IF(ICOUNN.EQ. 57)ODRC='6L'
IF(ICOUNN.EQ. 61)ODRC='6L'
IF(ICOUNN.EQ. 69)ODRC='6L'
IF(ICOUNN.EQ. 79)ODRC='6L'
GOTO230
ENDIF
IF(IISTAN.EQ.'46')THEN
ODRC='5L'
GOTO230
ENDIF
IF(IISTAN.EQ.'30')THEN
ODRC='6J'
IF(ICOUNN.EQ. 53)ODRC='6L'
GOTO230
ENDIF

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IF(IISTAN.EQ.'32')THEN
ODRC='6I'
IF(ICOUNN.EQ. 7)ODRC='6J'
IF(ICOUNN.EQ. 11)ODRC='6J'
IF(ICOUNN.EQ. 13)ODRC='6J'
IF(ICOUNN.EQ. 15)ODRC='6J'
IF(ICOUNN.EQ. 17)ODRC='6J'
IF(ICOUNN.EQ. 33)ODRC='6J'
IF(ICOUNN.EQ. 3)ODRC='6G'
IF(ICOUNN.EQ. 9)ODRC='6G'
IF(ICOUNN.EQ. 23)ODRC='6G'
GOTO230
ENDIF
IF(IISTAN.EQ.'59')THEN
ODRC='1A'
GOTO230
ENDIF
IF(IISTAN.EQ.'GQ')THEN
ODRC='6E'
GOTO230
ENDIF
IF(IISTAN.EQ.'38')THEN
ODRC='5L'
GOTO230
ENDIF
IF(IISTAN.EQ.'56')THEN
ODRC='4D'
IF(ICOUNN.EQ. 23)ODRC='6J'
IF(ICOUNN.EQ. 35)ODRC='6J'
IF(ICOUNN.EQ. 37)ODRC='6J'
IF(ICOUNN.EQ. 39)ODRC='6J'
IF(ICOUNN.EQ. 41)ODRC='6J'
GOTO230
ENDIF
IF(IISTAN.EQ.'2')GOTO217
IF(IISTAN.EQ.'02')THEN
ODRC='6E'
GOTO230
ENDIF
IF(IISTAN.EQ.'AQ')THEN
ODRC='6E'
GOTO230
ENDIF
IF(IISTAN.EQ.'RP')THEN
ODRC='6E'
GOTO230
ENDIF
IF(IISTAN.EQ.'UQ')THEN
ODRC='3L'
GOTO230
ENDIF
IF(IISTAN.EQ.'CA')THEN
ODRC='1N'
GOTO230
ENDIF
IF(IISTAN.EQ.'GE')THEN
ODRC='18'
GOTO230

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230
ENDIF
IF(I1STAN.EQ.'PN')THEN
  ODRG='3D'
  GOT0230
ENDIF
IF(I1STAN.EQ.'IT')THEN
  ODRG='1B'
  GOT0230
ENDIF
IF(I1EDCER.EQ.'')THEN
  OEDCER='0'
  GOT0240
ENDIF
IF(I1EDCER.EQ.'3')THEN
  OEDCER='2'
  GOT0240
ENDIF
IF(I1EDCER.EQ.'S')THEN
  OEDCER='3'
  GOT0240
ENDIF
IF(I1EDCER.EQ.'2')THEN
  OEDCER='4'
  GOT0240
ENDIF
IF(I1EDCER.EQ.'A')THEN
  OEDCER='5'
  GOT0240
ENDIF
IF(I1EDCER.EQ.'D')THEN
  OEDCER='5'
  GOT0240
ENDIF
IF(I1EDCER.EQ.'G')THEN
  OEDCER='6'
  GOT0240
ENDIF
IF(I1EDCER.EQ.'K')THEN
  OEDCER='7'
  GOT0240
ENDIF
IF(I1EDCER.EQ.'N')THEN
  OEDCER='8'
  GOT0240
ENDIF
IF(I1EDCER.EQ.'R')THEN
  OEDCER='8'
  GOT0240
ENDIF
IF(I1EDCER.EQ.'U')THEN
  OEDCER='8'
  GOT0240
ENDIF
ENDIF
IF(I1EDCER.EQ.'U')OEDCER='9'
IF(OEDCER.EQ.'0')THEN
  IF(I1RSED.GE.'8')OEDCER='1'
  IF(I1RSED.GE.'12')OEDCER='4'

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IF(I1RSED.GE.'13')OEDCER='5'
IF(I1RSED.GE.'14')OEDCER='6'
IF(I1RSED.GE.'16')OEDCER='7'
IF(I1RSED.GE.'18')OEDCER='8'
ENDIF
ODATE=IDATE(1)
DO 250 I=2,10
  IF(IDATE(1).LT.7000)GOTO250
  IF(IDATE(1).LT.ODATE)ODATE=IDATE(1)
CONTINUE
OAGE=0
IF(I1BIRTH.GE.2000)THEN
  IF(I1BIRTH.LE.ODATE)THEN
    IOTEST=ODATE-((ODATE/100)*100)
    IOTEST=I1BIRTH-((I1BIRTH/100)*100)
    OAGE=(ODATE-I1BIRTH-88)/100
    IF(IOTEST.GE.I1TEST)OAGE=(ODATE-I1BIRTH)/100
  ENDIF
ENDIF
OSEX=0
IF(I1SEX.EQ.'F')OSEX=1
ORACE=0
IF(I1RACE.EQ.'X')ORACE=0
IF(I1RACE.EQ.'R')ORACE=1
IF(I1RACE.EQ.'N')ORACE=2
IF(I1RACE.EQ.'C')ORACE=3
IF(I1RACE.EQ.'M')ORACE=4
IF(I1ETHNI.EQ.'1')GOTO255
IF(I1ETHNI.EQ.'4')GOTO255
IF(I1ETHNI.EQ.'6')GOTO255
IF(I1ETHNI.EQ.'9')GOTO255
IF(I1ETHNI.EQ.'S')GOTO255
OHISP=0
GOTO260
OHISP=1
ONARI=1
IF(ONARI.EQ.'S')ONARI=0
IF(ONARI.EQ.'M')ONARI=2
IF(ONARI.EQ.'J')ONARI=2
OPRIOR=0
IF(OPRIOR.EQ.'Y')OPRIOR=1
URITE(2,2) ODATE,ODRC,OSTATC,OSERU,OSERVUC,OPRIOR,
  IMCAT,IAFQT,OEDCER,OAGE,OSEX,
  ORACE,OHISP,ONARI
- FORMAT(14,A2,11,11,11,11,
  A2,A2,11,12,11,
  11,11,11)
GOTO10
100 PRINT *, 'TOTAL RECS=',K
999 STOP
END
-END OF INFORMATION-

```

Appendix C-19

FORTTRAN Program for Merging
MEPS Data with USAREC Data

```

PROGRAM MERGE
CHARACTER UDR2, UQMA13, UMHSSR13,
+ UUNEMP13, UARDOD13, UDODNP14,
+ UUDHMA14, UINCOM15, UBLACK13,
+ ADR2, ASTAT, AREST124,
+ TONA(840)13, THSSR(840)13,
+ TUNEMP(840)13, TARDOD(840)13,
+ TDODNP(840)14, TDHMA(840)14,
+ TINCOM(840)15, TBLACK(840)13
+ INTEGER UYEAR, UQTR, UDR1, TDR2, TINDEX,
+ ASERU, ADR1, AYEAR, AMONTH, AQTR
OPEN(1, FILE='USAREC')
OPEN(2, FILE='RECODE')
OPEN(3, FILE='MERGE')
K=0
READ(1, 1) UYEAR, UQTR, UDR1, UDR2,
+ UQMA, UMHSSR, UUNEMP, UARDOD,
+ UDODNP, UUDHMA, UINCOM, UBLACK
FORMAT(12, 1X, 11, 11, A1,
+ 7X, A3, 7X, A3, 15X, A3, 3X, A3,
+ 2X, A4, 2X, A4, A5, 2X, A3, 31X)
IF(UYEAR.EQ.79)GOTO10
IF(UYEAR.EQ.80)GOTO30
IF(UYEAR.EQ.81)GOTO30
IF(UYEAR.EQ.82)GOTO100
GOTO10
TDR2=0
IF(UDR2.EQ.'A')TDR2=1
IF(UDR2.EQ.'B')TDR2=2
IF(UDR2.EQ.'C')TDR2=3
IF(UDR2.EQ.'D')TDR2=4
IF(UDR2.EQ.'E')TDR2=5
IF(UDR2.EQ.'F')TDR2=6
IF(UDR2.EQ.'G')TDR2=7
IF(UDR2.EQ.'H')TDR2=8
IF(UDR2.EQ.'I')TDR2=9
IF(UDR2.EQ.'J')TDR2=10
IF(UDR2.EQ.'K')TDR2=11
IF(UDR2.EQ.'L')TDR2=12
IF(UDR2.EQ.'M')TDR2=13
IF(UDR2.EQ.'N')TDR2=14
IF(TDR2.EQ.0)THEN
PRINT 3, UYEAR, 0, UQTR, UDR1, UDR2
GOTO10
ENDIF
IF(UDR1.EQ.1)UDR1=2
TINDEX=((UYEAR-79)*280)+((UQTR-1)*70)
+ ((UDR1-2)*14)+TDR2
+ TONA(TINDEX)-UQMA
+ THSSR(TINDEX)-UMHSSR
+ TUNEMP(TINDEX)-UUNEMP
+ TARDOD(TINDEX)-UARDOD
+ TDODNP(TINDEX)-UDODNP
+ TDHMA(TINDEX)-UDHMA
+ TINCOM(TINDEX)-UINCOM
+ TBLACK(TINDEX)-UBLACK
GOTO10

```

```

100 READ(2, END=999) AYEAR, AMONTH,
+ ADR1, ADR2, ASTAT, ASERU, AREST
FORMAT(12, 12, 11, A1, A1, 11, A13)
IF(ADR2.NE.'')GOTO120
PRINT 2, 'BLANK DRC', AYEAR, AMONTH,
+ ADR1, ADR2, ASTAT, ASERU, AREST
GOTO100
IF(AYEAR.EQ.79)GOTO130
IF(AYEAR.EQ.80)GOTO130
IF(AYEAR.EQ.81)GOTO130
PRINT 3, 'BAD YEAR', AYEAR, AMONTH,
+ ADR1, ADR2, ASTAT, ASERU, AREST
GOTO100
TDR2=0
IF(ADR2.EQ.'A')TDR2=1
IF(ADR2.EQ.'B')TDR2=2
IF(ADR2.EQ.'C')TDR2=3
IF(ADR2.EQ.'D')TDR2=4
IF(ADR2.EQ.'E')TDR2=5
IF(ADR2.EQ.'F')TDR2=6
IF(ADR2.EQ.'G')TDR2=7
IF(ADR2.EQ.'H')TDR2=8
IF(ADR2.EQ.'I')TDR2=9
IF(ADR2.EQ.'J')TDR2=10
IF(ADR2.EQ.'K')TDR2=11
IF(ADR2.EQ.'L')TDR2=12
IF(ADR2.EQ.'M')TDR2=13
IF(ADR2.EQ.'N')TDR2=14
IF(TDR2.NE.0)GOTO150
PRINT 3, 'BAD DRC', AYEAR, AMONTH,
+ ADR1, ADR2, ASTAT, ASERU, AREST
GOTO100
K=K+1
IF(ADR1.EQ.1)ADR1=2
AQTR=((INT(AMONTH-1))/3
+ ((YEAR-79)*280)+((AQTR*70)
+ ((ADR1-2)*14)+TDR2
IF(ADR1.EQ.2)ADR1=1
WRITE(3, 3) AYEAR, AMONTH, ADR1,
+ ADR2, ASTAT, ASERU, AREST,
+ TONA(TINDEX), THSSR(TINDEX),
+ TUNEMP(TINDEX), TARDOD(TINDEX),
+ TDODNP(TINDEX), TDHMA(TINDEX),
+ TINCOM(TINDEX), TBLACK(TINDEX),
+ FORMAT(12, 12, 11, A1, A1, 11, A13, A3,
+ A3, A3, A3, A4, A4, A5, A3)
GOTO100
PRINT 3, 'TOTAL MERGE RECORDS = ', K
STOP
END

```

Appendix D-1

ACC13AM Periodogram Values

I	FQ	P	INTENSITY
1	.012	81.000	63278274.377
2	.025	40.500	5235330.593
3	.037	27.000	1719016.276
4	.049	20.250	3579549.309
5	.062	16.200	1719448.891
6	.074	13.500	2411507.427
7	.086	11.571	491409.172
8	.099	10.125	1010206.102
9	.111	9.000	330492.104
10	.123	8.100	504928.807
11	.136	7.364	439576.592
12	.148	6.750	139719.003
13	.160	6.231	2423090.524
14	.173	5.786	500393.976
15	.185	5.400	451279.603
16	.198	5.063	1370000.043
17	.210	4.765	1522421.170
18	.222	4.500	079073.900
19	.235	4.263	1210166.004
20	.247	4.050	110707.701
21	.259	3.857	65231.005
22	.272	3.602	061240.950
23	.284	3.522	760999.175
24	.296	3.375	263136.414
25	.309	3.240	449770.920
26	.321	3.115	146690.001
27	.333	3.000	246641.291
28	.346	2.893	1714200.933
29	.350	2.793	354057.130
30	.370	2.700	550007.917
31	.383	2.613	102201.432
32	.395	2.531	20143.902
33	.407	2.455	200172.371
34	.420	2.382	69922.707
35	.432	2.314	272449.232
36	.444	2.250	406660.565
37	.457	2.189	290356.196
38	.469	2.132	33567.349
39	.481	2.077	95709.762
40	.494	2.025	365335.094

AVERAGE INTENSITY= 2421741.0245555460

Appendix D-2

R and S Arrays at Low and High Frequencies for ACC13AM

(F(M) = ((-1)^(M+1)) * ACF(M))

R -array

	1	2	3	4	5	6	7	8	9	10
1	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
2	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
3	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
4	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
5	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
6	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
7	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
8	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
9	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
10	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

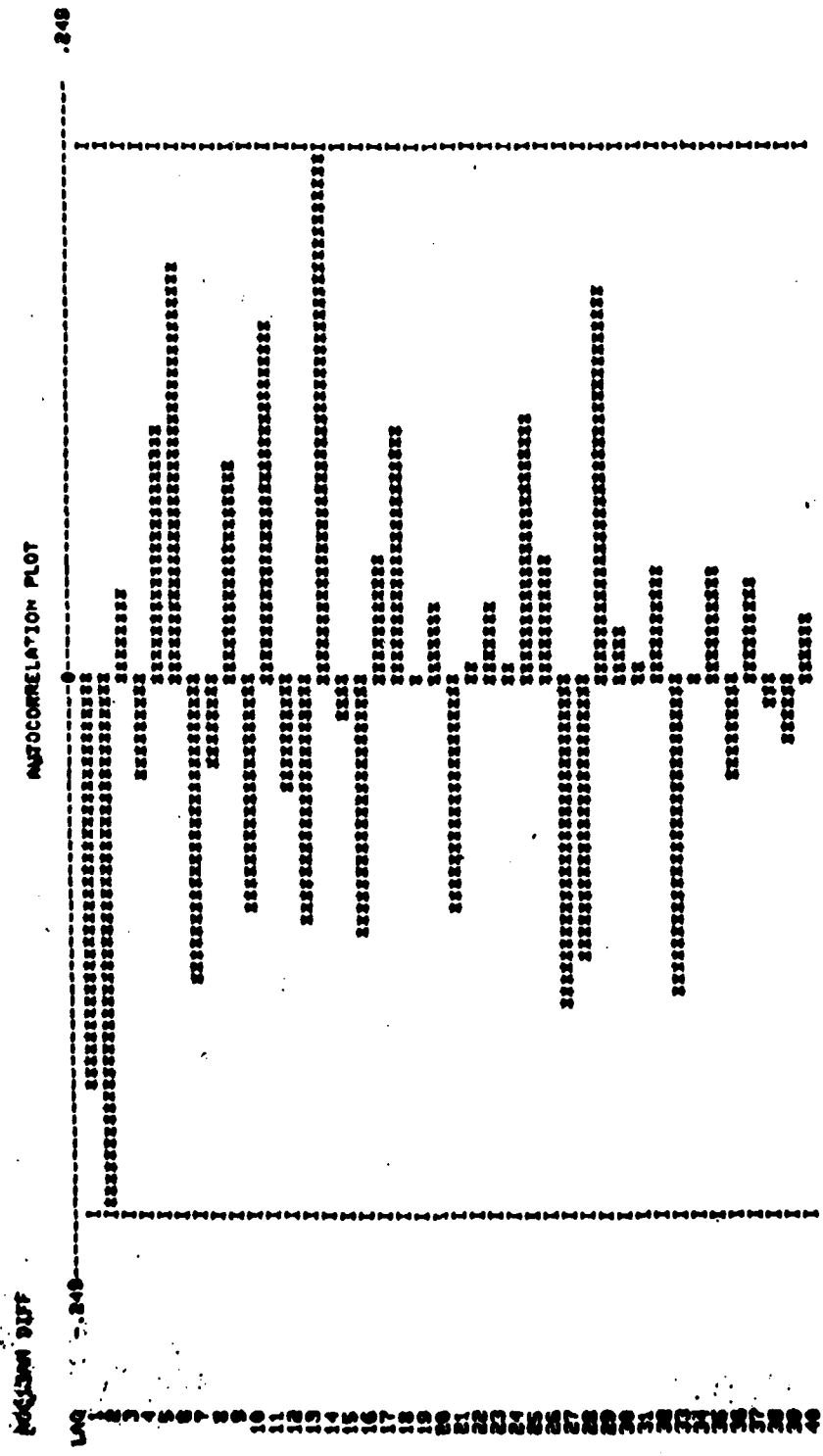
(PIN) = ACT (IN)

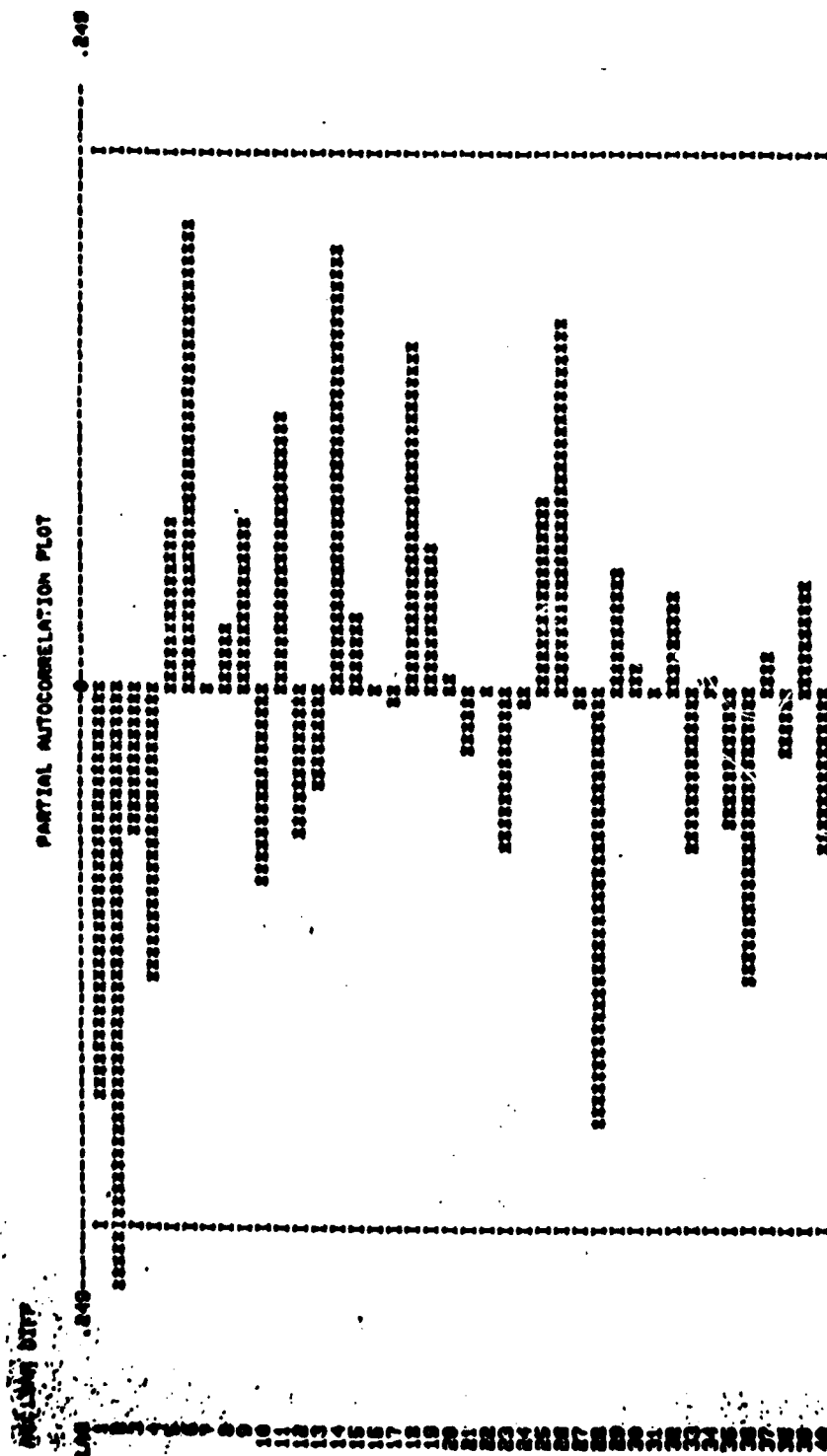
R -array

1	0.662	2.433	3.803	4.874	5.673	6.088	7.072	8.223	9.517	10
2	2.403	7.753	1.5015	2.808	2.825	2.782	2.782	2.782	2.512	0.000
3	2.282	4.170	2.862	3.154	1.457	2.904	2.904	2.904	1.4793	0.000
4	2.498	3.026	0.615	7.925	1.0428	2.308	2.308	2.308	4.042	0.000
5	2.904	1.0586	3.120	7.925	2.2559	0.283	0.283	0.283	3.1880	0.000
6	2.904	2.430	2.261	5.814	4.885	0.732	0.732	0.732	1.6964	0.000
7	3.159	5.000	2.261	2.406	4.818	0.748	0.748	0.748	2.7560	0.000
8	3.223	5.3473	2.438	1.236	1.800	2.700	2.700	2.700	2.5228	0.000
9	3.187	4.669	2.235	1.0131	1.0495	2.3072	2.3072	2.3072	1.870	0.000
10	4.424	5.484	0.425	1.8592	1.0388	0.136	0.136	0.136	5.894	0.000
11	4.788	2.1009	0.425	1.8592	1.0388	0.136	0.136	0.136	3.370	0.000
12	5.633	2.1009	0.425	1.8592	1.0388	0.136	0.136	0.136	5.894	0.000
13	5.982	1.0520	1.0945	1.718	1.353	1.127	1.127	1.127	1.592	0.000
14	7.131	1.7131	1.0945	2.3072	0.643	0.643	0.643	0.643	1.592	0.000
15	1.0000	2.314	1.248	1.581	1.223	1.118	1.118	1.118	1.592	0.000
16	7.131	2.314	1.248	1.581	1.223	1.118	1.118	1.118	1.592	0.000
17	5.982	1.350	1.350	0.555	1.871	0.087	0.087	0.087	1.1784	0.000
18	5.633	2.358	1.310	0.820	1.645	0.735	0.735	0.735	0.000	0.000
19	4.788	4.31	3.33	0.240	1.92	1.92	1.92	1.92	0.000	0.000
20	4.424	0.52	3.434	3.800	2.474	1.92	1.92	1.92	0.000	0.000
21	3.749	3.427	1.500	2.659	1.870	0.4716	0.4716	0.4716	0.000	0.000
22	3.187	0.859	1.7186	1.820	1.712	0.0000	0.0000	0.0000	0.000	0.000
23	3.223	0.675	0.002	0.650	0.487	0.0000	0.0000	0.0000	0.000	0.000
24	2.904	4.137	0.563	0.402	0.0000	0.0000	0.0000	0.0000	0.000	0.000
25	2.904	1.733	2.372	0.000	0.0000	0.0000	0.0000	0.0000	0.000	0.000
26	2.904	1.452	2.073	0.000	0.0000	0.0000	0.0000	0.0000	0.000	0.000
27	2.498	3.469	2.472	0.000	0.0000	0.0000	0.0000	0.0000	0.000	0.000
28	2.282	5.236	0.000	0.000	0.0000	0.0000	0.0000	0.0000	0.000	0.000
29	2.403	0.000	0.000	0.000	0.0000	0.0000	0.0000	0.0000	0.000	0.000
30	0.662	0.000	0.000	0.000	0.0000	0.0000	0.0000	0.0000	0.000	0.000
31	0.340	0.000	0.000	0.000	0.0000	0.0000	0.0000	0.0000	0.000	0.000

Appendix D-3

Simple and Partial Autocorrelation Plots for Differenced
ACC13AM





Appendix D-4

ACC13AM Differenced- Periodogram, R and S Arrays
(Low and High Frequencies)

I	F0	P	INTENSITY
1	.013	80.000	425263.264
2	.025	40.000	95272.234
3	.030	26.667	142067.746
4	.050	20.000	430195.250
5	.063	16.000	309961.510
6	.075	13.333	554123.006
7	.080	11.429	117026.221
8	.100	10.000	221731.274
9	.113	8.809	276989.756
10	.125	8.000	760311.606
11	.130	7.273	360433.640
12	.150	6.667	15013.410
13	.163	6.154	2414000.402
14	.175	5.714	140209.517
15	.180	5.333	316635.120
16	.200	5.000	2424474.010
17	.213	4.706	1701752.256
18	.225	4.444	1355003.652
19	.230	4.211	1104390.909
20	.250	4.000	205641.225
21	.263	3.810	204164.037
22	.275	3.636	2536959.417
23	.280	3.470	1250704.706
24	.300	3.333	669037.054
25	.313	3.200	1046371.276
26	.325	3.077	769922.030
27	.330	2.963	270799.307
28	.350	2.857	5259793.421
29	.363	2.759	2436559.057
30	.375	2.667	1521650.649
31	.380	2.581	171317.097
32	.400	2.500	267971.656
33	.413	2.424	1334370.454
34	.425	2.353	367933.390
35	.430	2.286	1499523.795
36	.450	2.222	740633.271
37	.463	2.162	670635.032
38	.475	2.105	626430.953
39	.480	2.051	979614.676
40	.500	2.000	230504.225

AVERAGE INTENSITY= 910403.2147095396

away

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Appendix D-5

ACC13AM - BMDP Output for ARI (2,1) Model

ARIMA VARIABLE IS ACC13AM.
 ORDER IS 1.
 ARORDERS ARE '(1,2)'.
 CENTERED./

ESTIMATION RESIDUAL = RACC./

ESTIMATION BY CONDITIONAL LEAST SQUARES METHOD

RELATIVE CHANGE IN EACH ESTIMATE LESS THAN .1000E-03

VARIABLE	VAR.	TYPE	MEAN	TIME	DIFFERENCES
ACC13AM	RANDOM	REMOVED	1-	81	(1-B)

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	ACC13AM	AR	1	1	-.2004	.1092	-2.57
2	ACC13AM	AR	1	2	-.2706	.1017	-2.74

RESIDUAL SUM OF SQUARES = 27219117.115255
 DEGREES OF FREEDOM = 76
 RESIDUAL MEAN SQUARE = 358146.277032

ESTIMATION BY BACKCASTING METHOD

RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN .1000E-04

VARIABLE	VAR.	TYPE	MEAN	TIME	DIFFERENCES
ACC13AM	RANDOM	REMOVED	1-	81	(1-B)

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	ACC13AM	AR	1	1	-.2763	.0938	-2.95
2	ACC13AM	AR	1	2	-.3269	.0937	-3.49

RESIDUAL SUM OF SQUARES = 27305053.812457 (BACKCASTS EXCLUDED)
 DEGREES OF FREEDOM = 76
 RESIDUAL MEAN SQUARE = 359207.550164

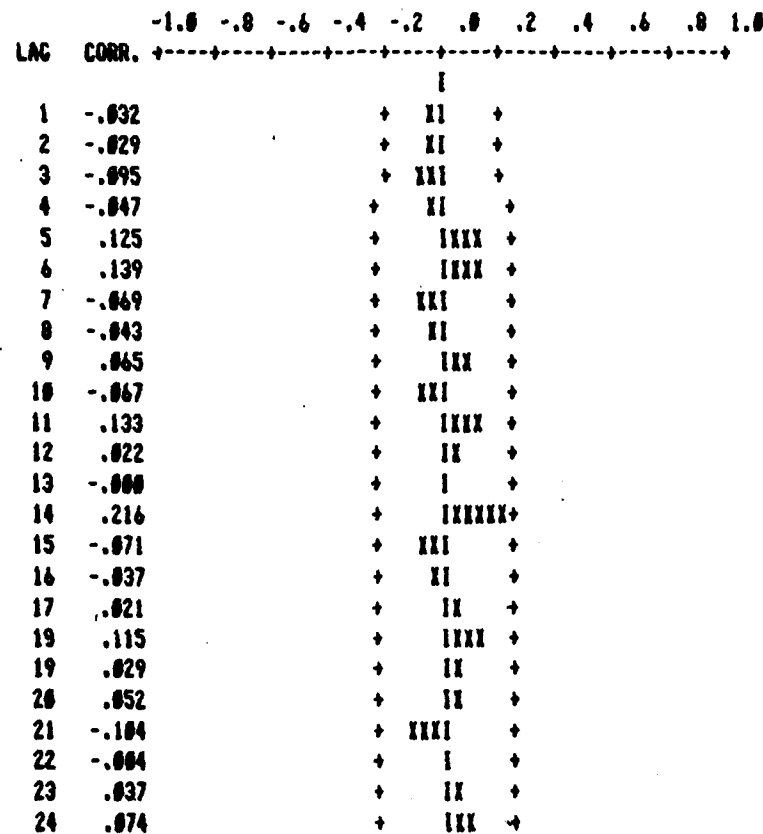
ACF VARIABLE IS RACC. MAXLAG IS 24./

NUMBER OF OBSERVATIONS = 81
 MEAN OF THE (DIFFERENCED) SERIES = -11.4826
 STANDARD ERROR OF THE MEAN = 69.8198
 T-VALUE OF MEAN (AGAINST ZERO) = -.1645

AUTOCORRELATIONS

1- 12	-.03	-.03	-.09	-.05	.13	.14	-.07	-.04	.06	-.07	.13	.02
ST.E.	.11	.11	.11	.11	.11	.11	.12	.12	.12	.12	.12	.12
13- 24	0.0	.22	-.07	-.04	.02	.11	.03	.05	-.10	0.0	.04	.07
ST.E.	.12	.12	.12	.13	.13	.13	.13	.13	.13	.13	.13	.13

PLOT OF SERIAL CORRELATION



```
NUMBER OF OBSERVATIONS      =          81
MEAN OF THE (DIFFERENCED) SERIES =      -11.4826
STANDARD ERROR OF THE MEAN   =       69.8190
T-VALUE OF MEAN (AGAINST ZERO) =      -1.6445
```

1- 12	.03 .03 -.10 -.06 .12 .14 -.06 -.02 .10 -.08 .09 .04										
ST.E.	.11 .11 .11 .11 .11 .11 .11 .11 .11 .11 .11 .11										
13- 24	.03 .23 -.05 -.03 .03 .13 -.01 -.01 -.01 .01 -.04 .07										
ST.E.	.11 .11 .11 .11 .11 .11 .11 .11 .11 .11 .11 .11										

LAC	CORR.	-1.0	-.8	-.6	-.4	-.2	.0	.2	.4	.6	.8	1.0
1	-.032						I					
2	-.030						II					
3	-.097						III					
4	-.055						II					
5	.117						XXXX					
6	.139						XXXX					
7	-.063						XXI					
8	-.024						XI					
9	.101						XXXX					
10	-.078						XXI					
11	.007						IXX					
12	.040						IX					
13	.026						IX					
14	.232						XXXXXX					
15	-.054						XI					
16	-.032						XI					
17	.020						IX					
18	.120						XXXX					
19	-.009						I					
20	-.007						I					
21	-.012						I					
22	.009						I					
23	-.040						XI					
24	.071						IXX					

Appendix D-6

ACC13AM - BMDP Output for ARIMA (2,1,0)*(1,0,0)₁₄

ARIMA VARIABLE IS ACC13AM.
 DFOUR IS 1.
 ARORDERS ARE '(1,2,14)'.
 CENTERED./

ESTIMATION RESIDUAL = RACC./

ESTIMATION BY CONDITIONAL LEAST SQUARES METHOD

RELATIVE CHANGE IN EACH ESTIMATE LESS THAN .1000E-03

VARIABLE	VAR.	TYPE	MEAN	TIME	DIFFERENCES
ACC13AM	RANDOM	REMOVED	1-	81	(1-B)

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	ACC13AM	AR	1	1	-.3590	.0983	-3.65
2	ACC13AM	AR	1	2	-.2042	.0965	-2.94
3	ACC13AM	AR	1	14	.1031	.0050	2.15

RESIDUAL SUM OF SQUARES = 1480064.398234
 DEGREES OF FREEDOM = 63
 RESIDUAL MEAN SQUARE = 236191.498385

ESTIMATION BY BACKCASTING METHOD

VARIABLE	VAR.	TYPE	MEAN	TIME	DIFFERENCES
ACC13AM	RANDOM	REMOVED	1-	81	(1-B)

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	ACC13AM	AR	1	1	-.1835	.0803	-2.29
2	ACC13AM	AR	1	2	-.2429	.0786	-3.09
3	ACC13AM	AR	1	14	.2670	.0726	3.68

RESIDUAL SUM OF SQUARES = 15763099.463337 (BACKCASTS EXCLUDED)
 DEGREES OF FREEDOM = 63
 RESIDUAL MEAN SQUARE = 250207.927989

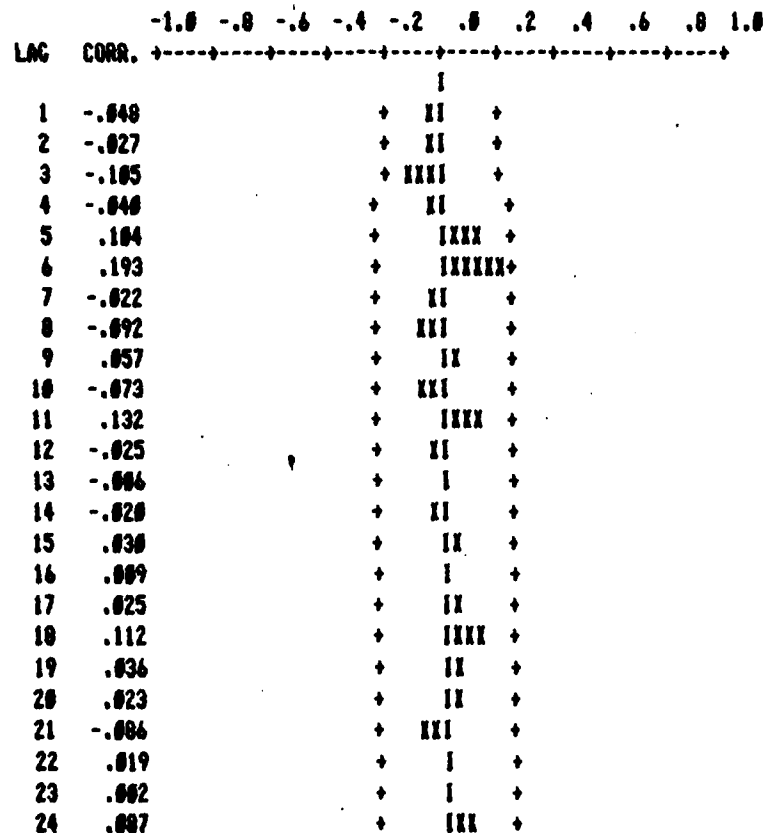
ACF VARIABLE IS RACC. NAILAG IS 24./

NUMBER OF OBSERVATIONS = 81
 MEAN OF THE (DIFFERENCED) SERIES = -11.1227
 STANDARD ERROR OF THE MEAN = 68.1453
 T-VALUE OF MEAN (AGAINST ZERO) = -.1632

AUTOCORRELATIONS

1- 12	-.05	-.03	-.10	-.04	.10	.19	-.02	-.09	.06	-.07	.13	-.03
ST.E.	.11	.11	.11	.11	.11	.11	.12	.12	.12	.12	.12	.12
13- 24	-.01	-.02	.03	.01	.03	.11	.04	.02	-.09	.02	0.0	.09
ST.E.	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12

PLOT OF SERIAL CORRELATION



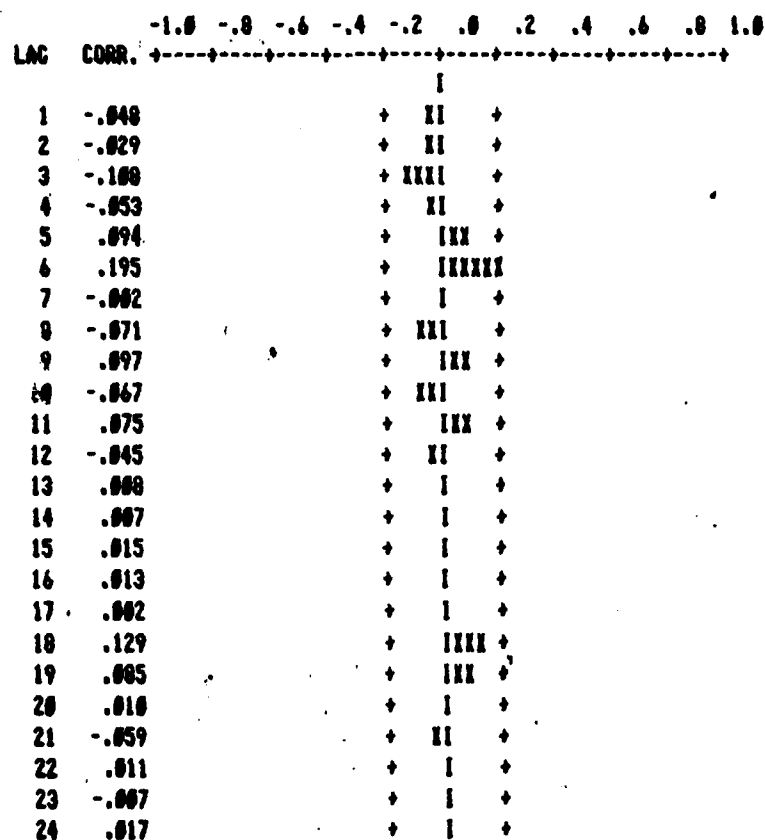
PACF VARIABLE IS RACC. MAILAC IS 24./

NUMBER OF OBSERVATIONS	*	81
MEAN OF THE (DIFFERENCED) SERIES	*	-11.1227
STANDARD ERROR OF THE MEAN	*	69.1453
T-VALUE OF MEAN (AGAINST ZERO)	*	-.1632

PARTIAL AUTOCORRELATIONS

1- 12	-.05	-.03	-.11	-.05	.09	.19	0.0	-.07	.10	-.07	.07	-.05
ST.E.	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11
13- 24	.01	.01	.02	.01	0.0	.13	.00	.01	-.06	.01	-.01	.02
ST.E.	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11

PLOT OF SERIAL CORRELATION

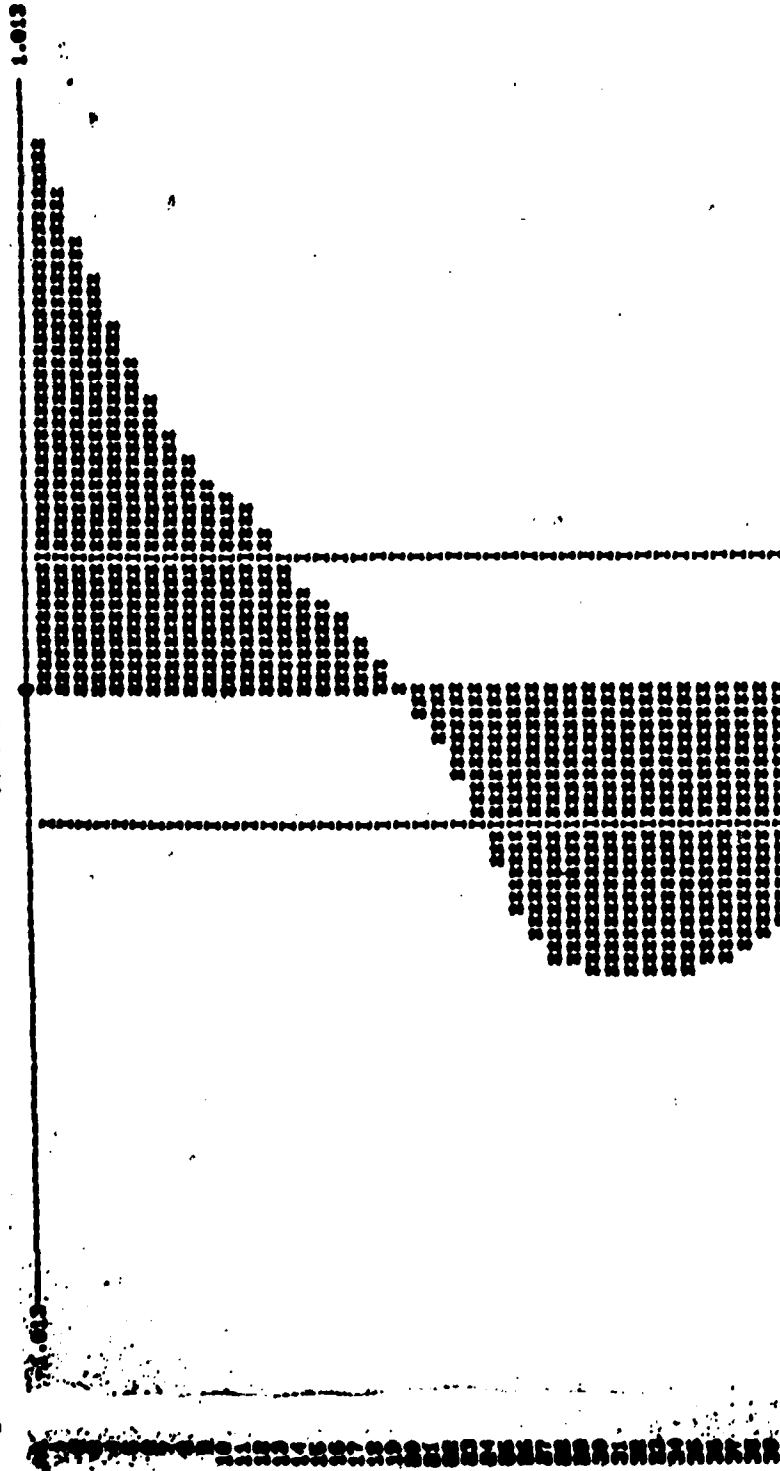


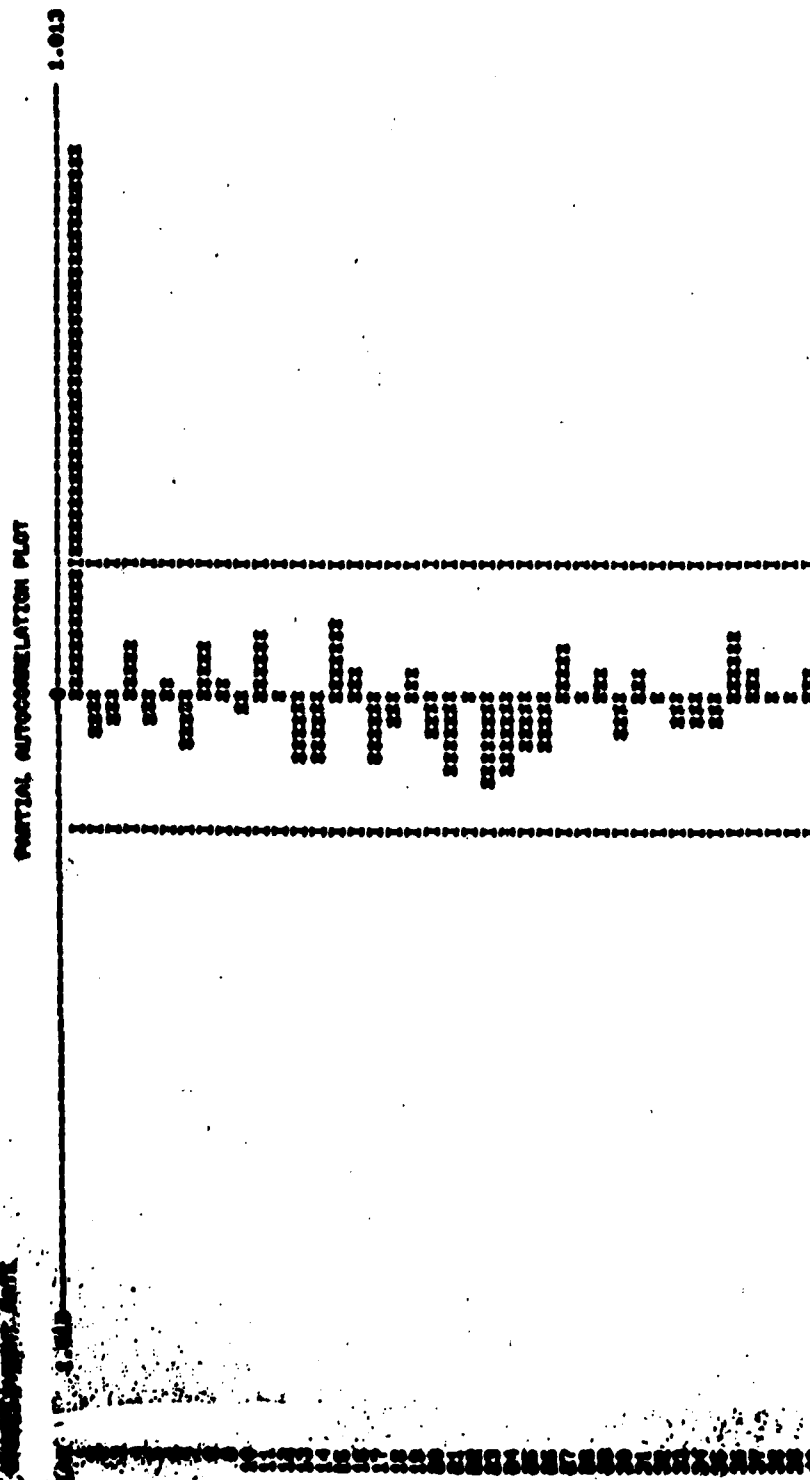
Appendix E-1

TSP Output for Raw Unemployment Rate Data

PO	P	INTENSITY
1	1	2.0007400220
2	2	2.0007400220
3	3	2.0007400220
4	4	2.0007400220
5	5	2.0007400220
6	6	2.0007400220
7	7	2.0007400220
8	8	2.0007400220
9	9	2.0007400220
10	10	2.0007400220
11	11	2.0007400220
12	12	2.0007400220
13	13	2.0007400220
14	14	2.0007400220
15	15	2.0007400220
16	16	2.0007400220
17	17	2.0007400220
18	18	2.0007400220
19	19	2.0007400220
20	20	2.0007400220
21	21	2.0007400220
22	22	2.0007400220
23	23	2.0007400220
24	24	2.0007400220
25	25	2.0007400220
26	26	2.0007400220
27	27	2.0007400220
28	28	2.0007400220
29	29	2.0007400220
30	30	2.0007400220
31	31	2.0007400220
32	32	2.0007400220
33	33	2.0007400220
34	34	2.0007400220
35	35	2.0007400220
36	36	2.0007400220
37	37	2.0007400220
38	38	2.0007400220
39	39	2.0007400220
40	40	2.0007400220
41	41	2.0007400220
42	42	2.0007400220
43	43	2.0007400220
44	44	2.0007400220
45	45	2.0007400220
46	46	2.0007400220
47	47	2.0007400220
48	48	2.0007400220
49	49	2.0007400220
50	50	2.0007400220
51	51	2.0007400220
52	52	2.0007400220
53	53	2.0007400220
54	54	2.0007400220
55	55	2.0007400220
56	56	2.0007400220
57	57	2.0007400220
58	58	2.0007400220
59	59	2.0007400220
60	60	2.0007400220
61	61	2.0007400220
62	62	2.0007400220
63	63	2.0007400220
64	64	2.0007400220
65	65	2.0007400220
66	66	2.0007400220
67	67	2.0007400220
68	68	2.0007400220
69	69	2.0007400220
70	70	2.0007400220
71	71	2.0007400220
72	72	2.0007400220
73	73	2.0007400220
74	74	2.0007400220
75	75	2.0007400220
76	76	2.0007400220
77	77	2.0007400220
78	78	2.0007400220
79	79	2.0007400220
80	80	2.0007400220
81	81	2.0007400220
82	82	2.0007400220
83	83	2.0007400220
84	84	2.0007400220
85	85	2.0007400220
86	86	2.0007400220
87	87	2.0007400220
88	88	2.0007400220
89	89	2.0007400220
90	90	2.0007400220
91	91	2.0007400220
92	92	2.0007400220
93	93	2.0007400220
94	94	2.0007400220
95	95	2.0007400220
96	96	2.0007400220
97	97	2.0007400220
98	98	2.0007400220
99	99	2.0007400220
100	100	2.0007400220

AUTOCORRELATION PLOT





(F(N) * ((-1) ** N) * AC(F(N)))

R -ARRAY

	1	2	3	4	5	6	7	8	9	10
1	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000
7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000
8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000
9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000
10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000

20

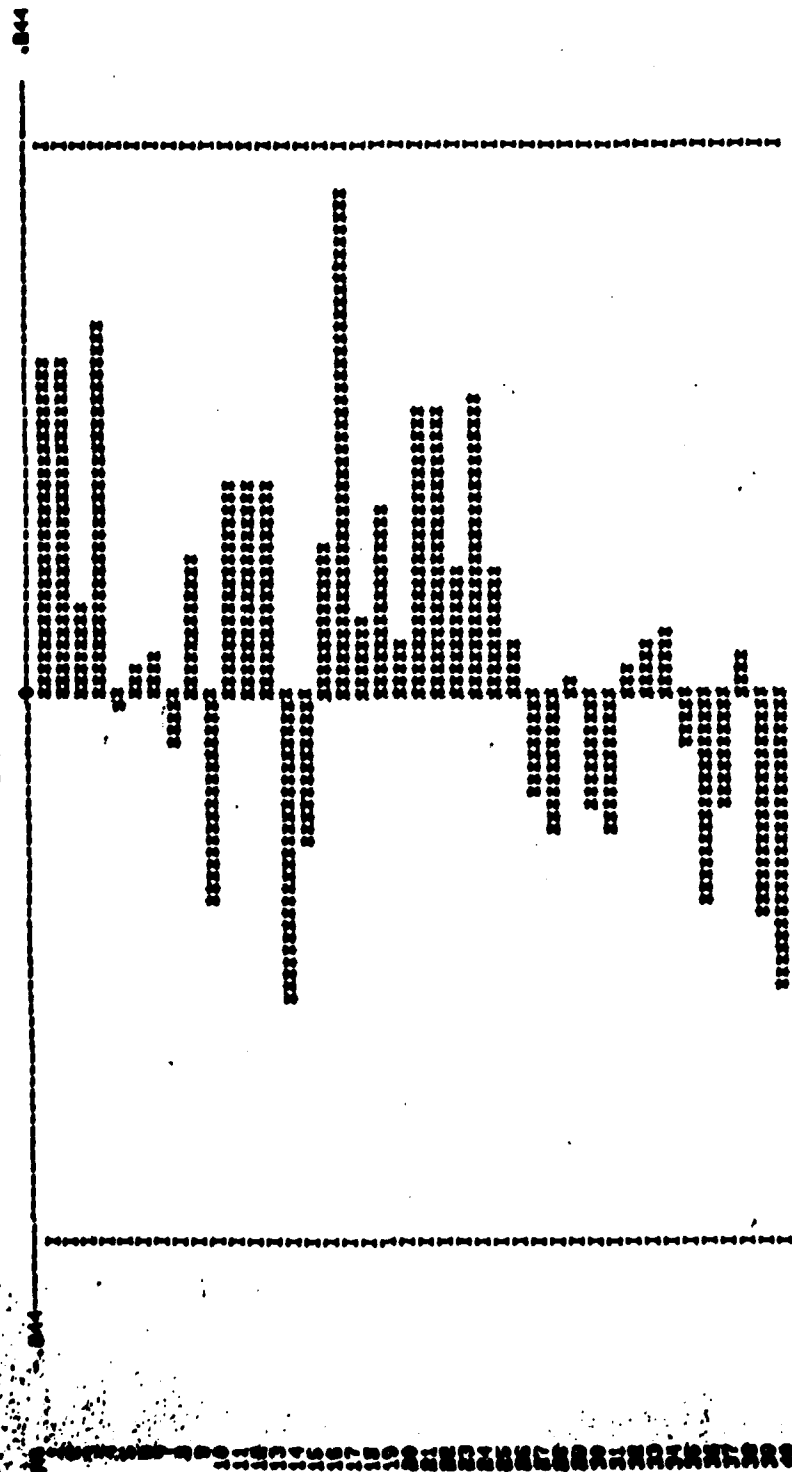
259

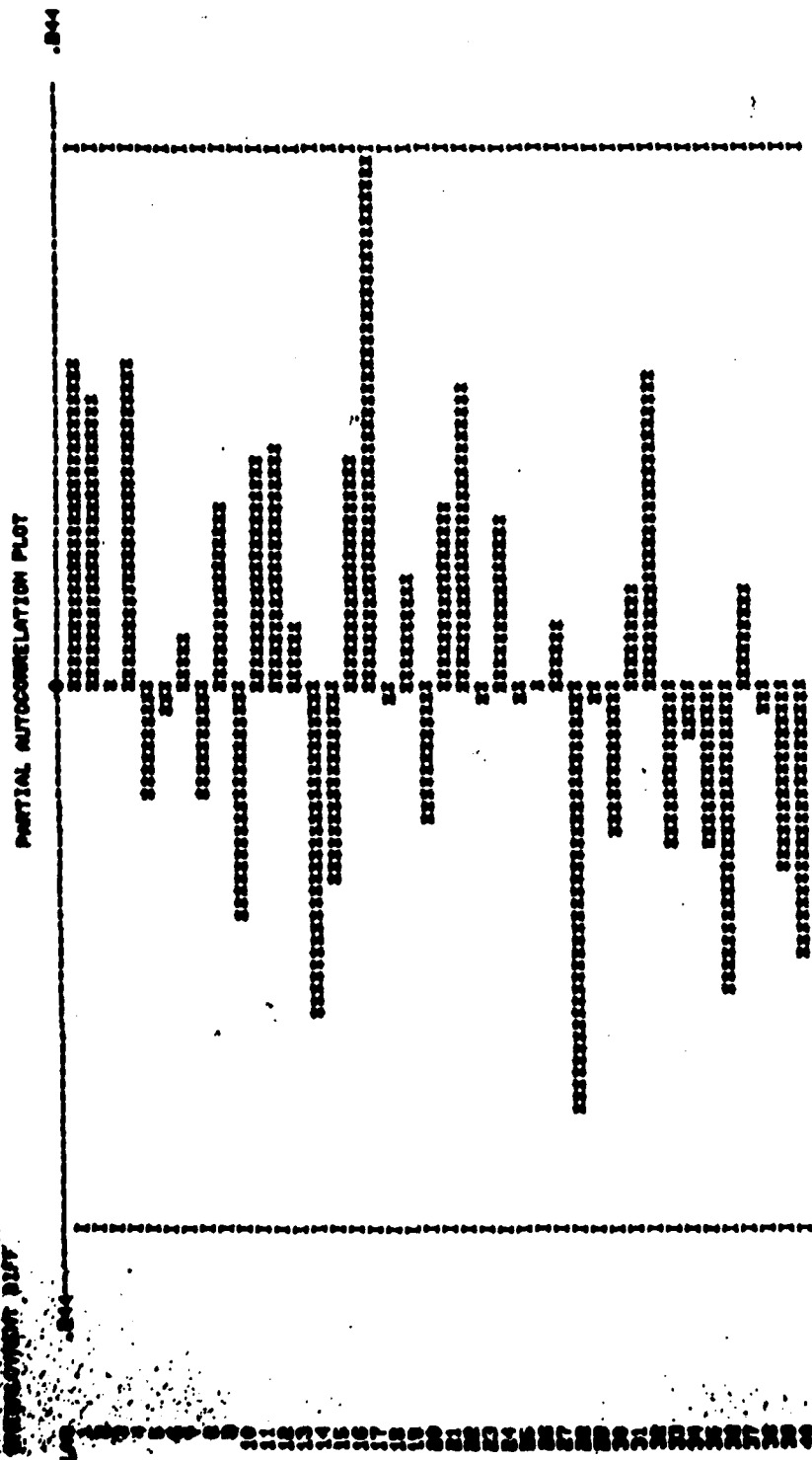
Appendix E-2

TSP Output for Differenced Unemployment Rate Data

128750000

AUTOCORRELATION PLOT





8

1	2	3	4	5	6	7	8	9	10
0001	1103	1103	2120	-1136	0353	0109	0076	2040	11013
0002	0002	0002	1130	0000	-1720	0109	-1906	5214	00573
0003	0003	0003	0000	0000	-1204	0012	-1400	28540	1-2334
0004	0004	0004	0000	0001	-1000	0017	0000	27878	1-3746
0005	0005	0005	0001	0001	-0001	0017	0000	14897	4-5092
0006	0006	0006	41006	0000	-0001	01013	0000	141314	5-5038
0007	0007	0007	41006	0000	-0001	01013	0000	26778	5-5038
0008	0008	0008	0000	0000	-0000	0000	0000	106773	00007
0009	0009	0009	0000	0000	-0000	0000	0000	106773	00007
0010	0010	0010	0000	0000	-0000	0000	0000	0000	00007
0011	0011	0011	0000	0000	-0000	0000	0000	0000	00007
0012	0012	0012	0000	0000	-0000	0000	0000	0000	00007
0013	0013	0013	0000	0000	-0000	0000	0000	0000	00007
0014	0014	0014	0000	0000	-0000	0000	0000	0000	00007
0015	0015	0015	0000	0000	-0000	0000	0000	0000	00007
0016	0016	0016	0000	0000	-0000	0000	0000	0000	00007
0017	0017	0017	0000	0000	-0000	0000	0000	0000	00007
0018	0018	0018	0000	0000	-0000	0000	0000	0000	00007
0019	0019	0019	0000	0000	-0000	0000	0000	0000	00007
0020	0020	0020	0000	0000	-0000	0000	0000	0000	00007
0021	0021	0021	0000	0000	-0000	0000	0000	0000	00007
0022	0022	0022	0000	0000	-0000	0000	0000	0000	00007
0023	0023	0023	0000	0000	-0000	0000	0000	0000	00007
0024	0024	0024	0000	0000	-0000	0000	0000	0000	00007
0025	0025	0025	0000	0000	-0000	0000	0000	0000	00007
0026	0026	0026	0000	0000	-0000	0000	0000	0000	00007
0027	0027	0027	0000	0000	-0000	0000	0000	0000	00007
0028	0028	0028	0000	0000	-0000	0000	0000	0000	00007
0029	0029	0029	0000	0000	-0000	0000	0000	0000	00007
0030	0030	0030	0000	0000	-0000	0000	0000	0000	00007
0031	0031	0031	0000	0000	-0000	0000	0000	0000	00007
0032	0032	0032	0000	0000	-0000	0000	0000	0000	00007
0033	0033	0033	0000	0000	-0000	0000	0000	0000	00007
0034	0034	0034	0000	0000	-0000	0000	0000	0000	00007
0035	0035	0035	0000	0000	-0000	0000	0000	0000	00007
0036	0036	0036	0000	0000	-0000	0000	0000	0000	00007
0037	0037	0037	0000	0000	-0000	0000	0000	0000	00007
0038	0038	0038	0000	0000	-0000	0000	0000	0000	00007
0039	0039	0039	0000	0000	-0000	0000	0000	0000	00007
0040	0040	0040	0000	0000	-0000	0000	0000	0000	00007
0041	0041	0041	0000	0000	-0000	0000	0000	0000	00007
0042	0042	0042	0000	0000					

12

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Appendix E-3

BMDP Output for Optimal Unemployment Rate Model and
a Comparison of Cumulative Periodogram Plots

ARJNO VARIABLE IS UNEMP
 ANNOTATIONS ARE -- 11.21
 ANNOTATIONS -- 1.127
 CENTERED

ESTIMATION RESIDUALS = RE./

ESTIMATION BY CONDITIONAL LEAST SQUARES METHOD

RELATIVE CHANGE IN EACH ESTIMATE LESS THAN .1000E-03

SUMMARY OF THE MODEL

OUTPUT VARIABLE -- UNEMP
 INPUT VARIABLES -- NOISE

VARIABLE	VAR.	TYPE	MEAN	TIME	DIFFERENCES
UNEMP	RANDOM	REMOVED	1- 01		

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	UNEMP	AR	1	1	1.127	.1127	10.03
2	UNEMP	AR	1	2	-.1477	.1164	-1.28

RESIDUAL SUM OF SQUARES = 0.000028
 DEGREES OF FREEDOM = 77
 RESIDUAL MEAN SQUARE = .000702

ESTIMATION BY BACKCASTING METHOD

RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN .1000E-04

SUMMARY OF THE MODEL

OUTPUT VARIABLE -- UNEMP
 INPUT VARIABLES -- NOISE

VARIABLE	VAR.	TYPE	MEAN	TIME	DIFFERENCES
UNEMP	RANDOM	REMOVED	1- 01		

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	UNEMP	AR	1	1	1.122	.0811	1071.73
2	UNEMP	AR	1	2	-.1363	.0847	-20.10

RESIDUAL SUM OF SQUARES = 0.070037 (BACKCASTS EXCLUDED)
 DEGREES OF FREEDOM = 77
 RESIDUAL MEAN SQUARE = .000902
 1 PAGE 8

ARIMA VARIABLE IS UNEMP.
 ORDERS ARE '(1,2)'.
 ARVALUES = 1.1301, -.1477.
 CENTERED./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
 OUTPUT VARIABLE = UNEMP
 INPUT VARIABLE = NOISE

ESTIMATION RESIDUALS = RI.
 METHOD IS CLS./

ESTIMATION BY CONDITIONAL LEAST SQUARES METHOD

RELATIVE CHANGE IN EACH ESTIMATE LESS THAN .1000E-03

SUMMARY OF THE MODEL

OUTPUT VARIABLE -- UNEMP
 INPUT VARIABLES -- NOISE

VARIABLE VAR. TYPE MEAN TIME DIFFERENCES

UNEMP RANDOM REMOVED 1- 81

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	UNEMP	AR	1	1	1.1301	.1127	10.03
2	UNEMP	AR	1	2	-.1477	.1154	-1.28

RESIDUAL SUM OF SQUARES	=	5.065950
DEGREES OF FREEDOM	=	77
RESIDUAL MEAN SQUARE	=	.065792

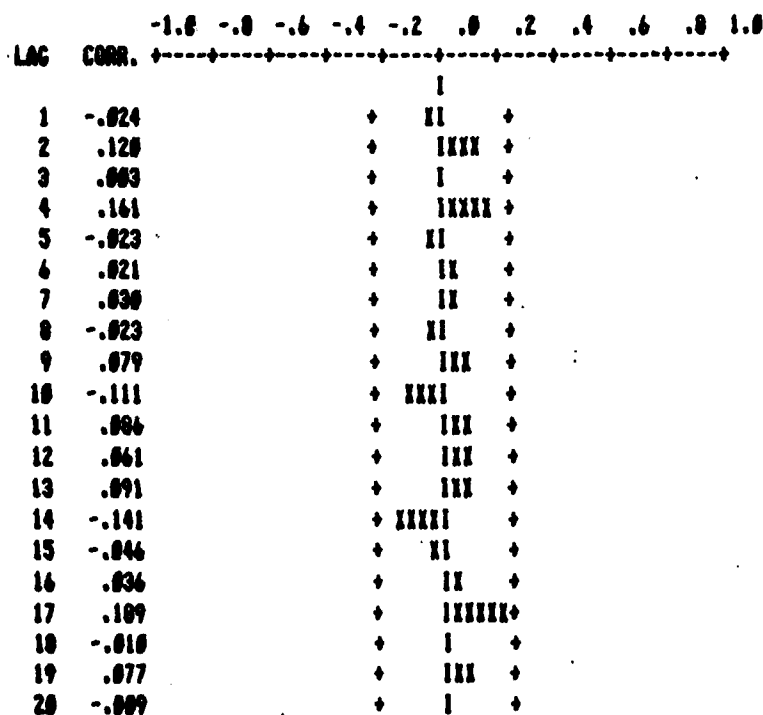
ACF VARIABLE IS RI. MAILAC IS 20.1

NUMBER OF OBSERVATIONS = 79
 MEAN OF THE (DIFFERENCED) SERIES = .0101
 STANDARD ERROR OF THE MEAN = .0286
 T-VALUE OF MEAN (AGAINST ZERO) = .3527

AUTOCORRELATIONS

1- 12	-.02	.12	0.0	.16	-.02	.02	.03	-.02	.00	-.11	.09	.06
ST.E.	.11	.11	.11	.11	.12	.12	.12	.12	.12	.12	.12	.12
13- 20	.09	-.14	-.05	.04	.19	-.01	.00	-.01				
ST.E.	.12	.12	.12	.12	.12	.13	.13	.13				

PLOT OF SERIAL CORRELATION



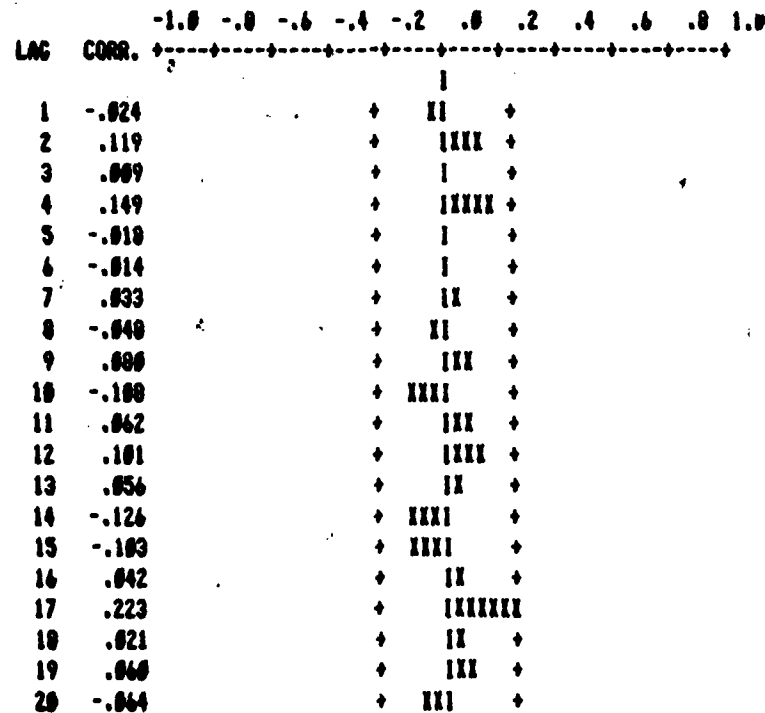
PACF VARIABLE IS RX. MAXLAG IS 20./

NUMBER OF OBSERVATIONS = 79
 MEAN OF THE (DIFFERENCED) SERIES = .0101
 STANDARD ERROR OF THE MEAN = .0206
 T-VALUE OF MEAN (AGAINST ZERO) = .3527

PARTIAL AUTOCORRELATIONS

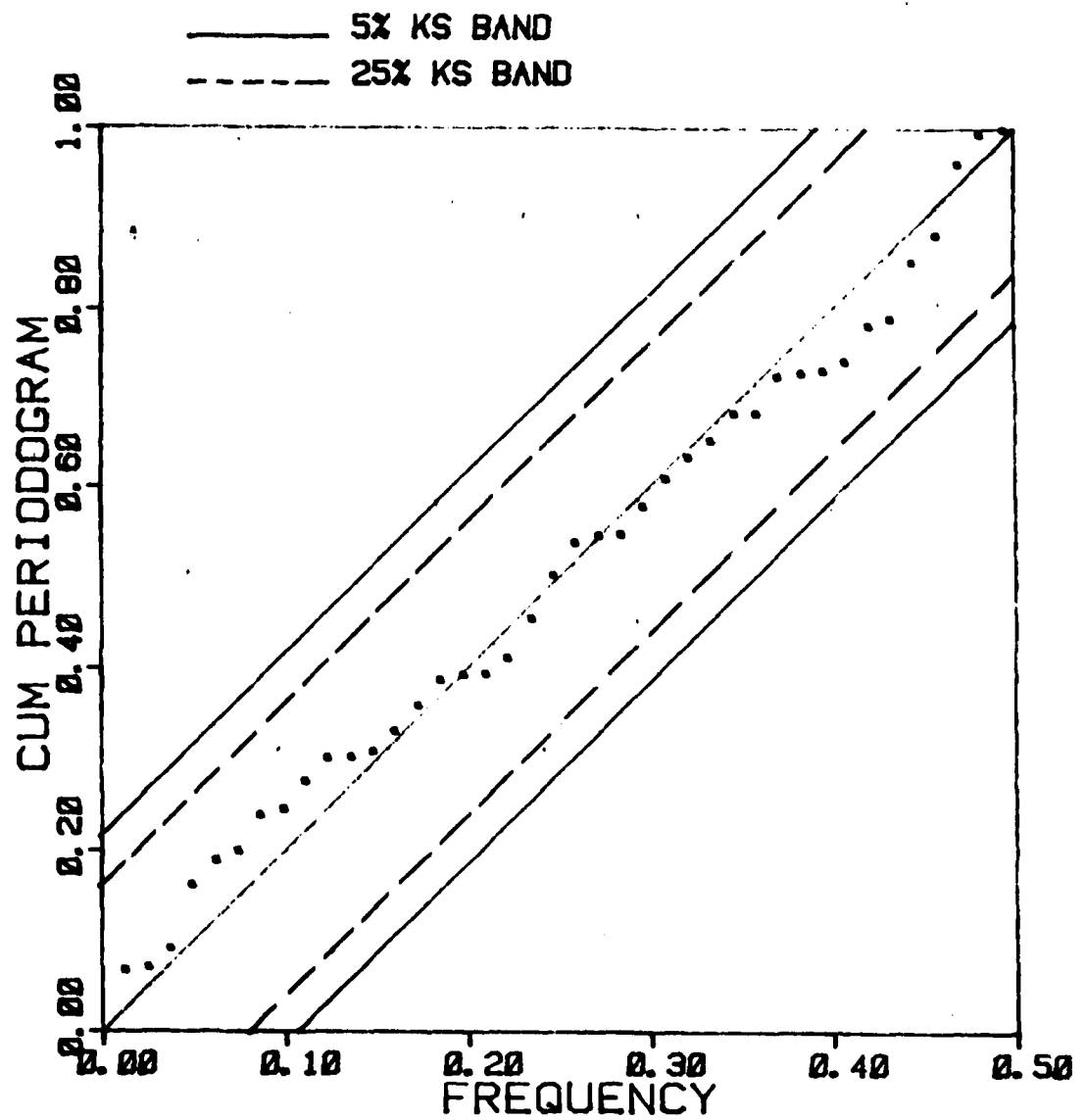
1- 12	-.02	.12	.01	.15	-.02	-.01	.03	-.05	.00	-.11	.04	.10
ST.E.	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11
13- 20	.06	-.13	-.10	.04	.22	.02	.06	-.06				
ST.E.	.11	.11	.11	.11	.11	.11	.11	.11				

PLOT OF SERIAL CORRELATION



UNEMP RATE

ARIMA(2, 0, 0)



AD-A124 845

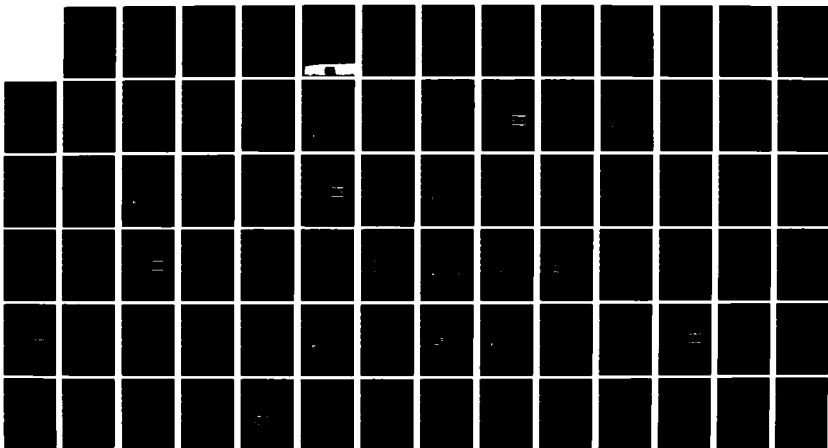
FACTORS INFLUENCING ARMY ACCESSIONS(U) AIR FORCE INST
OF TECH WRIGHT-PATTERSON AFB OH SCHOOL OF ENGINEERING
K M KALINICH ET AL. DEC 82 AFIT/GOR/OS/82D-7

4/4

UNCLASSIFIED

F/G 12/1

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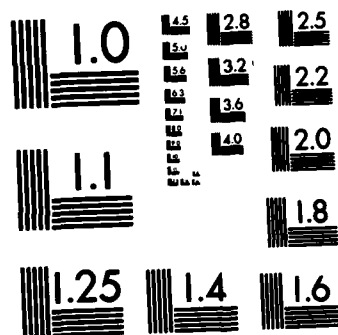


END

FILED

18

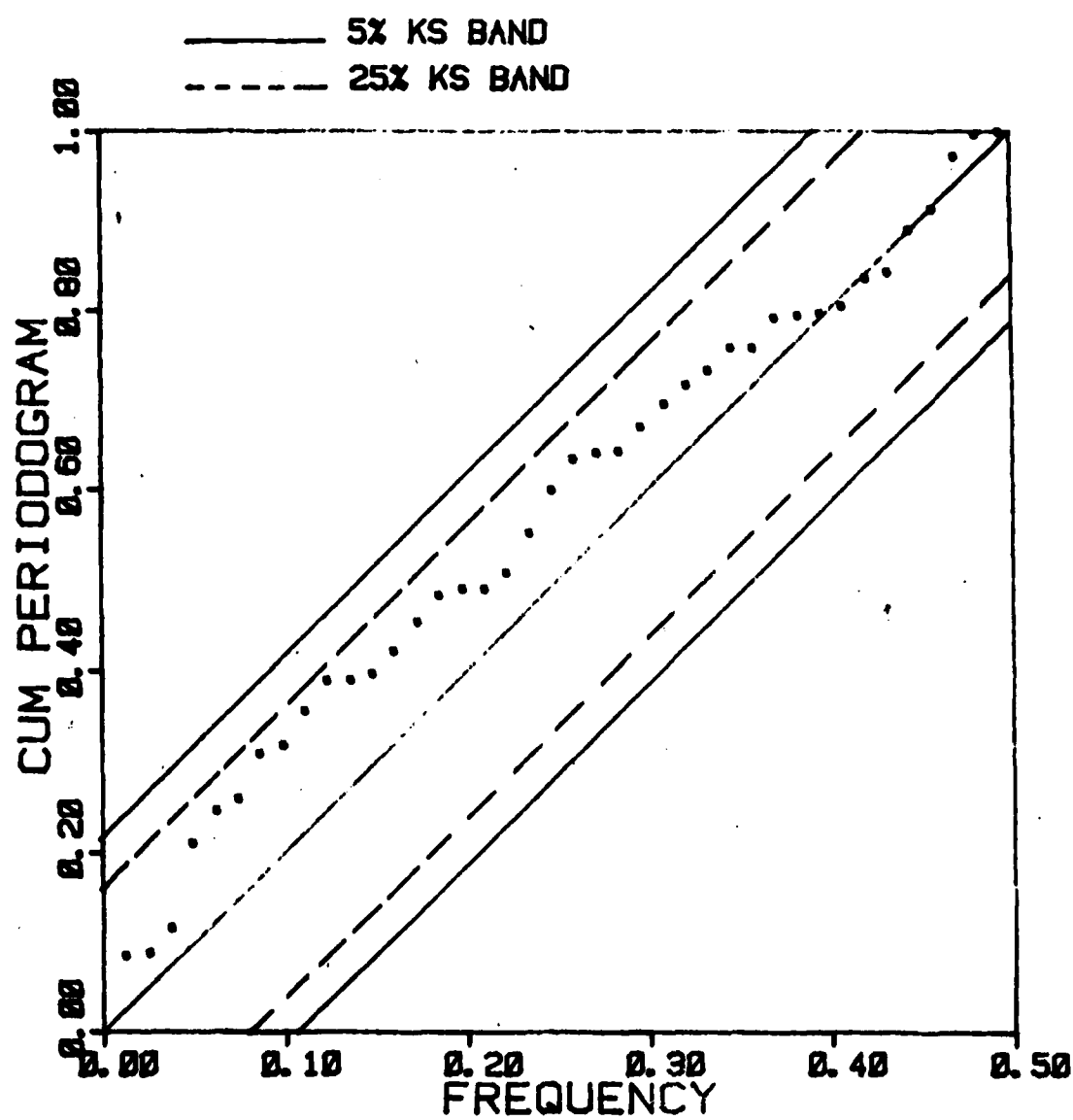
DTIC



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

UNEMP RATE

ARIMA(1, 1, 0)



Appendix E-4

BMDP Output for Leading Indicator Transfer Function
Model with Unemployment Rates as Input Variable

ARIMA VARIABLE IS ACC13AM.
 ARORDERS ARE '(1,6)'.
 ARVALUES = .5288, .4485.
 CENTERED./
 THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
 OUTPUT VARIABLE = ACC13AM
 INPUT VARIABLE = NOISE

INDEP VARIABLE IS UNEMP.
 UPORDERS = '(1,7,8)'.
 UPVALUES = 783.8, -441.8, 379.8./
 THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
 OUTPUT VARIABLE = ACC13AM
 INPUT VARIABLE = NOISE UNEMP

ESTIMATION RESIDUALS IS RYX.
 METHOD IS CLS./

ESTIMATION BY CONDITIONAL LEAST SQUARES METHOD

RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN .1888E-04

SUMMARY OF THE MODEL

OUTPUT VARIABLE -- ACC13AM
 INPUT VARIABLES -- NOISE UNEMP

VARIABLE	VAR. TYPE	MEAN	TIME	DIFFERENCES
ACC13AM	RANDOM	REMOVED	1-	01
UNEMP	RANDOM		1-	01

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	ACC13AM	AR	1	1	.5288	.0887	5.96
2	ACC13AM	AR	1	6	.4485	.0877	5.25
3	UNEMP	UP	1	1	782.9327	143.9189	4.88
4	UNEMP	UP	1	7	-441.8828	231.3832	-1.91
5	UNEMP	UP	1	8	379.8578	231.3298	1.64

RESIDUAL SUM OF SQUARES = 16481553.815996
 DEGREES OF FREEDOM = 62
 RESIDUAL MEAN SQUARE = 267766.984129

ACF VARIABLE IS RTI. MAILAC IS 20./

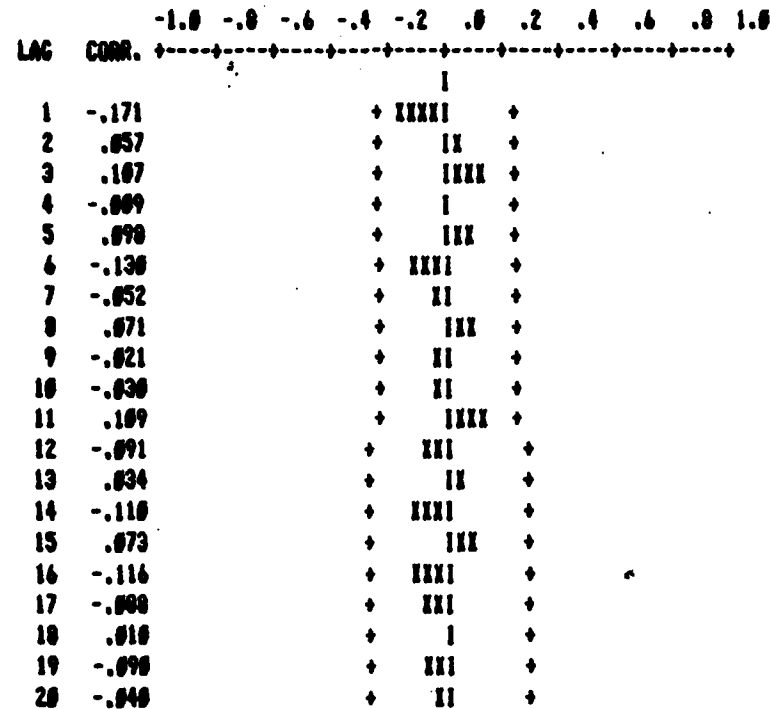
NUMBER OF OBSERVATIONS = 67
 MEAN OF THE (DIFFERENCED) SERIES = -0.6231
 STANDARD ERROR OF THE MEAN = 61.2632
 T-VALUE OF MEAN (AGAINST ZERO) = -0.1400

AUTOCORRELATIONS

1- 12 -.17 .06 .11 -.01 .10 -.13 -.05 .07 -.02 -.03 .11 -.09
 ST.E. .12 .13 .13 .13 .13 .13 .13 .13 .13 .13 .13 .13 .13

13- 20 .03 -.11 .07 -.12 -.09 .01 -.09 -.04
 ST.E. .13 .13 .14 .14 .14 .14 .14 .14

PLOT OF SERIAL CORRELATION



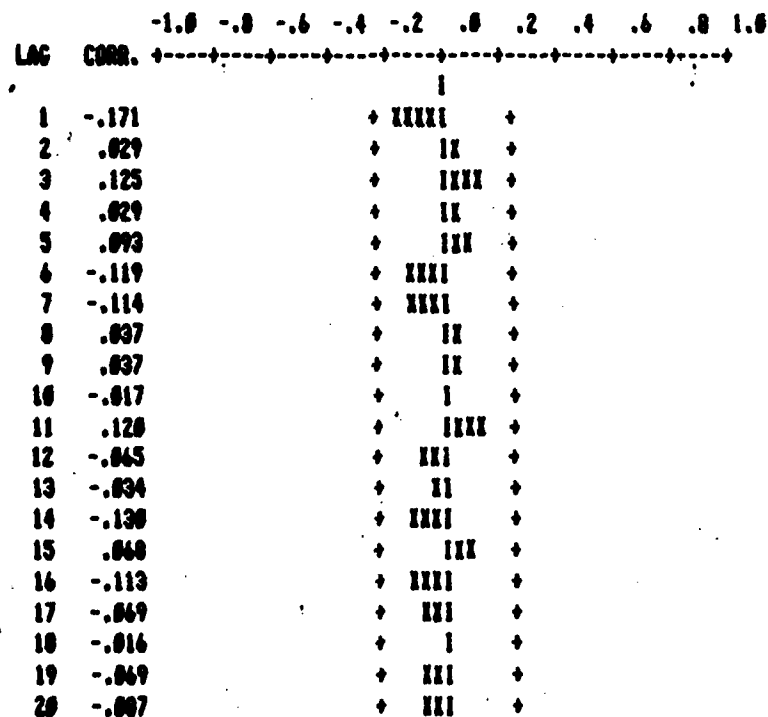
PACF VARIABLE IS RTX. MAILAC IS 20./

NUMBER OF OBSERVATIONS = 67
 MEAN OF THE (DIFFERENCED) SERIES = -0.6231
 STANDARD ERROR OF THE MEAN = 61.2632
 T-VALUE OF MEAN (AGAINST ZERO) = -0.1488

PARTIAL AUTOCORRELATIONS

1- 12	-.17	.03	.12	.03	.09	-.12	-.11	.04	.04	-.02	.12	-.06
ST.E.	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12
13- 20	-.03	-.13	.07	-.11	-.07	-.02	-.07	-.09				
ST.E.	.12	.12	.12	.12	.12	.12	.12	.12				

PLOT OF SERIAL CORRELATION



Appendix E-5

Forecasts Using Optimal Unemployment Rate Transfer
Function Model

ARIMA VARIABLE IS UNEMP.
 ARORDERS ARE '(1,2)'.
 ARVALUES = 1.130, -.1477.
 CENTERED./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
 OUTPUT VARIABLE = UNEMP
 INPUT VARIABLE = NOISE

FORECAST CASES ARE 24. JOIN./

PERIOD	FORECASTS	ST. ERR.	ACTUAL
82	9.45750	.25650	
83	9.40947	.30704	
84	9.36140	.40342	
85	9.31434	.56091	
86	9.26016	.62633	
87	9.22294	.60320	
88	9.17047	.73359	
89	9.13531	.77005	
90	9.09204	.81991	
91	9.05130	.85742	
92	9.01040	.89191	
93	8.97075	.92376	
94	8.93173	.95331	
95	8.89352	.98079	
96	8.85611	1.00644	
97	8.81940	1.03044	
98	8.78361	1.05293	
99	8.74049	1.07405	
100	8.71411	1.09391	
101	8.68043	1.11262	
102	8.64747	1.13027	
103	8.61510	1.14694	
104	8.58350	1.16270	
105	8.55243	1.17760	

STANDARD ERROR = .256499 (BY CONDITIONAL METHOD)

PSWEIGHT MAXPSI = 40./

40 PSI-WEIGHTS ARE STORED

ERASE MODEL./

UNIVARIATE TIME SERIES MODEL ERASED

ARIMA VARIABLE IS ACC13AM.
ARORDERS ARE '(1,6)'.
ARVALUES = .5288, .4685.
CENTERED./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT VARIABLE = NOISE

INDEP VARIABLE IS UNEMP.
UPORDERS = '(1,7,0)'.
UPVALUES = 789.0, -441.0, 379.0.
CENTERED./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT VARIABLE = NOISE UNEMP

FORECAST CASES = 48./

FORECAST CASES = 46./

FORECAST ON VARIABLE ACC13NM FROM TIME PERIOD 82

PERIOD	FORECASTS	ST. ERR.	ACTUAL
82	4777.45865	519.85866	
83	5044.97587	626.29125	
84	4968.74388	688.43988	
85	4882.42211	735.11545	
86	4494.18736	774.89383	
87	4731.33875	818.54486	
88	4725.19648	879.44646	
89	4495.89981	921.17142	
90	4754.85254	961.44798	
91	4698.98499	991.68683	
92	4577.18283	1014.83174	
93	4575.26554	1034.27679	
94	4536.88862	1061.18832	
95	4527.49499	1094.63149	
96	4539.52846	1126.66188	
97	4521.85585	1152.87122	
98	4457.83396	1179.18657	
99	4424.57868	1189.19918	
100	4399.92849	1206.44789	
101	4374.74368	1226.82761	
102	4368.31626	1248.88142	
103	4358.18739	1269.77766	
104	4324.52374	1287.65633	
105	4292.71688	1302.16358	
106	4265.79387	1315.79885	

BASED ON THE AVAILABLE DATA, ONLY 25 FORECASTS CAN BE MADE

STANDARD ERROR = 519.851 (BY CONDITIONAL METHOD)

Appendix E-6

Enhanced Transfer Function and Forecasts

ARIMA VARIABLE IS ACC13AM.
 ARORDERS ARE '(1,6)'.
 ARVALUES = .5288, .4685.
 MAORDERS ARE '(1)'.
 CENTERED./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
 OUTPUT VARIABLE = ACC13AM
 INPUT VARIABLE = NOISE

INDEP VARIABLE IS UNEMP.
 UPORDERS = '(1,7,8)'.
 UPVALUES = 578.8, -518.8, 436.8./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
 OUTPUT VARIABLE = ACC13AM
 INPUT VARIABLE = NOISE UNEMP

ESTIMATION RESIDUALS IS RTX.
 METHOD IS CLS./

ESTIMATION BY CONDITIONAL LEAST SQUARES METHOD

RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN .1000E-04

SUMMARY OF THE MODEL

OUTPUT VARIABLE -- ACC13AM
 INPUT VARIABLES -- NOISE UNEMP

VARIABLE VAR. TYPE MEAN TIME DIFFERENCES

ACC13AM RANDOM REMOVED 1- 81

UNEMP RANDOM 1- 81

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	ACC13AM	MA	1	1	.3169	.1663	1.91
2	ACC13AM	AR	1	1	.6832	.1829	6.64
3	ACC13AM	AR	1	6	.3114	.1813	3.87
4	UNEMP	UP	1	1	781.9198	133.3872	5.26
5	UNEMP	UP	1	7	-493.8116	241.7388	-2.84
6	UNEMP	UP	1	8	462.9891	248.2444	1.93

RESIDUAL SUM OF SQUARES = 15693758.567909
 DEGREES OF FREEDOM = 61
 RESIDUAL MEAN SQUARE = 257274.738621

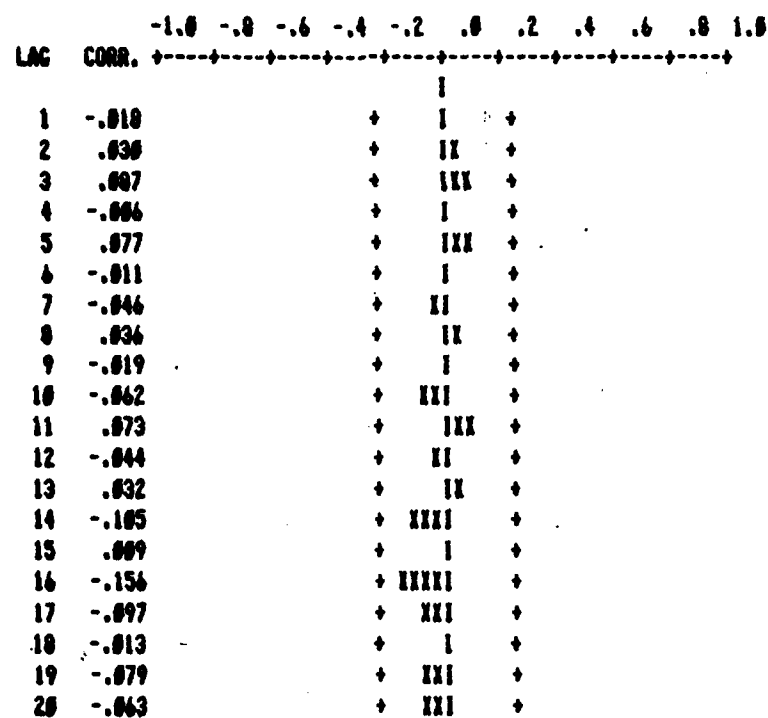
ACF VARIABLE IS RYX. MAILAG IS 20./

NUMBER OF OBSERVATIONS = 67
 MEAN OF THE (DIFFERENCED) SERIES = 4.8272
 STANDARD ERROR OF THE MEAN = 59.5707
 T-VALUE OF MEAN (AGAINST ZERO) = .0010

AUTOCORRELATIONS

1- 12 -.02 .03 .09 -.01 .08 -.01 -.05 .04 -.02 -.06 .07 -.04
 ST.E. .12 .12 .12 .12 .12 .12 .12 .12 .12 .12 .12 .12 .13
 13- 20 .03 -.11 .01 -.16 .10 -.01 -.08 -.06
 ST.E. .13 .13 .13 .13 .13 .13 .13 .13

PLOT OF SERIAL CORRELATION



PACF VARIABLE IS RTX. MAXLAG IS 20.

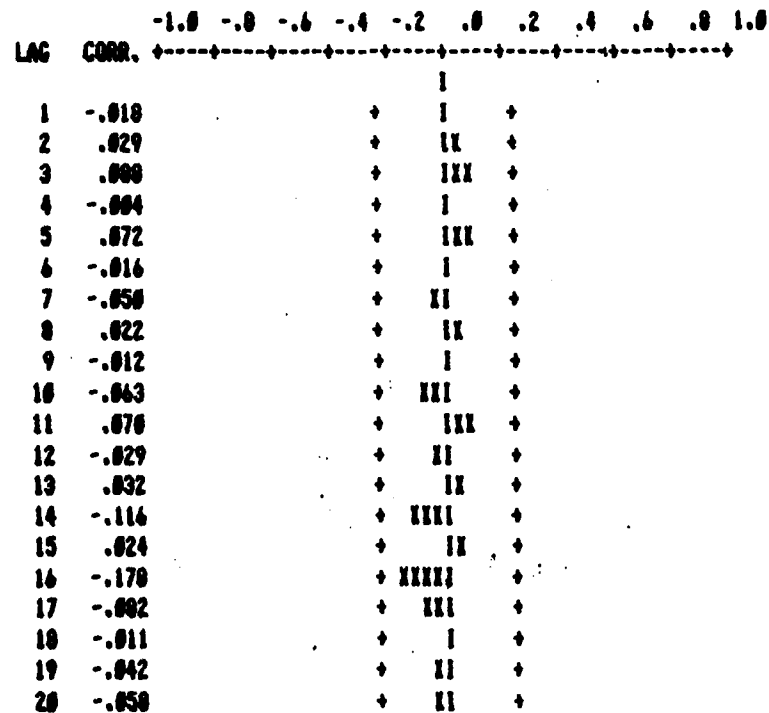
NUMBER OF OBSERVATIONS = 67
 MEAN OF THE (DIFFERENCED) SERIES = 4.0272
 STANDARD ERROR OF THE MEAN = 59.5707
 T-VALUE OF MEAN (AGAINST ZERO) = .0010

PARTIAL AUTOCORRELATIONS

1- 12 -.02 .03 .09 0.0 .07 -.02 -.05 .02 -.01 -.06 .07 -.03
 ST.E. .12 .12 .12 .12 .12 .12 .12 .12 .12 .12 .12 .12 .12

13- 20 .03 -.12 .02 -.10 -.08 -.01 -.04 -.06
 ST.E. .12 .12 .12 .12 .12 .12 .12 .12

PLOT OF SERIAL CORRELATION



ARIMA VARIABLE IS UNEMP.
 ORDERED ARE '(1,2)'.
 ARVALUES = 1.130, -.1477.
 CENTERED./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
 OUTPUT VARIABLE = UNEMP
 INPUT VARIABLE = NOISE

FORECAST CASES ARE 24. JOIN./

PERIOD	FORECASTS	ST. ERR.	ACTUAL
82	9.45750	.25450	
83	9.40947	.30704	
84	9.36140	.40342	
85	9.31434	.54091	
86	9.26816	.62633	
87	9.22294	.68320	
88	9.17867	.73359	
89	9.13531	.77005	
90	9.09286	.81991	
91	9.05130	.85742	
92	9.01060	.89191	
93	8.97075	.92376	
94	8.93173	.95331	
95	8.89352	.98079	
96	8.85611	1.00644	
97	8.81940	1.03044	
98	8.78361	1.05293	
99	8.74849	1.07405	
100	8.71411	1.09391	
101	8.68043	1.11262	
102	8.64747	1.13027	
103	8.61510	1.14694	
104	8.58358	1.16270	
105	8.55263	1.17760	

STANDARD ERROR = .254499 (BT CONDITIONAL METHOD)

PSWEIGHT MAIPSI = 40./

40 PSI-WEIGHTS ARE STORED

ERASE MODEL./

UNIVARIATE TIME SERIES MODEL ERASED

ARIMA VARIABLE IS ACC13AM.
ARORDERS ARE '(1,6)'.
ARVALUES = .5289, .4685.
MAORDERS ARE '(1)'.
CENTERED./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT VARIABLE = NOISE

INDEP VARIABLE IS UNEMP.
UPORDERS = '(1,7,8)'.
UPVALUES = 570.0, -510.0, 436.0.
CENTERED./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT VARIABLE = NOISE UNEMP

FORECAST ON VARIABLE ACC13AM FROM TIME PERIOD 82

PERIOD	FORECASTS	ST. ERR.	ACTUAL
82	4611.78357	523.68969	
83	4911.71812	596.48925	
84	4821.86786	648.12685	
85	4695.49648	673.43469	
86	4419.16461	782.15582	
87	4787.62628	728.13857	
88	4662.67182	792.68933	
89	4683.57373	827.27691	
90	4658.69896	857.83868	
91	4619.14989	878.45818	
92	4529.14543	894.37886	
93	4568.98222	987.41959	
94	4539.84647	929.35123	
95	4494.23172	957.45816	
96	4495.38239	983.68741	
97	4478.73134	1004.14821	
98	4429.56796	1019.35682	
99	4419.28446	1038.85918	
100	4485.22137	1044.27938	
101	4377.82844	1061.11589	
102	4364.98837	1079.54583	
103	4351.48223	1096.73299	
104	4322.68974	1111.81581	
105	4383.61324	1122.19385	
106	4288.83627	1132.98868	

BASED ON THE AVAILABLE DATA, ONLY 25 FORECASTS CAN BE MADE

STANDARD ERROR = 523.618 (BY CONDITIONAL METHOD)
 1PAGE 18 ACC13AM WITH UNEMP

Appendix E-2

BMDP Output for Leading Indicator Transfer Function
Models (with Forecasts) with Producer Price Index
as Input Variable

VARIABLE IS PPJ.
 OF WHICH IS 1.
 PARAMETERS ARE 19.121.
 INITIALS ARE 2724. 2887.
 PARAMETERS ARE 111. 181.
 INITIALS ARE 0.481. 2282.
 CENTERED.
 ESTIMATION
 RESIDUALS = 81.
 METHOD IS ELS.

ESTIMATION BY CONDITIONAL LEAST SQUARES METHOD
 RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN .1000E-04

SUMMARY OF THE MODEL

OUTPUT VARIABLE -- PPJ
 INPUT VARIABLES -- NOISE

VARIABLE VAR. TYPE MEAN TIME DIFFERENCES
 PPJ RANDOM REMOVED 1- 01 (1-B)

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	PPJ	MA	1	1	-.0000	.0004	-13.24
2	PPJ	MA	2	5	-.3167	.1308	-2.42
3	PPJ	AR	1	3	.2802	.1152	2.89
4	PPJ	AR	1	12	.4850	.1800	4.54

RESIDUAL SUM OF SQUARES = 54.451834
 DEGREES OF FREEDOM = 84
 RESIDUAL MEAN SQUARE = .648067

FILTER VARIABLE IS ACC13AN.
 RESIDUALS = RY.

RESIDUAL MEAN SQUARE = 4068178.011306
 VARIABLE ACC13AN IS FILTERED. RESULTS ARE STORED IN VARIABLE RY

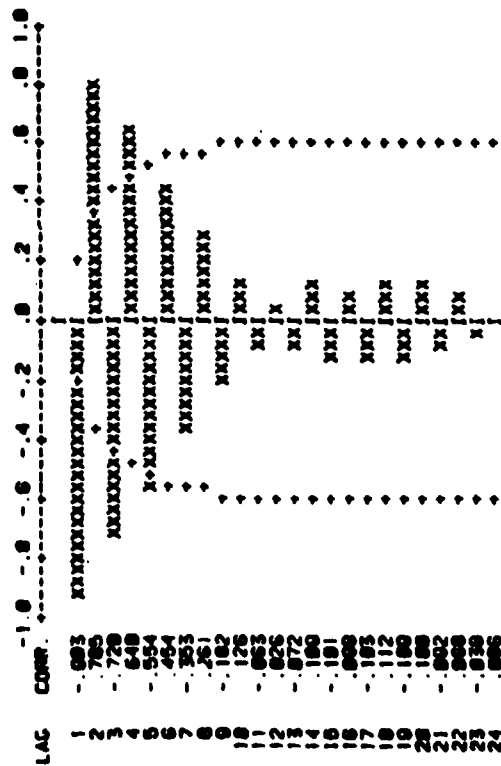
ACF VARIABLE IS BY. MAXLAC IS 24.

NUMBER OF OBSERVATIONS 81
 MEAN OF THE (DIFFERENCED) SERIES -1.2827
 STANDARD ERROR OF THE MEAN 283.8547
 T-VALUE OF MEAN (AGAINST ZERO) -.0157

AUTOCORRELATIONS

L	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
ACF	.093	.093	.093	.093	.093	.093	.093	.093	.093	.093	.093	.093	.093	.093	.093	.093	.093	.093	.093	.093	.093	.093	.093	.093
ST.E.	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11
13-24	.07	.11	.10	.10	.10	.11	.11	.11	.10	.09	.07	.04	.01											
ST.E.	.09	.09	.09	.09	.09	.09	.09	.09	.09	.09	.09	.09	.09	.09	.09	.09	.09	.09	.09	.09	.09	.09	.09	.09

PLOT OF SERIAL CORRELATION



PACF

五

7-21 51 50744 18 24.1

NUMBER OF OBSERVATIONS	-	61
MEAN OF THE (DIFFERENCED) SERIES	-	-1.2027
STANDARD ERROR OF THE MEAN	-	205.0347
T-VALUE OF MEAN (AGAINST ZERO)	-	-.0157

REPORT OF OBSERVATIONS

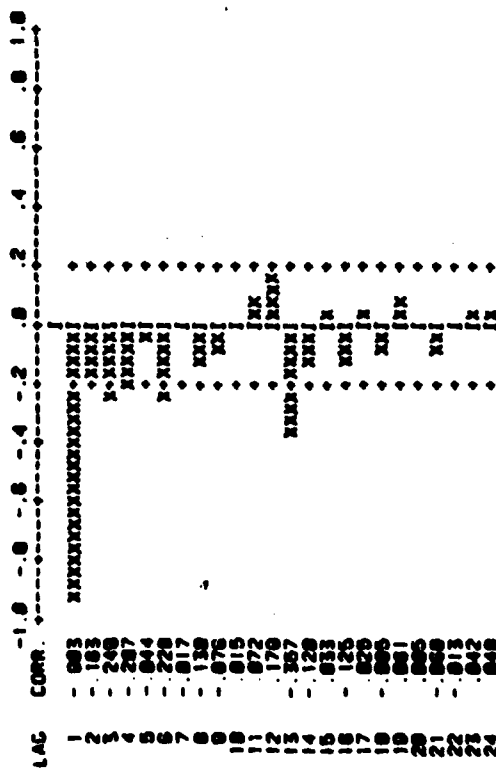
MEAN OF THE (DIFFERENCED) SERIES -

SYNOPSIS UNDER THE PLAN
I-VALUE OF PLAN (CALCULATED)

PARTIAL AUTOCORRELATIONS

[illegible]

PLOT OF SERIAL CORRELATION



PLOT OF SERIAL CORRELATIO

CF VARIABLES ARE RX,RY, RYRAC IS 24./

EFFECTIVE NUMBER OF OBSERVATIONS = 60

CORRELATION OF RX AND RY IS .24

CROSS CORRELATIONS OF RX (I) AND RY (I+K)

1-12	-.22	.17	-.14	.16	-.10	.09	-.09	.05	-.05	.01	.05	-.01
ST.E.	.12	.12	.12	.13	.13	.13	.13	.13	.13	.13	.13	.13

13-24	0.0	0.1	-.02	0.0	.02	-.01	0.0	0.0	-.01	.03	-.04	.04
ST.E.	.13	.14	.14	.14	.14	.14	.14	.14	.14	.15	.15	.15

CROSS CORRELATIONS OF RY (I) AND RX (I+K)

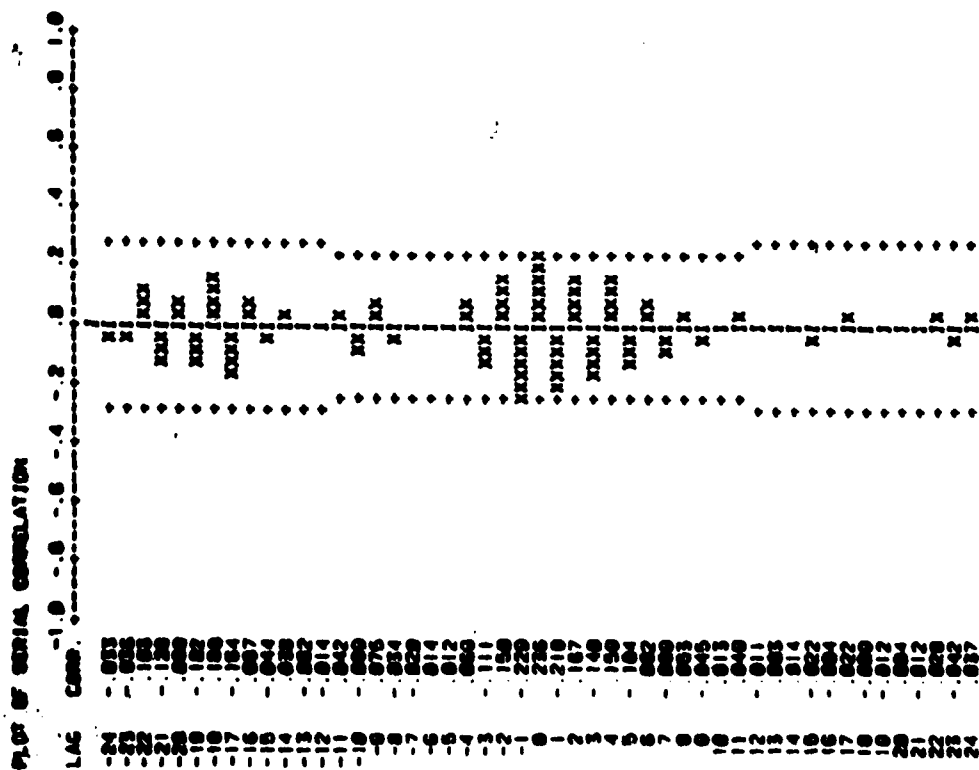
1-12	-.23	.15	-.11	.07	.01	-.01	-.02	-.03	.00	-.00	.04	-.01
ST.E.	.12	.12	.12	.13	.13	.13	.13	.13	.13	.13	.13	.13

13-24	0.0	.04	-.04	.00	-.16	.17	-.10	.10	-.13	.18	-.04	-.03
ST.E.	.13	.14	.14	.14	.14	.14	.14	.14	.15	.15	.15	.15

TRANSFER FUNCTION WEIGHTS

LAC	SCCF(X(I),Y(I+K))	SSY/SX	SCCF(Y(I),X(I+K))	SSY/SX
0	521.77638	.00011	521.77638	.00011
1	-404.30124	-.00018	-505.00400	-.00018
2	350.18359	.00008	332.30787	.00007
3	-300.96454	-.00006	-244.30322	-.00005
4	261.57448	.00007	192.00373	.00003
5	-228.97710	-.00006	-25.70270	-.00001
6	188.43082	.00004	31.01031	.00001
7	-106.05474	-.00004	-43.42000	-.00001
8	118.00268	.00002	-74.17005	-.00002
9	-109.14206	-.00002	106.52173	.00003
10	20.52570	.00001	-187.30400	-.00004
11	100.11148	.00002	01.00103	.00002
12	-24.16302	-.00000	-20.02076	-.00001
13	7.00167	.00000	-4.70400	-.00000
14	31.00373	.00001	03.00042	.00002
15	-47.01732	-.00001	-07.71270	-.00002
16	-0.00425	-.00000	102.20100	.00004
17	40.00045	.00001	-353.31023	-.00007
18	-10.21500	-.00000	370.00000	.00000
19	-20.30001	-.00001	-270.10002	-.00000
20	0.22317	.00000	210.13177	.00004
21	-20.77022	-.00001	-203.90300	-.00005
22	02.10051	.00001	227.02430	.00000
23	-02.40497	-.00002	-70.00718	-.00002
24	01.53711	.00002	-71.00003	-.00001

WHERE X(I) IS THE FIRST SERIES, Y(I) THE SECOND SERIES, SX THE STANDARD ERROR OF X(I), AND SY THE STANDARD ERROR OF Y(I)



ADJIN VARIABLE IS ACC13AN
ADJUSTMENTS ARE (11.8)
ADJUSTMENTS ARE (11.8)
ADJUSTMENTS ARE (11.8)

THE COMPONENT HAS BEEN ADDED TO THE MODEL
THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AN
INPUT VARIABLE = NOISE

INDEP VARIABLE IS PPI
UPONORS = (19.1)
UPVALUES = 25.25, -25.0, /

THE COMPONENT HAS BEEN ADDED TO THE MODEL
THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AN
INPUT VARIABLE = NOISE PPI

ESTIMATION RESIDUALS IS RYX
METHOD IS ELS.

ESTIMATION BY CONDITIONAL LEAST SQUARES METHOD
RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN .1000E-04

SUMMARY OF THE MODEL

OUTPUT VARIABLE -- ACC13AN
INPUT VARIABLES -- NOISE PPI

VARIABLE	VAR.	TYPE	MEAN	TIME	DIFFERENCES
ACC13AN	RANDOM	REMOVED	1 - 0		
PPI	RANDOM		1 - 0		

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	ACC13AN	AR		1	.7222	.1100	6.17
2	ACC13AN	AR		2	.1572	.1170	1.29
3	PPI	UP		0	.05.0225	.20.2019	1.19
4	PPI	UP		0	-.05.1100	.20.2022	-1.20

RESIDUAL SUM OF SQUARES = 20822720.797542
DEGREES OF FREEDOM = 74
RESIDUAL MEAN SQUARE = 578008.957067

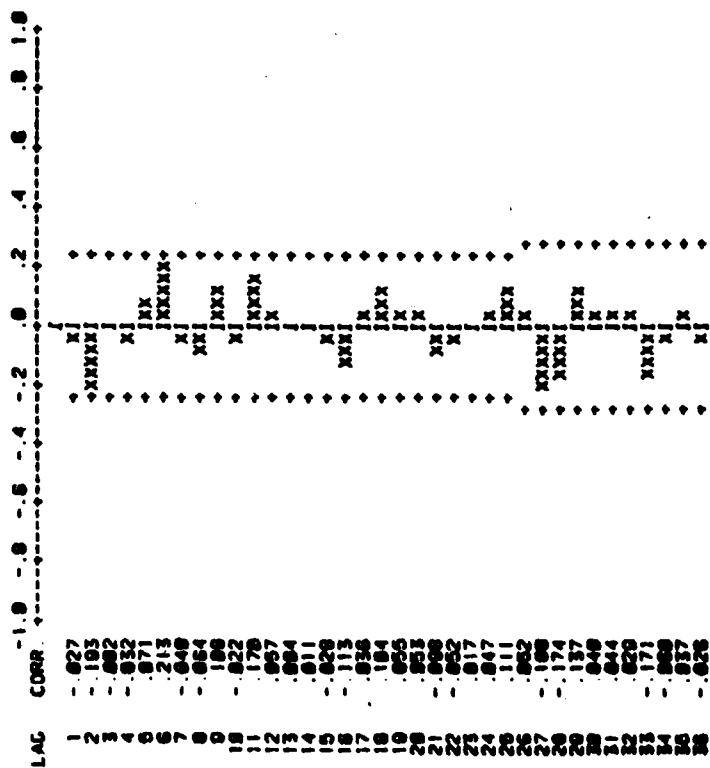
ACF VARIABLE IS RVX./

NUMBER OF OBSERVATIONS = 78
 MEAN OF THE DIFFERENCED SERIES = -10.1000
 STANDARD ERROR OF THE MEAN = 50.2718
 T-VALUE OF MEAN (AGAINST ZERO) = -2000

AUTOCORRELATIONS

1-12	-.03	-.10	0.0	-.03	.07	.21	-.04	-.06	.11	-.02	.17	.06
ST.E.	.11	.11	.12	.12	.12	.12	.12	.12	.12	.12	.12	.13
13-24	0.0	.01	-.03	-.11	.04	.10	.05	.05	-.10	-.05	.02	.05
ST.E.	.13	.13	.13	.13	.13	.13	.13	.13	.13	.13	.13	.13
25-36	.11	.05	-.10	-.12	.14	.04	.04	.03	-.17	-.06	.04	-.03
ST.E.	.13	.13	.13	.14	.14	.14	.14	.14	.14	.14	.14	.15

PLOT OF SERIAL CORRELATION

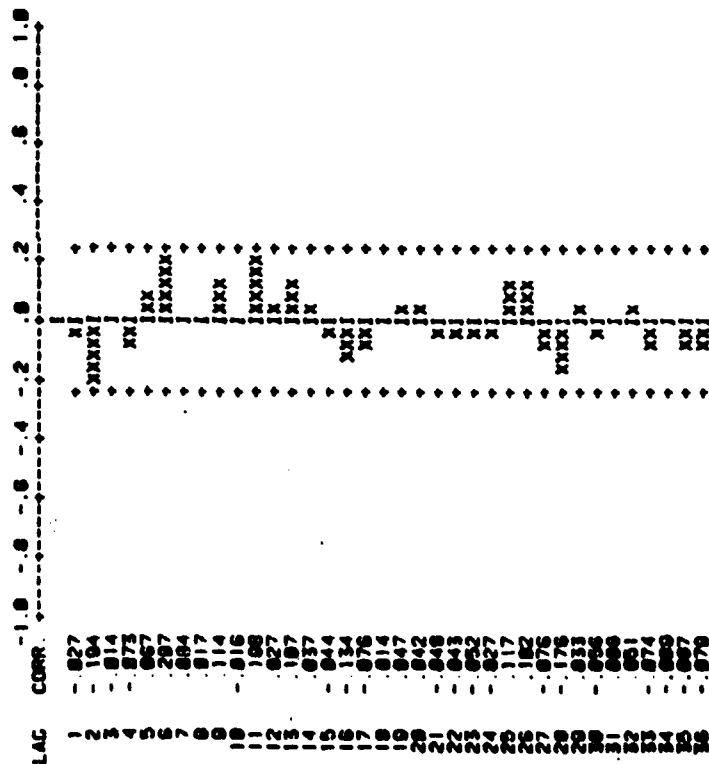


NUMBER OF OBSERVATIONS 70
 MEAN OF Y (DIFFERENCED) SERIES -10.1000
 STANDARD ERROR OF THE MEAN .002716
 T-VALUE OF MEAN (AGAINST ZERO) -3.680

PARTIAL AUTOCORRELATIONS

1-12	.05	.10	.01	.07	.07	.21	0.0	.02	.11	-.02	.20	.03
ST.E.	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11
13-24	.11	.04	-.04	-.13	-.00	.01	.05	.04	-.05	-.04	-.05	.03
ST.E.	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11
25-36	.12	.10	-.00	-.10	.03	-.05	.01	.05	-.07	-.01	-.00	-.00
ST.E.	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11

PLOT OF SERIAL CORRELATION



VARIABLE IS PPI.
 SP-ONEIN IS 1.
 ADDRESS ARE 19.121.
 AP-VALUES - 2724. 2897.
 ADDRESS ARE 111. 16.
 NA-VALUES - -8481. -2882.
 CERTIFIED.

THE COMPONENT HAS BEEN ADDED TO THE MODEL
 THE CURRENT MODEL HAS
 OUTPUT VARIABLE - PPI
 INPUT VARIABLE - NOISE

FORECAST CASES ARE 24. JOIN./

PERIOD	FORECASTS	FROM TIME PERIOD	ST. ERR.	ACTUAL
82	200 71711	82	1.87826	
83	200 64308		1.88611	
84	200 25087		2.48118	
85	200 56880		3.11214	
86	200 42185		3.72724	
87	200 38336		4.38746	
88	200 48352		5.02878	
89	200 43742		5.83854	
90	200 28800		6.28772	
91	200 48351		8.75485	
92	200 75803		7.28828	
93	200 88857		7.74786	
94	201 17848		8.33378	
95	201 22125		8.88864	
96	201 13871		9.95738	
97	201 38880		10.18216	
98	201 25747		10.81318	
99	201 23548		11.43856	
100	201 88328		12.87824	
101	201 88458		12.88826	
102	201 56156		13.28186	
103	201 77882		13.88457	
104	201 87581		14.48880	
105	201 93881		15.81847	

STANDARD ERROR = .878288 BY CONDITIONAL METHOD

PS

RESUME/JOIN RAUPSI = 48 /

40 PSI-WEIGHTS ARE STORED

ERASE MODEL /

UNIVARIATE TIME SERIES MODEL ERASED

ARIMA VARIABLE IS ACC13AM.
ARORDERS ARE (1,2)
ARVALUES = .7282, .1822
CENTERED /

THE COMPONENT HAS BEEN ADDED TO THE MODEL
THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT VARIABLE = NOISE

INDEP VARIABLE IS PPI
UPORDERS = (1,1)
UPVALUES = 95.483, -95.119 /

THE COMPONENT HAS BEEN ADDED TO THE MODEL
THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT VARIABLE = NOISE PPI

FORECAST CASES = 48. JOIN /

FORECAST ON VARIABLE ACCIDEN FROM TIME PERIOD 82

PERIOD	FORECASTS	ST	ERR.	ACTUAL
82	4671.61718	816	83529	
83	4462.48011	782	12776	
84	4248.12182	886	78468	
85	4126.84718	848	88873	
86	3948.81285	888	38714	
87	3828.78844	1038	88888	
88	3788.47484	1088	88771	
89	3688.88878	1088	22348	
90	3488.28782	1112	11488	
91	3438.88381	1127	24348	
92	3181.48848	1138	84832	
93	3282.48881	1148	18888	
94	3238.28883	1158	88837	
95	3187.78848	1181	83881	
96	3112.87481	1188	88881	
97	3088.31848	1188	78812	
98	3038.83782	1172	81888	
99	3082.18112	1174	87834	
100	3081.88825	1178	88882	
101	2948.11881	1178	12883	
102	2818.28837	1178	24827	
103	2817.38883	1188	14771	
104	2801.81157	1188	88812	
105	2871.78884	1181	41782	

BASED ON THE AVAILABLE DATA, ONLY 24 FORECASTS CAN BE MADE

STANDARD ERROR = 815.374 (BY CONDITIONAL METHOD)

ADINA
 VARIABLE IS PPI.
 ORDERED IS 1
 PARAMETERS ARE 13, 121.
 INITIALS ARE 2724, 3887.
 INITIALS ARE 111, 181.
 INITIALS ARE -8481, -2882.
 CENTERED.

THE COMPONENT HAS BEEN ADDED TO THE MODEL
 THE CURRENT MODEL HAS
 OUTPUT VARIABLE = PPI
 INPUT VARIABLE = NOISE

ESTIMATION RESIDUALS = RX.
 METHOD IS CLS.

ESTIMATION BY CONJUGATE GRADIENT METHOD
 RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN 1.000E-04

SUMMARY OF THE MODEL

OUTPUT VARIABLE -- PPI
 INPUT VARIABLES -- NOISE

VARIABLE VAR. TYPE MEAN TIME DIFFERENCES
 PPI RANDOM REMOVED 1- 81 (1-8)

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	PPI	NA	1	1	-.0000	.0024	-13.24
2	PPI	NA	2	5	-.3167	.1300	-2.42
3	PPI	AR	1	3	-.2082	.1152	-2.59
4	PPI	AR	1	12	.4885	.1805	4.54

RESIDUAL SUM OF SQUARES = 54.451834
 DEGREES OF FREEDOM = 84
 RESIDUAL MEAN SQUARE = .648178

FILTER VARIABLE IS ACCISAM.
 RESIDUALS = RY.

RESIDUAL MEAN SQUARE = 4880178.811308
 VARIABLE ACCISAM IS FILTERED. RESULTS ARE STORED IN VARIABLE RY

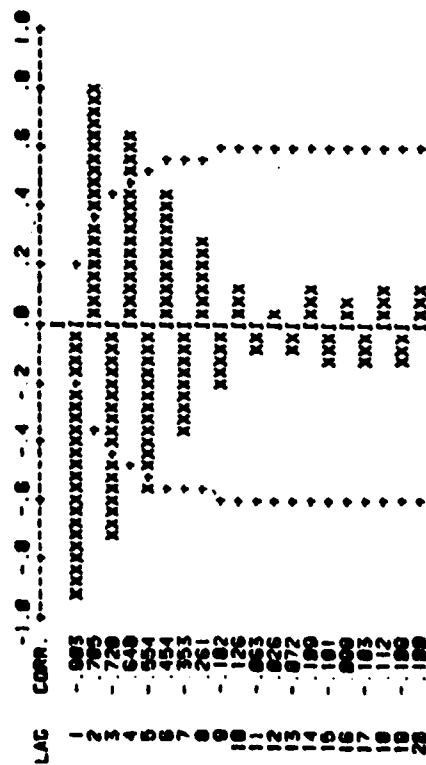
ACF VARIABLE IS BY. MAXLAG IS 20 /

NUMBER OF OBSERVATIONS 81
 MEAN OF THE (DIFFERENCED) SERIES -3.2827
 STANDARD ERROR OF THE MEAN 288.0947
 T-VALUE OF MEAN (AGAINST ZERO) -.0187

AUTOCORRELATIONS

LAG	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ACF	.08	.11	.10	.22	.26	.27	.28	.29	.29	.28	.26	.25	.24	.23	.22	.21	.20	.19	.18	.17
ST. E.	.07	.11	.10	.10	.10	.10	.11	.11	.11	.11	.11	.11	.10	.10	.10	.10	.10	.10	.10	.10

PLOT OF SERIAL CORRELATION



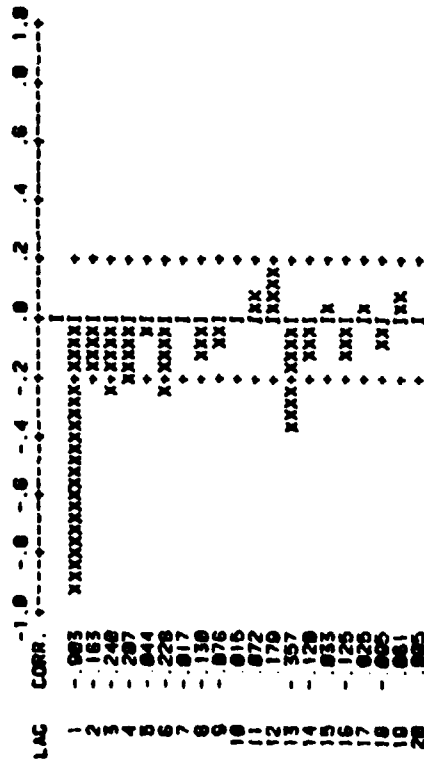
PAGE VARIABLE IS BY. MAXLAC IS 20./

NUMBER OF OBSERVATIONS 81
 MEAN OF THE (DIFFERENCED) SERIES -3.2637
 STANDARD ERROR OF THE MEAN 203.8347
 T-VALUE OF MEAN (AGAINST ZERO) -.8167

PARTIAL AUTOCORRELATIONS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1-12	.08	.16	.24	.21	.04	.23	.02	.13	.00	.02	.07	.10								
ST.E.	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11								
13-20	.36	.12	.03	.12	.03	.00	.05	.01												
ST.E.	.11	.11	.11	.11	.11	.11	.11	.11												

PLOT OF SERIAL CORRELATION



ECF VARIABLES ARE RX,RY. PARLAG IS 20./

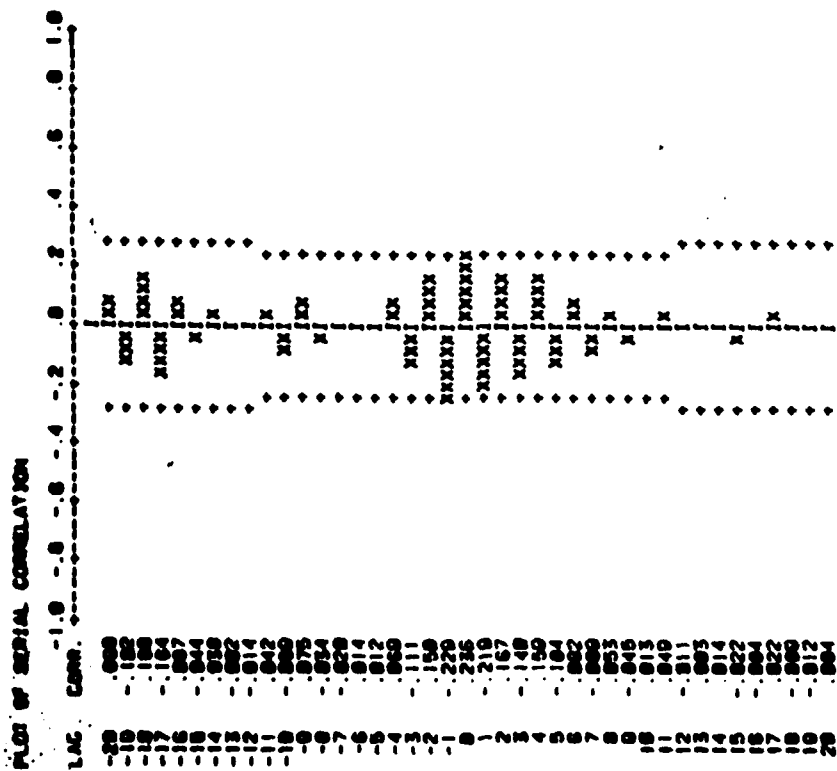
EFFECTIVE NUMBER OF OBSERVATIONS = 80

CORRELATION	OF RX	AND RY	IS	24
CROSS CORRELATIONS OF RX	(1)	AND RY	(1<R)	
1-12	-.22	.17	.14	.16
ST.E.	.12	.12	.12	.13
13-20	0.0	.01	-.02	0.0
ST.E.	.13	.14	.14	.14
CROSS CORRELATIONS OF RY	(1)	AND RX	(1<R)	
1-12	-.23	.15	.11	.07
ST.E.	.12	.12	.12	.13
13-20	0.0	.04	-.04	0.0
ST.E.	.13	.14	.14	.14

TRANSFER FUNCTION WEIGHTS

LAC	SCF(X(1),Y(J,K))	SCF(Y(1),X(J,K))
TSY/SX	TSX/SY	TSY/SX
0	521.77636	521.77636
1	-484.36124	-585.86460
2	360.15368	332.30367
3	-360.55454	-244.30522
4	351.67446	182.86533
5	-228.67710	20.78270
6	188.43082	31.81531
7	-186.65474	-43.42888
8	118.88288	-74.17885
9	-188.14256	186.82173
10	20.52678	-187.38488
11	189.11148	81.86183
12	-24.18382	-29.82878
13	7.89167	-4.78488
14	31.56373	83.85842
15	-47.81732	-87.71220
16	-8.88845	182.28188
17	40.88845	-383.33825
18	-19.21808	378.88888
19	-26.35881	-225.18882
20	8.22317	88888.218.13177

WHERE X(1) IS THE FIRST SERIES, Y(1) THE SECOND SERIES, SX THE STANDARD ERROR OF X(1), AND SY THE STANDARD ERROR OF Y(1)



AS

ACF

VARIABLE IS ACC13AH
ADDITIONS ARE 11.61
APPROXIMATES 7002.2004
CENTREDD.

THE COMPONENT HAS BEEN ADDED TO THE MODEL
THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AH
INPUT VARIABLE = NOISE

INDEP VARIABLE IS PP1.

THE COMPONENT HAS BEEN ADDED TO THE MODEL
THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AH
INPUT VARIABLE = NOISE PP1

ESTIMATION RESIDUALS IS RYX
METHOD IS CLS.

ESTIMATION BY CONDITIONAL LEAST SQUARES METHOD
RELATIVE CHANGE IN EACH ESTIMATE LESS THAN .1000E-03

SUMMARY OF THE MODEL

OUTPUT VARIABLE -- ACC13AH
INPUT VARIABLES -- NOISE PP1

VARIABLE	VAR	TYPE	MEAN	TIME	DIFFERENCES
ACC13AH	RANDOM	REMOVED	1- 01		
PP1	RANDOM		1- 01		

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	ACC13AH	AR	1	1	.7931	.0077	8.00
2	ACC13AH	AR	1	6	.1110	.0044	1.33

RESIDUAL SUM OF SQUARES = 27400134.407300
DEGREES OF FREEDOM = 73
RESIDUAL MEAN SQUARE = 375344.300000

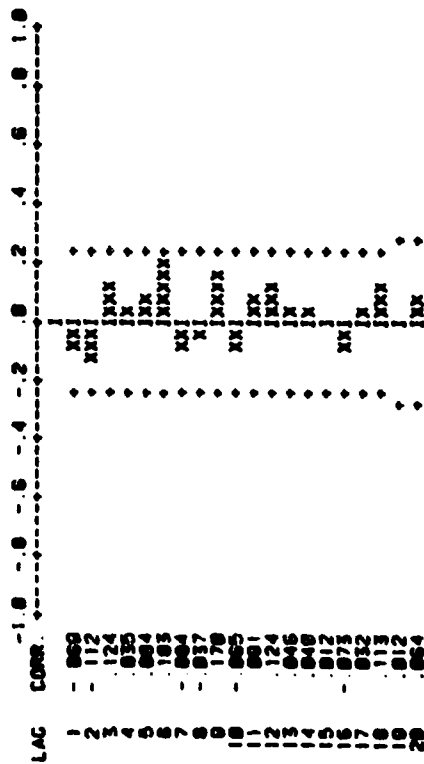
AC7 VARIABLE IS RTH. MAXLAG IS 20.

NUMBER OF OBSERVATIONS = 70
 MEAN OF THE (DIFFERENCED) SERIES = -40.2926
 STANDARD ERROR OF THE MEAN = 70.1857
 T-VALUE OF MEAN (AGAINST ZERO) = -0.5767

AUTOCORRELATIONS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	.97	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12
ST.E.	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12

PLOT OF SERIAL CORRELATION



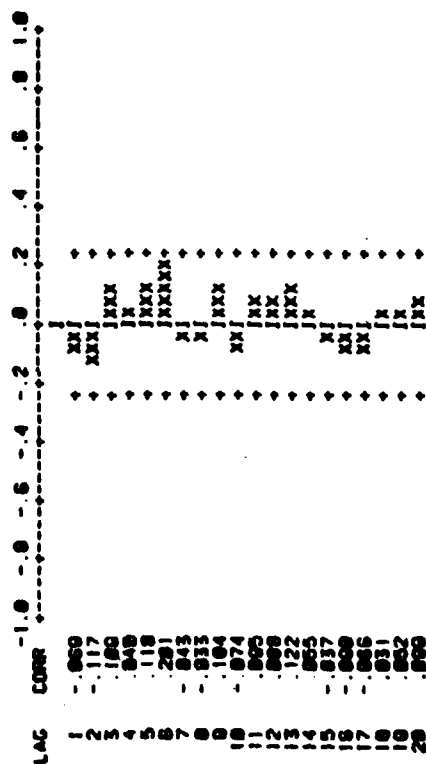
PROG VARIABLE IS RVX MAXLAG IS 20./

NUMBER OF OBSERVATIONS = 76
 MEAN OF THE (DIFFERENCED) SERIES = -.48 2805
 STANDARD ERROR OF THE MEAN = 76.1857
 T-VALUE OF MEAN (AGAINST ZERO) = -.6757

PARTIAL AUTOCORRELATIONS

1-12	-.97	-.12	.11	.04	.12	.20	-.04	-.05	.18	-.07	.10	.09
ST.E.	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12
13-20	.12	.06	-.04	-.00	-.07	.03	.05	.10				
ST.E.	.12	.12	.12	.12	.12	.12	.12	.12				

PLOT OF SERIAL CORRELATION



VARIABLE IS PPI.
 ORDER IS 1, 13, 121.
 VALUES ARE 2724, 3007.
 VALUES ARE 11, 161.
 VALUES ARE -9461, -2802.
 CENTERED.

THE COMPONENT HAS BEEN ADDED TO THE MODEL
 THE CURRENT MODEL HAS
 OUTPUT VARIABLE = PPI
 INPUT VARIABLE = NOISE

FORECAST CASES ARE 24. JOIN./

PERIOD	FORECASTS	ST. ERR.	FROM TIME PERIOD	ACTUAL
82	200.71711	.07826		
83	200.84308	1.80511		
84	200.25087	2.48118		
85	200.55080	3.11214		
86	200.42183	3.72224		
87	200.36536	4.35746		
88	200.40352	5.02076		
89	200.43742	5.63054		
90	200.20000	6.20772		
91	200.40351	6.78465		
92	200.70803	7.20520		
93	200.08387	7.74708		
94	201.17548	8.33378		
95	201.22125	8.88564		
96	201.13671	9.50738		
97	201.30880	10.10216		
98	201.25747	10.61319		
99	201.23548	11.14556		
100	201.05328	12.07824		
101	201.00408	12.88626		
102	201.06156	13.29186		
103	201.77862	13.88457		
104	201.07851	14.46800		
105	201.03681	15.01647		
STANDARD ERROR = .078265		BY CONDITIONAL METHOD 1		

PSIWEIGHT

PPSWEIGHT 2ANP51 = 48 /

48 P51-WEIGHTS ARE STORED

ERASE MODEL /

UNIVARIATE TIME SERIES MODEL ERASED

APINA VARIABLE IS ACC13AM.
ARNDERS ARE .11, 81.
ARVALUES = .7082, .2894.
CENTERED. /

THE COMPONENT HAS BEEN ADDED TO THE MODEL
THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT VARIABLE = NOISE

INDEP VARIABLE IS PPI. /

THE COMPONENT HAS BEEN ADDED TO THE MODEL
THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT VARIABLE = NOISE PPI

FORECAST CASES = 48. JOIN. /

FORECAST ON VARIABLE ACCIDENT FROM TIME PERIOD 02

PERIOD	FORECASTS	ST. ERR.	ACTUAL
02	4874.84656	659.18431	
03	4718.80118	778.88217	
04	4732.30538	653.05185	
05	4888.38208	882.48782	
06	4822.15518	876.88832	
07	4838.84378	884.82721	
08	4852.84188	918.22327	
09	4838.82824	884.87184	
10	4822.27444	888.85385	
11	4577.85847	1843.88348	
12	4824.12814	1888.88574	
13	4818.84138	1888.83484	
14	4818.88873	1188.81888	
15	4814.89118	1128.88848	
16	4885.88824	1152.84741	
17	4488.88888	1177.81342	
18	4461.48831	1288.84833	
19	4448.88811	1218.78888	
20	4426.83888	1237.48488	
21	4415.17878	1284.81488	
22	4484.88835	1272.42488	
23	4382.78388	1288.27613	
24	4377.83888	1387.88382	
25	4368.32313	1324.88785	

BASED ON THE AVAILABLE DATA, ONLY 24 FORECASTS CAN BE MADE

STANDARD ERROR = 629.154 (BY CONDITIONAL METHOD)

-END

APINA

VARIABLE IS PPI.
 ORDER IS 1
 ANDREWS ARE -19.121
 ANVALUES = 2724.4287
 MADREDS ARE (11, 18)
 MAVALUES = -0.169, -1071.
 CENTERED.

ESTIMATION RESIDUALS = RX.
 METHOD IS CLS /

ESTIMATION BY CONDITIONAL LEAST SQUARES METHOD
 RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN .1000E-04

SUMMARY OF THE MODEL

OUTPUT VARIABLE -- PPI
 INPUT VARIABLES -- NOISE

VARIABLE VAR. TYPE MEAN TYPE DIFFERENCES
 PPI RANDOM REMOVED 1- 01 (1-8)

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	PPI	MA	1	1	-.0700	.0874	-13.85
2	PPI	MA	2	9	-.3160	.1304	-2.43
3	PPI	AR	1	3	.2085	.1159	2.58
4	PPI	AR	1	12	.4865	.1804	4.54

RESIDUAL SUM OF SQUARES = 54.451305
 DEGREES OF FREEDOM = 64
 RESIDUAL MEAN SQUARE = .850802

FILTER VARIABLE IS ACC13AH.
 RESIDUALS = RY.

RESIDUAL MEAN SQUARE = 4038065.862205
 VARIABLE ACC13AH IS FILTERED. RESULTS ARE STORED IN VARIABLE RY

ACF

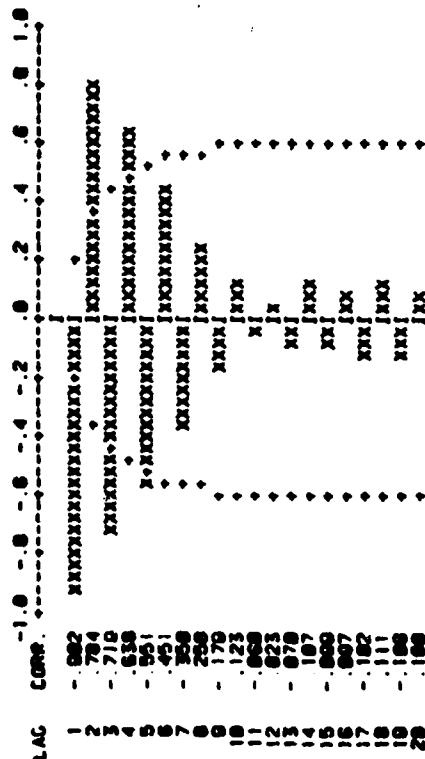
ACF VARIABLE IS RT. MAXLAC IS 30./

NUMBER OF OBSERVATIONS 81
 MEAN OF THE (DIFFERENCED) SERIES -3.0801
 STANDARD ERROR OF THE MEAN 289.0887
 T-VALUE OF MEAN (AGAINST ZERO) -8.185

AUTOCORRELATIONS

1-12	-.09	.78	-.72	.64	-.55	.45	-.35	.25	-.18	.12	-.05	.02
ST.E.	.11	.16	.22	.25	.27	.28	.29	.29	.30	.30	.30	.30
13-20	-.07	.11	-.10	.10	.10	.11	.11	.11	.10			
ST.E.	.30	.30	.30	.30	.30	.30	.30	.30	.30			

PLOT OF SERIAL CORRELATION



PAGE

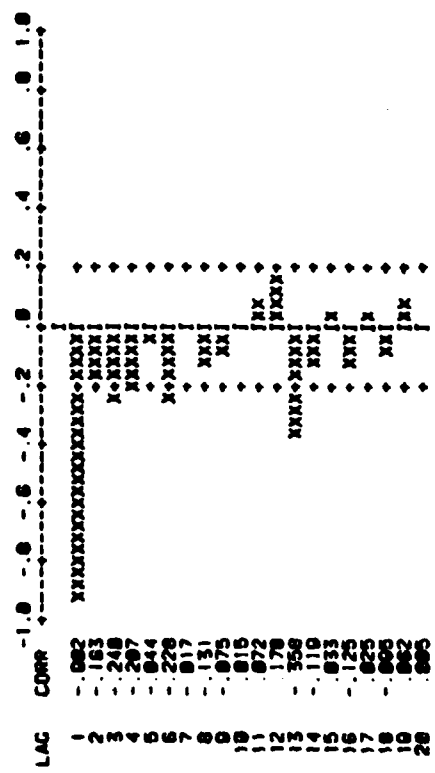
PAGE VARIABLE IS 87. MAXLAG IS 20.

NUMBER OF OBSERVATIONS : 91
 MEAN OF THE (DIFFERENCED) SERIES : -3.103
 STANDARD ERROR OF THE MEAN : 283.1037
 T-VALUE OF MEAN (AGAINST ZERO) : -.0106

PARTIAL AUTOCORRELATIONS

1-12	.00	.18	.24	.21	.04	.23	.02	.13	.00	.01	.07	.10
ST.E.	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11
13-20	.35	.12	.03	.12	.03	.00	.06	.01				
ST.E.	.11	.11	.11	.11	.11	.11	.11	.11				

PLOT OF SERIAL CORRELATION



CCF VARIABLES ARE RX,RY. MAXLAG IS 20./

EFFECTIVE NUMBER OF OBSERVATIONS = 88

CORRELATION OF RX AND RY IS .24

CROSS CORRELATIONS OF RX I(1) AND RY I(1-K)

1-12	-.22	.17	-.14	.15	-.18	.08	-.09	-.04	.01	.05	-.01
ST.E.	.12	.12	.12	.13	.13	.13	.13	.13	.13	.13	.13

13-20	0.0	.01	-.02	0.0	.02	-.01	-.01	0.0
ST.E.	.13	.14	.14	.14	.14	.14	.14	.14

CROSS CORRELATIONS OF RY I(1) AND RX I(1-K)

1-12	-.23	.15	-.11	.07	.01	-.01	-.02	-.03	.00	-.00	.04	-.01
ST.E.	.12	.12	.12	.13	.13	.13	.13	.13	.13	.13	.13	.13

13-20	0.0	.04	-.04	.00	-.15	.17	-.10	.10
ST.E.	.13	.14	.14	.14	.14	.14	.14	.14

TRANSFER FUNCTION WEIGHTS

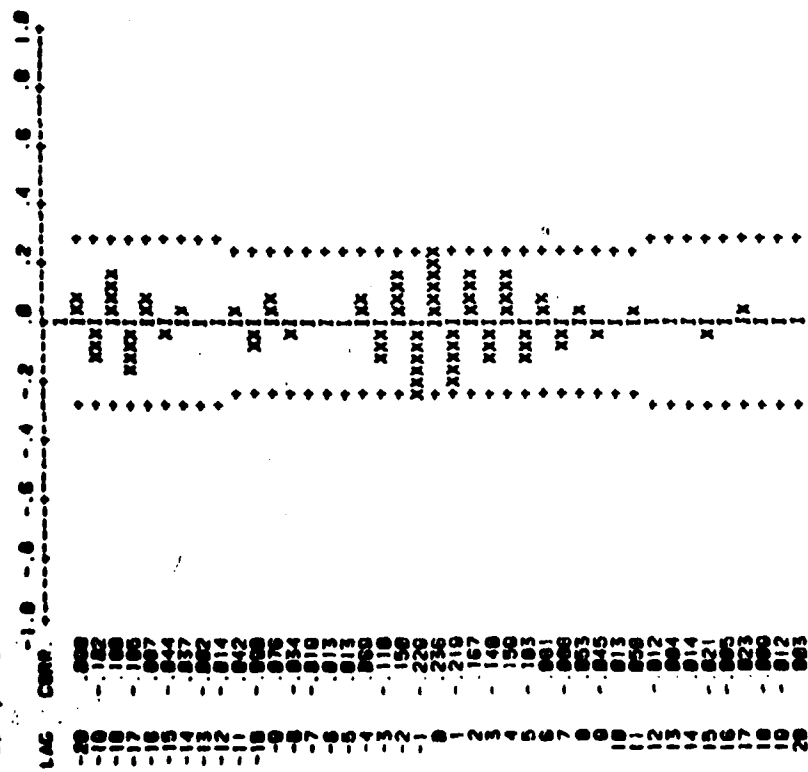
LAG	SCF(X(I),Y(I-K))	SCF(Y(I),X(I-K))
8SY/SX	8SY/SX	8SX/SY

0	510.14377	.00011	510.14377	.00011
1	-481.76010	-.00018	-504.41835	-.00018
2	355.68223	.00008	338.88284	.00007
3	-397.14245	-.00005	-242.28012	-.00005
4	340.27824	.00007	158.01823	.00003
5	-226.64484	-.00005	27.84245	.00001
6	178.17808	.00004	28.48855	.00001
7	-104.39185	-.00004	-42.18708	-.00001
8	115.78188	.00002	-75.58848	.00002
9	-98.28335	-.00002	187.58808	.00003
10	27.88868	.00001	-189.28125	.00004
11	118.73378	.00002	62.84218	.00002
12	-25.71300	-.00001	-38.86367	-.00001
13	8.01376	.00000	-4.84178	.00000
14	38.22019	.00001	62.32725	.00002
15	-46.67877	-.00001	-68.88788	.00002
16	-18.48520	.00000	181.88484	.00004
17	58.28882	.00001	-382.71345	.00007
18	-18.84325	-.00000	378.38882	.00006
19	-25.78575	.00001	-224.71857	.00005
20	7.95421	.00000	218.04579	.00004

WHERE X(I) IS THE FIRST SERIES, Y(I) THE SECOND SERIES, SX THE STANDARD ERROR OF X(I), AND SY THE STANDARD ERROR OF Y(I)

PL

PLOT OF SERIAL CORRELATION



RESIDUAL SUM OF SQUARES = 22270000.185344
 DEGREES OF FREEDOM = 84
 RESIDUAL MEAN SQUARE = 26512.84336

ACF VARIABLE IS RYX.

VARIABLE IS ACC13AH
 ANORDERS ARE 12.61
 ANVALUES = 7748.2
 INORDERS ARE 111
 INVALUES = -8031
 CENTERED./

THE COMPONENT HAS BEEN ADDED TO THE MODEL
 THE CURRENT MODEL HAS
 OUTPUT VARIABLE = ACC13AH
 INPUT VARIABLE = NOISE

INDEP VARIABLE IS PPJ
 UPORDERS = 15.81
 UPVALUES = 75.4, -74.8./

THE COMPONENT HAS BEEN ADDED TO THE MODEL
 THE CURRENT MODEL HAS
 OUTPUT VARIABLE = ACC13AH
 INPUT VARIABLE = NOISE PPJ

ESTIMATION RESIDUALS IS RYX
 METHOD IS CLS./

ESTIMATION BY CONDITIONAL LEAST SQUARES METHOD
 RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN .1888E-84

SUMMARY OF THE MODEL

OUTPUT VARIABLE -- ACC13AH
 INPUT VARIABLES -- NOISE PPJ

VARIABLE	VAR	TYPE	MEAN	TIME	DIFFERENCES
ACC13AH	RANDOM	REMOVED	1- 01		
PPJ	RANDOM		1- 01		

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	ACC13AH	MA		1	-.0872	.0712	-12.74
2	ACC13AH	AR		2	.0040	.1206	4.50
3	ACC13AH	AR		6	.2410	.1845	2.51
4	PPJ	UP		5	73.3874	83.0126	1.16
5	PPJ	UP		6	-79.0610	83.7342	-1.11

JCF VARIABLE IS RYR. MAXLAG IS 20 /

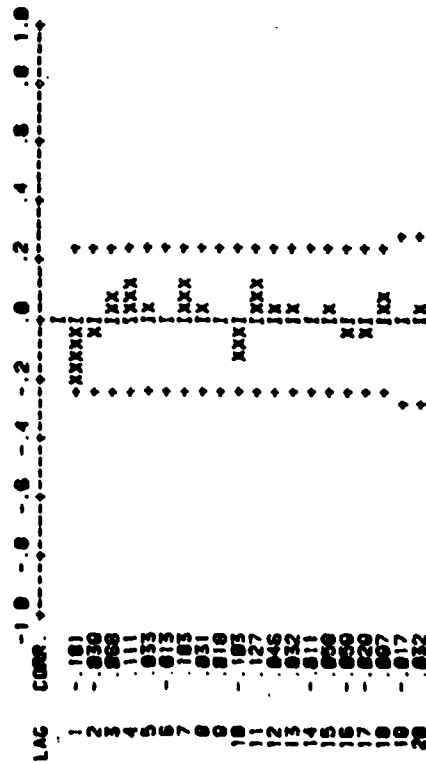
NUMBER OF OBSERVATIONS 60
 MEAN OF THE (DIFFERENCED) SERIES -44.8831
 STANDARD ERROR OF THE MEAN 60.8280
 T-VALUE OF MEAN (AGAINST ZERO) -8472

AUTOCORRELATIONS

LAG	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ACF	.12	-.18	-.04	.07	.11	.05	-.01	.10	.03	.02	-.10	.13	.13	.13	.13	.13	.13	.13	.13	.13
ST.E.	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12

LAG	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ST.E.	.13	.13	.13	.13	.13	.13	.13	.13	.13	.13	.13	.13	.13	.13	.13	.13	.13	.13	.13	.13

PLOT OF SERIAL CORRELATION



PACF VARIABLE I

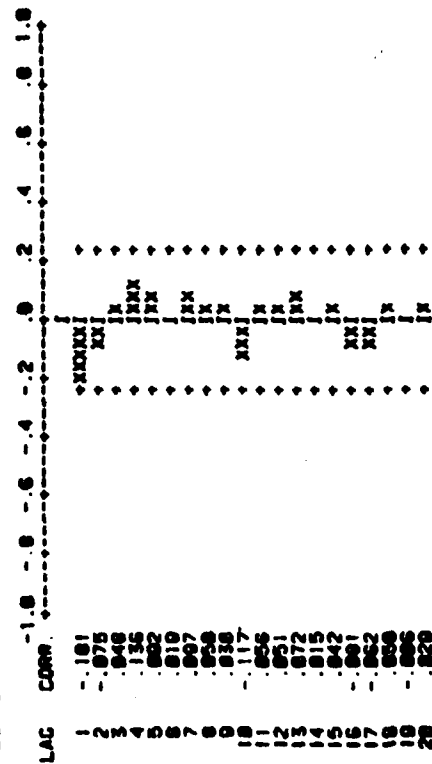
PAGE: VARIABLE IS RVS. NAME: LAC IS 29.

NUMBER OF OBSERVATIONS: 60
 MEAN OF THE (DIFFERENCED) SERIES: -44.9831
 STANDARD ERROR OF THE MEAN: 69.8399
 T-VALUE OF MEAN (AGAINST ZERO): -0.6472

PARTIAL AUTOCORRELATIONS

LAC	1-12	1-10	1-8	1-6	1-4	1-2	0	2	4	6	8	10	12
ST.E.	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12
13-20	.07	.01	.04	-.08	-.05	.05	.05	-.01	.03				
ST.E.	.12	.12	.12	.12	.12	.12	.12	.12	.12				

PLOT OF SERIAL CORRELATION



ARIMA
 VARIABLE IS PPI.
 ORDER IS 1
 ORDERING ARE (1,1,1)
 INITIALS = 2724.4897
 MAXIMUMS ARE (11, 10)
 MINIMUMS = -0180. -3871
 CENTERED

THE COMPONENT HAS BEEN ADDED TO THE MODEL
 THE CURRENT MODEL HAS
 OUTPUT VARIABLE = PPI
 INPUT VARIABLE = NOISE

FORECAST CASES ARE 24. JOIN./

PERIOD	FORECASTS	FROM TIME PERIOD	ST. ERR.	ACTUAL
82	200.54633	82	0.0024	
83	200.54285	1	0.0042	
84	200.54338	2	0.0055	
85	200.54338	3	0.0053	
86	200.54288	4	0.0057	
87	200.54288	5	0.0057	
88	200.54288	6	0.0057	
89	200.54288	7	0.0057	
90	200.54288	8	0.0057	
91	200.54288	9	0.0057	
92	200.54288	10	0.0057	
93	200.54288	11	0.0057	
94	200.54288	12	0.0057	
95	200.54288	13	0.0057	
96	200.54288	14	0.0057	
97	200.54288	15	0.0057	
98	200.54288	16	0.0057	
99	200.54288	17	0.0057	
100	200.54288	18	0.0057	
101	200.54288	19	0.0057	
102	200.54288	20	0.0057	
103	200.54288	21	0.0057	
104	200.54288	22	0.0057	
105	200.54288	23	0.0057	

STANDARD ERROR = 0.00230 (BY CONDITIONAL METHOD)

PSIWEIGHT MAXPSI = 48./

POI-WEIGHTS ARE STORED

ERASE MODEL /

UNIVARIATE TIME SERIES MODEL ERASED

APTRA
VARIABLE IS ACC13AM
ARORDERS ARE 12.81
ARVALUES = 7746.2
PAORDERS ARE 111
PAVALUES = -.0031
CENTERED /

THE COMPONENT HAS BEEN ADDED TO THE MODEL
THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT VARIABLE = NOISE

INDEP
VARIABLE IS PP1
UPORDERS = 15.61
UPVALUES = 75.4, -74.8 /

THE COMPONENT HAS BEEN ADDED TO THE MODEL
THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT VARIABLE = NOISE PP1

FORECAST CASES = 48. JOIN /

PERIOD	FORECAST	VARIABLE	ACCIDENT	FROM TIME PERIOD	82	ACTUAL
100	4936	16762	814	24488		
99	4758	84572	818	47586		
98	4660	88853	847	88487		
97	4723	87688	1058	88288		
96	4767	77686	1188	13263		
95	4688	82247	1148	47853		
94	4717	88378	1221	28847		
93	4614	88818	1273	41824		
92	4738	38878	1338	41884		
91	4883	24851	1386	88888		
90	4857	41818	1441	84788		
89	4888	88288	1482	88248		
88	4858	52712	1532	28887		
87	4844	42248	1688	71427		
86	4845	47538	1615	32433		
85	4863	81242	1688	88288		
84	4813	82483	1581	78181		
83	4824	32821	1724	88518		
82	4855	88881	1782	88184		
81	4872	88888	1782	32888		
80	4851	48228	1828	28878		
79	4853	21724	1855	84826		
78	4882	88183	1888	38883		
77	4877	84248	1815	88482		
76	4884	48418	1848	38848		
75	4888	28881	1878	37837		
74	4881	83531	1888	71847		
73	4886	21823	2022	27886		
72	4448	82346	2048	83483		

BASED ON THE AVAILABLE DATA. ONLY 28 FORECASTS CAN BE MADE
STANDARD ERROR = 814.245 (BY CONDITIONAL METHOD)

-END OF INFO

Appendix E-8

BMDP Output for Leading Indicator Transfer Function
Models (with Forecasts) with Prime Rate as Input
Variable

VARIABLE IS PRIME.
 ORDER IS 1.
 ARROWS ARE (114).
 ARROWS ARE 3.
 VALUES ARE (113.4).
 VALUES ARE -.0005, .3017, .0006.
 CENTERED.

FILTER

ESTIMATION RESIDUAL = RX. MAXIT = 10./

ESTIMATION BY CONDITIONAL LEAST SQUARES METHOD

RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN .1000E-04

SUMMARY OF THE MODEL

OUTPUT VARIABLE -- PRIME
INPUT VARIABLES -- NOISE

VARIABLE VAR. TYPE MEAN TIME DIFFERENCES

PRIME RANDOM REMOVED 1- 01 (11-0)

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	PRIME	NA	1	1	.0048	.0048	-7.82
2	PRIME	NA	1	3	.0029	.1212	2.08
3	PRIME	NA	1	4	.0574	.1104	5.06
4	PRIME	AR	1	14	.3003	.1571	2.23

RESIDUAL SUM OF SQUARES = 43.416807
 DEGREES OF FREEDOM = 62
 RESIDUAL MEAN SQUARE = .700744

ESTIMATION BY BACKCASTING METHOD

RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN .1000E-04

SUMMARY OF THE MODEL

OUTPUT VARIABLE -- PRIME
INPUT VARIABLES -- NOISE

VARIABLE VAR. TYPE MEAN TIME DIFFERENCES

PRIME RANDOM REMOVED 1- 01 (11-0)

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	PRIME	NA	1	1	.0045	.0020	-7.06
2	PRIME	NA	1	3	.0017	.1100	2.08
3	PRIME	NA	1	4	.0568	.1008	5.10
4	PRIME	AR	1	14	.3007	.1347	2.23

RESIDUAL SUM OF SQUARES = 43.200721 (BACKCASTS EXCLUDED)
 DEGREES OF FREEDOM = 62
 RESIDUAL MEAN SQUARE = .696386

FILTER VARIABLE IS ACC13AN
RESIDUALS = RV //

RESIDUAL MEAN SQUARE = 1877173.880831
VARIABLE ACC13AN IS FILTERED, RESULTS ARE STORED IN VARIABLE RV

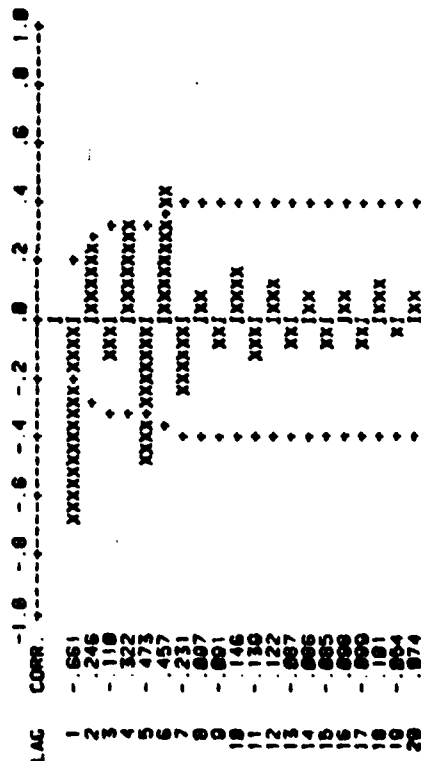
ACF VARIABLE IS RV MAXLAG IS 28 //

NUMBER OF OBSERVATIONS 91
MEAN OF THE 10(DIFFERENCED) SERIES = -18.8887
STANDARD ERROR OF THE MEAN 118.4167
T-VALUE OF MEAN (AGAINST ZERO) = -.8814

AUTOCORRELATIONS

L	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
ACF	.66	.25	.11	.32	.47	.48	.23	.18	.00	.15	.14	.12	.09	.07	.05	.07	.05	.07	.05	.07	.05	.07	.05	.07	.05	.07	.05	.07	.05	.07
ST.E.	.11	.15	.16	.17	.18	.20	.20	.21	.21	.21	.21	.21	.21	.21	.21	.21	.21	.21	.21	.21	.21	.21	.21	.21	.21	.21	.21	.21	.21	.21

PLOT OF SERIAL CORRELATION



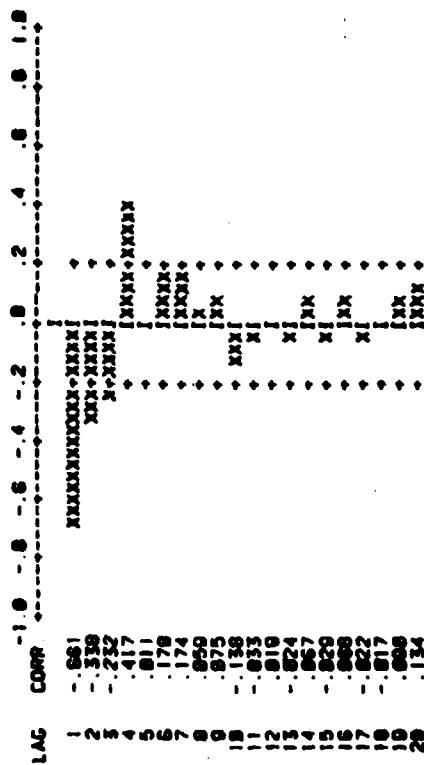
PAGE VARIABLE IS BY. NAME IS 29.

NUMBER OF OBSERVATIONS 81
 MEAN OF Y (DIFFERENCED) SERIES -18.0027
 STANDARD ERROR OF THE MEAN 118.4187
 T-VALUE OF MEAN (AGAINST ZERO) -

PARTIAL AUTOCORRELATIONS

LAG	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
ST.E.	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11

PLOT OF SERIAL CORRELATION



CCF VARIABLES ARE RX,RY MAXLAC IS 20./

EFFECTIVE NUMBER OF OBSERVATIONS = 81

CORRELATION OF RX AND RY IS .81

CROSS CORRELATIONS OF RX (1) AND RY (1+K)

1-12	-.04	.00	-.05	.02	-.05	.18	-.00	.07	-.01	.05	-.02	.07
ST.E.	.11	.11	.11	.11	.11	.12	.12	.12	.12	.12	.12	.12

13-20

1-12	-.06	.05	.00	0.0	-.00	.13	-.10	.05
ST.E.	.12	.12	.12	.12	.13	.13	.13	.13

CROSS CORRELATIONS OF RY (1) AND RX (1+K)

1-12	-.05	.07	-.03	.01	0.0	.03	-.01	.03	-.01	0.0	.11	-.00
ST.E.	.11	.11	.11	.11	.11	.12	.12	.12	.12	.12	.12	.12

13-20

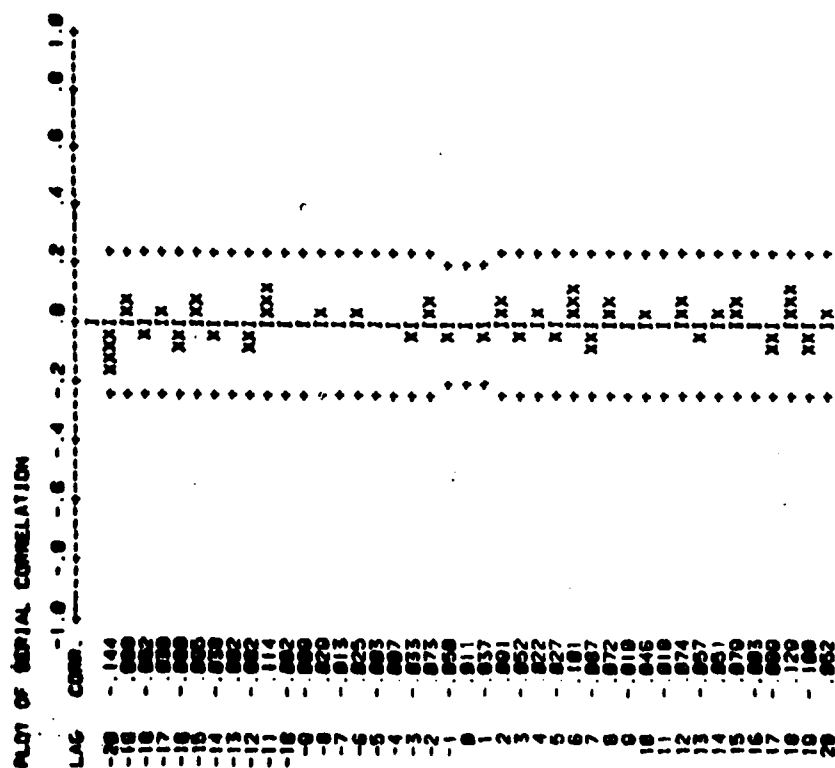
1-12	0.0	-.04	.00	-.00	.03	-.05	.00	-.14
ST.E.	.12	.12	.12	.12	.13	.13	.13	.13

TRANSFER FUNCTION WEIGHTS

LAC	SCCFIX(1),Y(1+K)	YSX/SY	SCCF(Y(1),X(1+K))	YSY/SX	YSX/SY
0	14.43359	-.00001	14.43359	-.00001	-.00001
1	50.30205	-.00003	-87.06502	-.00004	-.00004
2	122.87647	-.00007	87.00273	-.00005	-.00005
3	-78.56811	-.00004	-44.72252	-.00002	-.00002
4	20.07000	-.00002	9.01000	-.00000	-.00000
5	-35.15811	-.00002	-3.06276	-.00000	-.00000
6	135.00006	-.00007	33.00004	-.00002	-.00002
7	-117.30872	-.00005	-17.70503	-.00001	-.00001
8	87.40169	-.00003	30.04400	-.00002	-.00002
9	-12.02035	-.00001	-11.70011	-.00001	-.00001
10	61.00303	-.00003	-2.20007	-.00000	-.00000
11	-23.70470	-.00001	103.74005	-.00000	-.00000
12	60.56300	-.00005	-118.07723	-.00000	-.00000
13	-77.04522	-.00004	3.12202	-.00000	-.00000
14	60.40001	-.00004	-81.07004	-.00003	-.00003
15	105.04000	-.00005	120.03010	-.00007	-.00007
16	-3.00703	-.00000	-100.42010	-.00005	-.00005
17	-120.20700	-.00007	41.03700	-.00002	-.00002
18	174.82021	-.00010	-70.70000	-.00004	-.00004
19	-134.00400	-.00007	120.01143	-.00007	-.00007
20	60.00237	-.00004	-104.30470	-.00011	-.00011

WHERE X(1) IS THE FIRST SERIES, Y(1) THE SECOND SERIES, SX THE STANDARD ERROR OF X(1), AND SY THE STANDARD ERROR OF Y(1)

PLOT OF SER



ADJINA
 VARIABLE IS ACC13AH
 ANCHORS ARE 71.61
 CENTERED /

THE COMPONENT HAS BEEN ADDED TO THE MODEL
 THE CURRENT MODEL HAS
 OUTPUT VARIABLE = ACC13AH
 INPUT VARIABLE = NOISE

INDOP VARIABLE IS PRIME /

THE COMPONENT HAS BEEN ADDED TO THE MODEL
 THE CURRENT MODEL HAS
 OUTPUT VARIABLE = ACC13AH
 INPUT VARIABLE = NOISE PRIME

ESTIMATION RESIDUALS IS RYX. MAXIT = 10.
 METHOD IS CLS /

ESTIMATION BY CONDITIONAL LEAST SQUARES METHOD
 RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN .1000E-04

SUMMARY OF THE MODEL

OUTPUT VARIABLE -- ACC13AH
 INPUT VARIABLES -- NOISE PRIME

VARIABLE VAR. TYPE MEAN TYPE DIFFERENCES

ACC13AH RANDOM REMOVED 1- 81

PRIME RANDOM 1- 81

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	ACC13AH	AR	1	1	.7891	.0007	8.48
2	ACC13AH	AR	1	6	.1048	.0061	1.22

RESIDUAL SUM OF SQUARES = 27423564.834341
 DEGREES OF FREEDOM = 73
 RESIDUAL MEAN SQUARE = 375665.280744

ACF VARIABLE IS RYX.

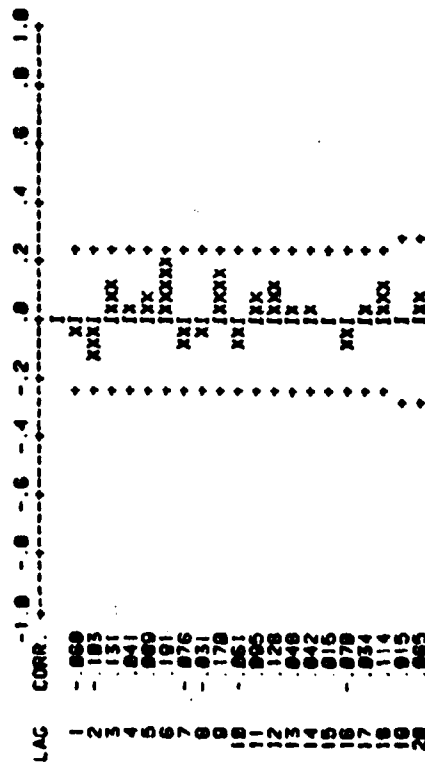
ACF VARIABLE IS RYX. MAXLAC IS 20 /

NUMBER OF OBSERVATIONS 78
 MEAN OF THE (DIFFERENCED) SERIES -0.4893
 STANDARD DEVIATION OF THE MEAN 78.2848
 T-VALUE OF MEAN (AGAINST ZERO) -1.552

AUTOCORRELATIONS

LAC	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ST.E.	.06	.06	.04	.04	.04	.04	.04	.04	.04	.04	.04	.04	.04	.04	.04	.04	.04	.04	.04	.04
13-20	.05	.04	.01	.07	.03	.11	.01	.05												
ST.E.	.13	.13	.13	.13	.13	.13	.13	.13												

PLOT OF SERIAL CORRELATION



PACF VAR

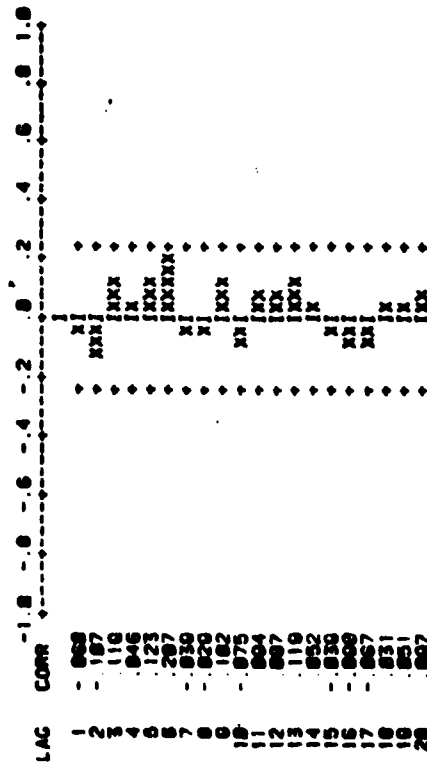
PACF VARIABLE IS NYA. MAXLAG IS 28.

NUMBER OF OBSERVATIONS 70
 MEAN OF THE DIFFERENCED SERIES -0.4903
 STANDARD ERROR OF THE MEAN 70.2940
 T-VALUE OF MEAN (AGAINST ZERO) -1.552

PARTIAL AUTOCORRELATIONS

LAC	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
1	.12	-.05	-.11	.12	.05	.12	.21	-.04	-.03	.19	-.03	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ST.E.	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12

PLOT OF SERIAL CORRELATION



VARIABLE IS PRIME.
 DEPENDENT IS 1.
 INDEPENDENT ARE (1,4).
 ACTUALS ARE 1987.
 PREDICTEDS ARE (11,3,4).
 P-VALUES ARE .0000, .0017, .0000.
 CENTERED.

THE COMPONENT HAS BEEN ADDED TO THE MODEL
 THE CURRENT MODEL HAS
 OUTPUT VARIABLE = PRIME
 INPUT VARIABLE = NOISE

FORECAST CASES = 24. JOIN.

PERIOD	FORECASTS	ST. ERR.	ACTUAL
82	17.17000	.8725	
83	17.56023	1.82003	
84	17.85387	2.13209	
85	17.85882	2.30813	
86	17.73272	2.47086	
87	17.24258	2.85466	
88	16.76946	2.83934	
89	16.43660	2.70300	
90	16.87426	2.77552	
91	16.85822	2.84533	
92	16.85822	2.81348	
93	16.85822	2.80886	
94	16.85822	3.04519	
95	16.85822	3.10005	
96	16.86866	3.23061	
97	16.87774	3.30404	
98	17.88313	3.55189	
99	17.88487	3.87782	
100	17.82808	3.76789	
101	18.07851	3.88411	
102	18.73304	3.03749	
103	18.61638	4.87268	
104	18.63538	4.10437	
105	16.78882	4.18447	
STANDARD ERROR = .87288		(BY CONDITIONAL METHOD)	

PSWEIGHT

PSWEIGHT MAXPSI = 40./

40 PSI-WEIGHTS ARE STORED

ERASE MODEL./

UNIVARIATE TIME SERIES MODEL ERASED

ARIMA VARIABLE IS ACC13AM.
ARCHONES ARE 11.61.
ARVALUES = .7501. 1040
CENTERED./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT VARIABLE = NOISE

INDEP VARIABLE IS PRIME./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT VARIABLE = NOISE PRIME

FORECAST CASES = 40 JOIN./

PERIOD	FORECASTS	ST. ERR	ACTUAL
82	4873.81241	812.81585	
83	4866.71882	798.16242	
84	4167.29689	648.21824	
85	3968.77829	679.18488	
86	3827.93218	689.28884	
87	3787.72888	811.88188	
88	3713.38765	828.32177	
89	3624.18822	848.28885	
90	3537.78875	868.41823	
91	3452.32128	872.78815	
92	3373.48811	882.28278	
93	3318.88348	889.28888	
94	3254.78546	894.88843	
95	3203.86124	898.88881	
96	3167.81254	1893.88182	
97	3112.78848	1897.87888	
98	3071.28821	1818.88832	
99	3033.54826	1813.88488	
100	2998.38859	1818.88873	
101	2968.27371	1816.78807	
102	2938.87878	1818.18857	
103	2914.11835	1818.38874	
104	2888.44324	1828.38888	
105	2868.78851	1821.18782	

BASED ON THE AVAILABLE DATA. ONLY 24 FORECASTS CAN BE MADE
 STANDARD ERROR = 612.815 (BY CONDITIONAL METHOD 1)

-END OF INFORMATION-

ARINA VARIABLE IS PRIME.
 ORDER IS 1.
 ORDERS ARE (1,2,4,5,6,10).
 CENTERED.
 ESTIMATION RESIDUAL = RX. MAXIT = 10.
 ESTIMATION BY CONDITIONAL LEAST SQUARES METHOD

RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN .1000E-04

SUMMARY OF THE MODEL

OUTPUT VARIABLE -- PRIME
 INPUT VARIABLES -- NOISE

VARIABLE VAR. TYPE MEAN TYPE DIFFERENCES
 PRIME RANDOM REMOVED 1- 01 (1-0)

PARAMETER VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1 PRIME	AR	1	1	.5728	.1003	5.71
2 PRIME	AR	2	2	-.3650	.1001	-3.65
3 PRIME	AR	4	4	-.3723	.1153	-3.23
4 PRIME	AR	5	5	.3723	.1317	2.83
5 PRIME	AR	6	6	-.4630	.1100	-4.21
6 PRIME	AR	10	10	-.2548	.1027	-2.48

RESIDUAL SUM OF SQUARES = 44.478600
 DEGREES OF FREEDOM = 54
 RESIDUAL MEAN SQUARE = .804978

ESTIMATION BY BACKCASTING METHOD

RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN .1000E-04

SUMMARY OF THE MODEL

OUTPUT VARIABLE -- PRIME
 INPUT VARIABLES -- NOISE

VARIABLE VAR. TYPE MEAN TYPE DIFFERENCES
 PRIME RANDOM REMOVED 1- 01 (1-0)

PARAMETER VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1 PRIME	AR	1	1	.5728	.1070	5.35
2 PRIME	AR	2	2	-.3650	.1076	-3.39
3 PRIME	AR	4	4	-.3723	.1147	-3.25
4 PRIME	AR	5	5	.3723	.1313	2.84
5 PRIME	AR	6	6	-.4630	.1107	-4.19
6 PRIME	AR	10	10	-.2548	.1010	-2.52

RESIDUAL SUM OF SQUARES = 44.481785 (BACKCASTS EXCLUDED)
 DEGREES OF FREEDOM = 54
 RESIDUAL MEAN SQUARE = .805820

FILTER VARIABLE IS ACCIDAM.
RESIDUALS = RV./

RESIDUAL MEAN SQUARE = 1047789.860465
VARIABLE ACCIDAM IS FILTERED. RESULTS ARE STORED IN VARIABLE RV

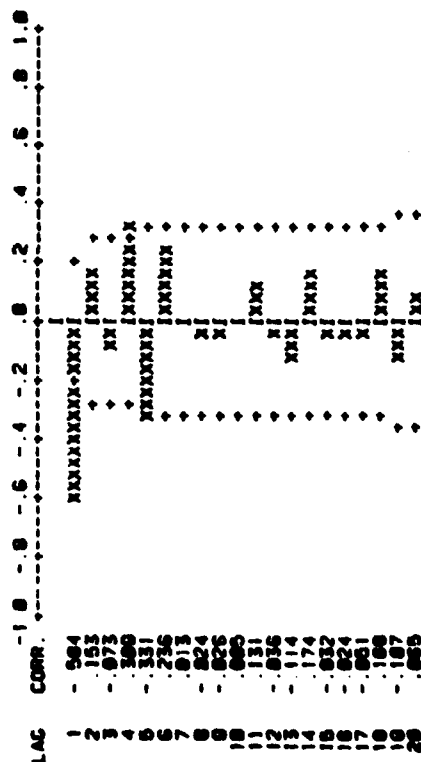
ALF VARIABLE IS RV. MAXLAG IS 20./

NUMBER OF OBSERVATIONS 81
MEAN OF THE (DIFFERENCED) SERIES = -35.8488
STANDARD ERROR OF THE MEAN 188.1238
T-VALUE OF MEAN (AGAINST ZERO) = -1.9207

AUTOCORRELATIONS

L	12	58	15	87	31	33	24	81	82	875	81	13	84
ST.E.	11	14	15	15	15	16	17	17	17	17	17	17	17
13-20	11	17	17	83	82	85	17	11	87				
ST.E.	17	17	17	17	17	17	17	17	17				

PLOT OF SERIAL CORRELATION



PAGE VARIABLE IS BY. NALAG IS 20.7

NUMBER OF OBSERVATIONS 81
 MEAN OF THE DIFFERENCED SERIES -25.0488
 STANDARD ERROR OF THE MEAN 188.1238
 T-VALUE OF MEAN (AGAINST ZERO) -25.77

PARTIAL AUTOCORRELATIONS

1-12	-.58	-.29	-.21	.34	.13	.17	.20	.15	.14	-.10	-.07	.14
ST.E.	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11
13-20	-.15	.04	.02	.00	-.01	-.11	.05	.14				
ST.E.	.11	.11	.11	.11	.11	.11	.11	.11				

PLOT OF SERIAL CORRELATION

LAC	CORR.	-1.0	-.8	-.6	-.4	-.2	.0	.2	.4	.6	.8	1.0
1	-.594											
2	-.285											
3	-.287											
4	.348											
5	.125											
6	.168											
7	.208											
8	.168											
9	.135											
10	-.181											
11	-.072											
12	.130											
13	-.146											
14	.030											
15	.023											
16	.003											
17	-.012											
18	-.111											
19	.052											
20	.141											

CCF

CCF VARIABLES ARE RX,RY MAXLAG IS 20./

EFFECTIVE NUMBER OF OBSERVATIONS = 81

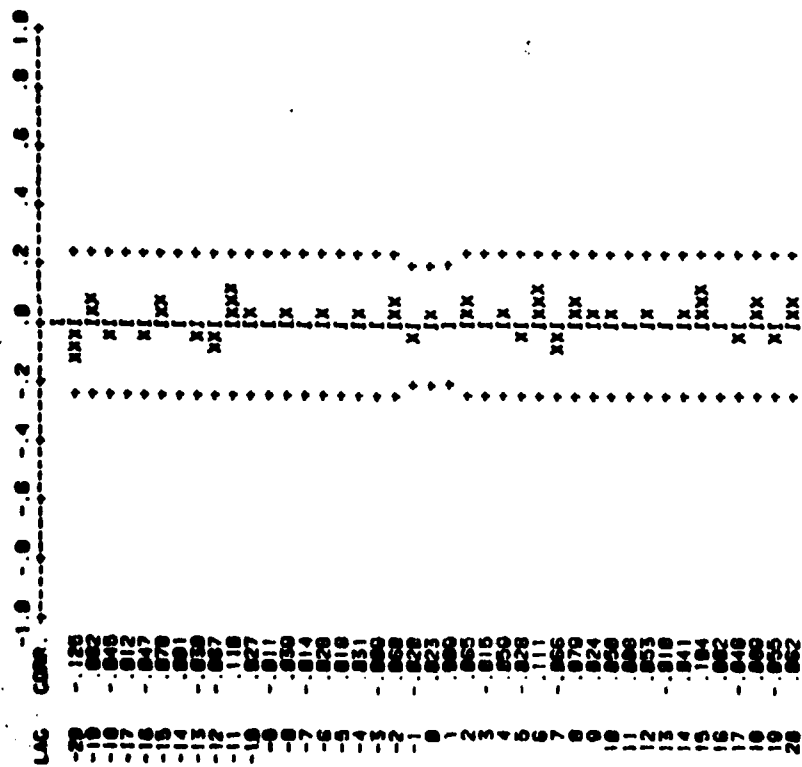
CORRELATION	OF RX	AND RY	IS	.02
CROSS CORRELATIONS OF RX	(1)	AND RY	(1+K)	
1-12	.01	.07	-.02	.06
ST.E.	.11	.11	.11	.11
13-20	-.01	.04	.18	.09
ST.E.	.12	.12	.12	.13
CROSS CORRELATIONS OF RY	(1)	AND RX	(1+K)	
1-12	-.02	.06	-.01	.03
ST.E.	.11	.11	.11	.11
13-20	-.03	0.0	.08	-.05
ST.E.	.12	.12	.12	.13

TRANSFER FUNCTION WEIGHTS

LAC	SCCF X(1), Y(1+K)	95% SX	SCCF Y(1), X(1+K)	95% SY
0	30.72327	.00002	30.72327	.00002
1	12.10766	.00001	-27.21297	-.00002
2	86.04815	.00005	80.20057	.00005
3	-29.25463	.00001	-11.80203	-.00001
4	77.66829	.00004	41.14806	.00002
5	-36.68090	.00002	23.00053	.00001
6	147.12789	.00008	37.84752	.00002
7	-86.87438	.00005	-18.48072	-.00001
8	184.31848	.00006	52.35145	.00003
9	31.68879	.00002	-15.12008	-.00001
10	86.42347	.00004	35.48478	.00002
11	18.71889	.00001	145.83587	.00008
12	60.86805	.00004	-88.84176	-.00005
13	-13.80101	.00001	-20.71120	-.00002
14	54.03377	.00003	1.07153	.00000
15	137.42010	.00008	184.13804	.00008
16	2.13016	.00000	-82.22831	-.00004
17	-63.28821	.00004	18.48487	.00001
18	118.78887	.00007	-50.88286	-.00003
19	-73.84519	.00004	180.28487	.00006
20	82.14572	.00005	-185.48889	-.00000

WHERE X(1) IS THE FIRST SERIES, Y(1) THE SECOND SERIES, SX THE STANDARD ERROR OF X(1), AND SY THE STANDARD ERROR OF Y(1)

PLOT OF SERIAL CORRELATION



ARI

ACF VARIABLE IS RYX.

ADPVA VARIABLE IS ACC13AN
ADPONES ARE (11)
APVALUES = 7177
ADPONES ARE (16)
NAVALUES = -3466
CENTERED.

THE COMPONENT HAS BEEN ADDED TO THE MODEL
THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AN
INPUT VARIABLE = NOISE

INDEP VARIABLE IS PRIME./

THE COMPONENT HAS BEEN ADDED TO THE MODEL
THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AN
INPUT VARIABLE = NOISE PRIME

ESTIMATION RESIDUALS IS RYX. MAXIT = 10.
METHOD IS CLS./

ESTIMATION BY CONDITIONAL LEAST SQUARES METHOD
RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN .1000E-04

SUMMARY OF THE MODEL

OUTPUT VARIABLE -- ACC13AN
INPUT VARIABLES -- NOISE PRIME
VARIABLE VAR. TYPE MEAN TIME DIFFERENCES
ACC13AN RANDOM REMOVED 1- 01
PRIME RANDOM 1- 01

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	ACC13AN	MA	1	0	-3450	.1135	-3.05
2	ACC13AN	AR	1	1	.7116	.0002	18.43

RESIDUAL SUM OF SQUARES = 20000502.716625
DEGREES OF FREEDOM = 78
RESIDUAL MEAN SQUARE = 257443.496209

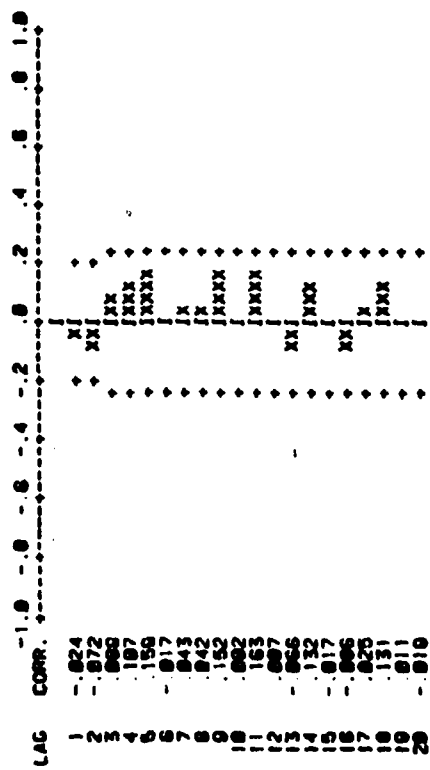
ADF VARIABLE IS MYX. MAXLAC IS 20.

NUMBER OF OBSERVATIONS 60
 MEAN OF THE DIFFERENCED SERIES -0.9734
 STANDARD ERROR OF THE MEAN 0.1873
 T-VALUE OF MEAN (AGAINST ZERO) -5.1921

AUTOCORRELATIONS

LAG	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ACF	.11	.02	-.07	.00	.11	.16	-.02	.04	.04	.15	.00	.16	.01	.12	.12	.12	.12	.12	.12	.12
ST. E.	.12	.07	.13	.02	.00	.02	.13	.01	.02	.13	.13	.13	.13	.13	.13	.13	.13	.13	.13	.13

PLOT OF SERIAL CORRELATION



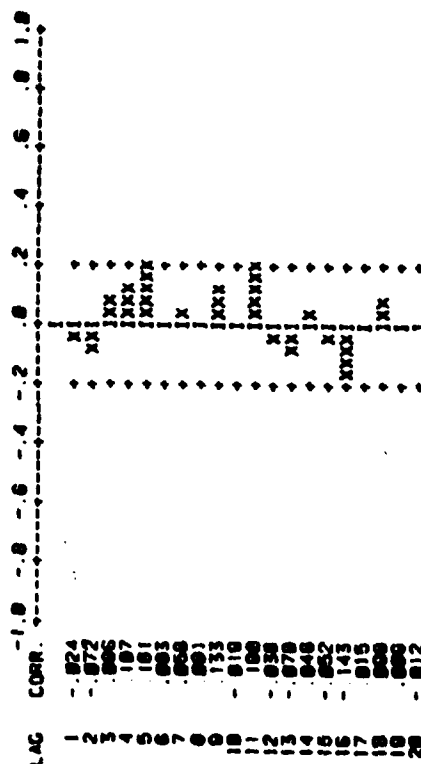
PMCT VARIABLE IS RYX PARLAG IS 20./

NUMBER OF OBSERVATIONS 80
 MEAN OF THE (DIFFERENCED) SERIES -0.0734
 STANDARD ERROR OF THE MEAN 07.5375
 T-VALUE OF MEAN (AGAINST ZERO) -1.021

PARTIAL AUTOCORRELATIONS

LAG	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
RYX	.02	-.07	.00	.11	.10	.00	.00	.00	.00	.00	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11
ST.E																				

PLOT OF SERIAL CORRELATION



ORDER VARIABLE IS PRIME
 ORDER IS 1
 ADVANCE ARE (1,2,4,6,8,10)
 ADVANCE - 8788 - 2000 - 3783 - 403 - 204
 CENTERED

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
 OUTPUT VARIABLE = PRIME
 INPUT VARIABLE = NOISE

FORECAST CASES = 24 JOIN.

PERIOD FORECAST ON VARIABLE PRIME FROM TIME PERIOD 82 ACTUAL

PERIOD	FORECASTS	ST. ERR.	ACTUAL
82	16.83864	1.83864	
83	17.23746	1.62348	
84	17.72334	2.10894	
85	18.21532	2.45488	
86	18.70828	2.80885	
87	19.20377	2.78473	
88	19.70258	2.85658	
89	17.83088	2.88138	
90	16.84565	2.88315	
91	16.85502	2.92778	
92	16.85850	2.85433	
93	16.87186	2.87488	
94	16.88480	2.88953	
95	16.89593	3.81278	
96	16.90280	3.87877	
97	17.89338	3.16128	
98	17.20363	3.28485	
99	17.48388	3.38378	
100	17.88648	3.48348	
101	17.44948	3.53888	
102	17.30802	3.80782	
103	17.20842	3.63138	
104	17.18258	3.87114	
105	17.11842	3.71816	

STANDARD ERROR = .833883 BY CONDITIONAL METHOD

PSWEIGHT MAXPS

PODEIGHT NAPS: = 48./

PGI-WEIGHTS ARE STORED

GRADE MODEL./

UNIVARIATE TIME SERIES MODEL ERASED

ARIMA VARIABLE IS ACC13AM.
ARVALUES ARE .111.
ARVALUES = .7117
MAVALUES ARE .161.
MAVALUES = -.3485.
CENTERED./

THE COMPONENT HAS BEEN ADDED TO THE MODEL
THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT VARIABLE = NOISE

INDEP VARIABLE IS PRIME./

THE COMPONENT HAS BEEN ADDED TO THE MODEL
THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT VARIABLE = NOISE PRIME

FORECAST CASES = 48. JOIN./

FORECAST ON VARIABLE ACCRUAL FROM TIME PERIOD 82

PERIOD	FORECASTS	ST. ERR.	ACTUAL
82	4718.77784	888.19172	
83	4821.88388	744.81788	
84	4176.82784	884.88222	
85	3781.84844	834.81852	
86	3882.17222	848.89478	
87	3898.85188	825.88484	
88	3371.88788	882.82181	
89	3188.88881	828.82832	
90	3888.21815	837.88788	
91	2882.18822	845.88828	
92	2828.84342	845.88822	
93	2771.74888	847.88888	
94	2733.88888	848.18887	
95	2788.77778	848.48838	
96	2888.28888	848.87823	
97	2872.48888	848.78887	
98	2882.78888	848.81888	
99	2855.81448	848.84882	
100	2858.84448	848.85331	
101	2847.81834	848.86888	
102	2844.88148	848.88338	
103	2842.78182	848.88887	
104	2841.41881	848.88884	
105	2848.43788	848.88888	

BASED ON THE AVAILABLE DATA, ONLY 24 FORECASTS CAN BE MADE

STANDARD ERROR = 888.171, 18Y CONDITIONAL METHOD 1

END/

Appendix E-9
Forecasts of TS Models

ARINA VARIABLE IS ACC13AM.
 DFORDER IS 1.
 ARORDERS ARE (1,2).
 CENTERED./

FORECAST CASE IS 10. START IS 50./

FORECAST ON VARIABLE ACC13AM FROM TIME PERIOD 50

PERIOD	FORECASTS	ST. ERR.	ACTUAL
50	1748.97683	713.64942	1742.00000
51	1678.35866	880.91520	1650.00000
52	1655.71074	943.40842	2488.00000
53	1685.05384	1045.89281	2504.00000
54	1684.34892	1150.15525	2340.00000
55	1674.95158	1229.25173	2203.00000
56	1677.77880	1304.73549	2172.00000
57	1680.06950	1380.47766	2398.00000
58	1678.51230	1450.75478	2915.00000
59	1678.19378	1516.87421	2653.00000

STANDARD ERROR = 713.649 (BY CONDITIONAL METHOD)

ARIMA VARIABLE IS ACC13AM.
 DFORDER IS 1.
 ARORDERS ARE '(1,2)'.
 CENTERED./

FORECAST CASE IS 10. START IS 60./

FORECAST ON VARIABLE ACC13AM FROM TIME PERIOD 60

PERIOD	FORECASTS	ST. ERR.	ACTUAL
60	2556.39389	661.07372	2375.00000
61	2668.73581	816.01676	2495.00000
62	2669.27230	873.90600	2323.00000
63	2632.39999	968.84021	2500.00000
64	2642.41359	1065.42146	3113.00000
65	2651.69991	1138.69078	3029.00000
66	2645.86041	1208.61353	2965.00000
67	2644.43839	1278.77565	2649.00000
68	2646.74024	1343.87534	2322.00000
69	2646.56902	1405.12365	2998.00000

STANDARD ERROR = 661.074 (BY CONDITIONAL METHOD)

ARIMA VARIABLE IS ACC13AM.
 DFORDER IS 1.
 ARORDERS ARE '(1,2)'.

FORECAST CASE IS 10. START IS 75./

FORECAST ON VARIABLE ACC13AM FROM TIME PERIOD 75

PERIOD	FORECASTS	ST. ERR.	ACTUAL
75	3194.09557	602.63919	3630.00000
76	3155.86233	743.88630	4455.00000
77	3178.81816	796.65851	4454.00000
78	3184.97302	883.20116	4933.00000
79	3175.76808	971.24528	4396.00000
80	3176.29970	1038.03807	4455.00000
81	3179.16185	1101.78012	5097.00000
82	3178.19716	1165.74037	
83	3177.52811	1225.08568	
84	3178.02834	1280.92005	

STANDARD ERROR = 602.639 (BY CONDITIONAL METHOD)

FORECAST CASE IS 10. START IS 50./

FORECAST ON VARIABLE ACC13AM FROM TIME PERIOD 50

PERIOD	FORECASTS	ST. ERR.	ACTUAL
50	1631.13598	608.05057	1742.00000
51	1624.99382	784.98051	1650.00000
52	1646.37702	867.48427	2488.00000
53	1662.90076	963.67506	2504.00000
54	1854.64815	1059.92722	2340.00000
55	1701.97338	1141.99861	2203.00000
56	1521.88813	1217.76167	2172.00000
57	1653.96637	1290.51636	2398.00000
58	1860.62967	1359.30526	2915.00000
59	1766.05508	1424.47338	2653.00000

STANDARD ERROR = 608.051 (BY CONDITIONAL METHOD)
PAGE 11 ACCESSIONS

FORECAST CASE IS 10. START IS 60./

FORECAST ON VARIABLE ACC13AM FROM TIME PERIOD 60

PERIOD	FORECASTS	ST. ERR.	ACTUAL
60	2549.33471	549.21368	2375.00000
61	2632.00274	709.02331	2495.00000
62	2512.52297	783.54375	2323.00000
63	2542.93764	870.42681	2500.00000
64	2598.95116	957.36531	3113.00000
65	2556.72016	1031.49521	3029.00000
66	2774.60056	1099.92720	2965.00000
67	2749.14360	1165.64191	2649.00000
68	2657.10415	1227.77459	2322.00000
69	2643.60233	1286.63683	2998.00000

ARIMA VARIABLE IS ACC13AM.
 DFORDER IS 1.
 ARORDERS ARE (1,2,14)'.
 CENTERED./

FORECAST CASE IS 10. START IS 75./

FORECAST ON VARIABLE ACC13AM FROM TIME PERIOD 75

PERIOD	FORECASTS	ST. ERR.	ACTUAL
75	3239.12204	496.13972	3630.00000
76	3155.69930	640.50595	4455.00000
77	3216.53659	707.82501	4454.00000
78	3389.29928	786.31202	4933.00000
79	3320.38748	864.84911	4396.00000
80	3273.98160	931.81537	4455.00000
81	3214.86950	993.63435	5097.00000
82	3149.68556	1052.99864	
83	3356.49160	1109.12704	
84	3470.80177	1162.30106	

STANDARD ERROR = 496.140 (BY CONDITIONAL METHOD)
1PAGE 9 ACCESSIONS

ARIMA VARIABLE IS ACC13AM.
 DFORDER IS 1.
 ARORDERS ARE (1,2,14).
 CENTERED./

FORECAST CASE IS 10. START IS 80./

FORECAST ON VARIABLE ACC13AM FROM TIME PERIOD 80

PERIOD	FORECASTS	ST. ERR.	ACTUAL
80	4361.11308	502.22676	4455.00000
81	4413.59049	648.36419	5097.00000
82	4325.12868	716.50918	
83	4509.10059	795.95913	
84	4633.25590	875.45978	
85	4461.12185	943.24763	
86	4456.14689	1005.82505	
87	4496.20323	1065.91768	
88	4529.84149	1122.73471	
89	4620.19912	1176.56110	

STANDARD ERROR = 502.227 (BY CONDITIONAL METHOD)
 1PAGE 9 ACCESSIONS

VITA

Kenneth Michael Kalinich was born on 30 November 1951 in Endicott, New York. He enlisted in the Army in July 1969 to attend the United States Military Academy Preparatory School at Ft. Belvoir, Virginia. He attended and graduated from the United States Military Academy in 1974 with a Bachelor of Science degree. He was commissioned in June 1974 and was stationed at Ft. Eustis, Virginia where he served as personnel management officer for the post. In September 1977 he was assigned to Headquarters V US Army Corps in Germany where he performed duties as company grade (officer) assignment officer. From there he was assigned to Fulda, Germany where he served as Regional Personnel Center Commander. In August 1979 he was assigned to Frankfurt, Germany where he served as Detachment Commander for the 64th Replacement Regulating Detachment. In September 1980 he attended the Adjutant General Officer Advanced Course at Ft. Harrison, Indiana, and was subsequently assigned for duty at the School of Engineering, Air Force Institute of Technology, in May 1981.

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VITA

Dennis Charles Wenzel was born on 1 August 1949 in San Antonio, Texas. He enlisted in the Army in February 1972 and served in Korea as a computer programmer from September 1972 to October 1974. Under an Army enlisted student status, he received a Bachelor of Arts in Mathematics and a Bachelor of Business Administration in Personnel Management from Saint Mary's University of San Antonio in May 1976. He was commissioned in October 1976 and served in Korea for one year as a computer data base manager. In January 1978 he performed duty as a personnel management officer in the 6th Air Cavalry Brigade and as a systems analyst in III Corps at Fort Hood, Texas. In 1980 he was assigned six months Temporary Duty to Fort Harrison, Indiana, as a Data Processing Officer Student and Instructor. He then attended the Adjutant General Officer Advanced Course at Fort Harrison, and was subsequently assigned for duty at the School of Engineering, Air Force Institute of Technology, in May 1981.

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