

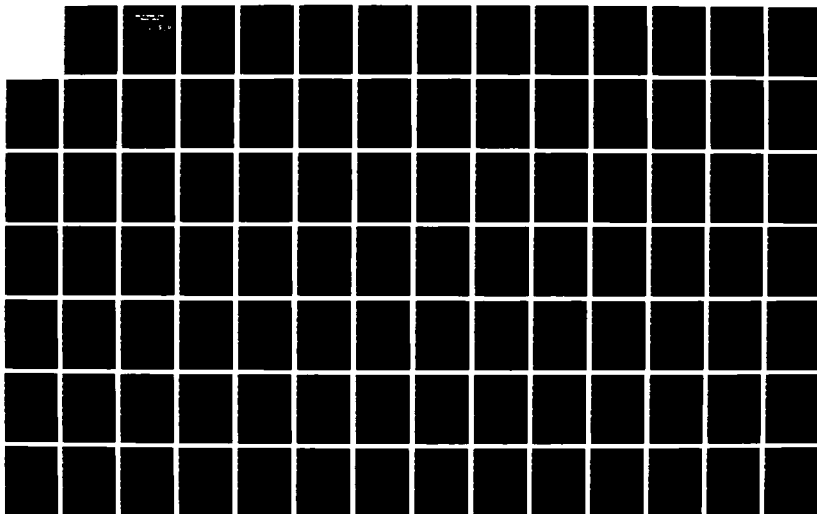
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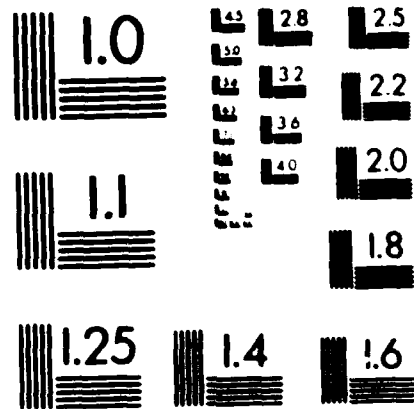
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# NAVAL POSTGRADUATE SCHOOL Monterey, California



## THESIS

THE EFFECTS OF ECONOMIC CONDITIONS ON  
OVERALL AIR FORCE OFFICER ATTRITION

by

Gary R. Grimes

December 1987

Thesis Co-Advisors:

Loren Solnick  
David Henderson

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The Affects of Economic Conditions on Overall  
Air Force Officer Attrition

by

Gary R. Grimes  
First Lieutenant, United States Air Force  
B.A., New Mexico State University, 1983

Submitted in partial fulfillment of the  
requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

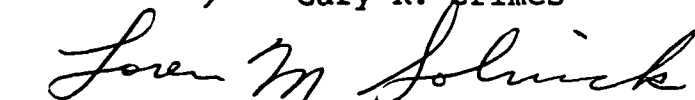
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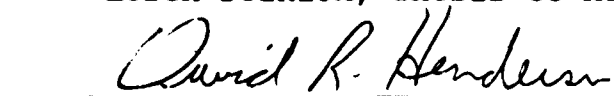
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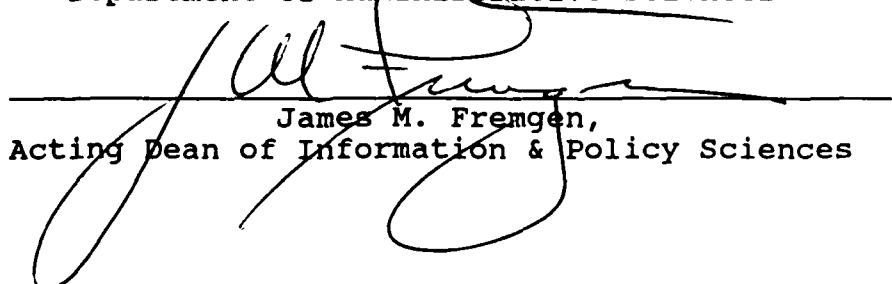
  
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# ABSTRACT

Air Force planners need to accurately predict officer losses in order to effectively control: the overall force size, promotion rates, augmentation and recruiting needs. Officer losses are influenced by a variety of behavioral and economic factors. This research identified the overall civilian unemployment rate as the major economic factor affecting Air Force officer losses.

However, including the unemployment rate with the <sup>win</sup> system data (the number of separation/retirement applications already accepted) failed to increase the accuracy of the model currently used by the Air Force.

Recommendations are to further explore the cause of the serial correlation found in the time series data and to model the causal relationships that cause officers to leave the Air Force. *Measuring Military Separation, Attrition*

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## I. INTRODUCTION

### A. BACKGROUND

To effectively manage policies related to accession, promotion, and other issues within the officer corps, Air Force planners require a high degree of accuracy in predicting officer losses. Internal personnel flows, such as transfers and promotions, are greatly influenced by external personnel flows, such as retirement and separations. Vacancies created by the external flows need to be filled by personnel from within the system, through promotion, or by the recruitment of personnel from outside the system. Great care needs to be given to accession and promotion policies. These two policies are the Air Forces' most effective personnel management tools.

Accession and promotion policies are subject to change depending upon the overall manning structure authorization. The manning structure is affected by three main factors: officer losses, changes in Congressional authorization, and the federal budget. The latter two factors, Congressional authorization and the federal budget, determine Air Force policy. Officer losses however, are affected by Air Force policy.

Obtaining Air Force officers at the entry level can take several years of lead time. The Air Force Academy, for

instance, requires a minimum of 4 years lead time, Air Force Reserve Officer Training Corps (AFROTC) a minimum of 2 years and Officer Training School (OTS) a minimum of 6 months.

Insufficient lead time can result in reacting too late to crises. Crisis reactive personnel policies may result in morale problems among the officer corps. These problems can lead to excessive losses or even abnormally high retention, both of which can have adverse effects on long term manpower planning. However, pro-active personnel policies lead to effective and efficient personnel management. With the proper personnel policies, perhaps the military could eliminate the need for such personnel actions as Reductions in Force (RIF), which are caused by unforeseen manning overages.

The ability to accurately project officer attrition, in advance, provides Air Force leadership the information and sufficient lead time necessary to compensate for these losses and provide for a stable officer corps.

## B. OBJECTIVES

The purpose of this thesis was to develop a model capable of accurately predicting Air Force Officer losses. To accomplish this, historical retirement and separations data needed to be analyzed. This was done to identify and analyze any trends and patterns that may exist in the data.

In addition to the separation and retirement trend data, an economic indicator that patterned the attrition rate was

sought. There is a definite and clear negative relationship between officer losses and the state of the U.S. economy. The best economic predictor of officer losses appears to be the overall unemployment rate. As the national unemployment rate increases, the number of officers leaving the Air Force decreases. Correspondingly, when the unemployment rate decreases, Air Force officers are more willing to leave, due to the increased availability of good civilian jobs.

Succinctly put, I hoped to have developed a model, using linear regression analysis, that will accurately and in a timely manner project the number of Air Force Officers leaving the Air Force, within the current fiscal year.

#### C. RESEARCH QUESTIONS

Can future Air Force Officer losses be accurately projected by using historical data? Furthermore, how does the current state of the economy, as measured by the unemployment rate, affect the decisions of individuals to separate from the U.S. Air Force Officer Corps?

#### D. LIMITATIONS, SCOPE AND ASSUMPTIONS OF RESEARCH

##### 1. Limitations

Present Air Force policy requires officers to give a minimum of 180 days notice prior to separation or retirement. However, recent officer reductions mandated by the Gramm-Rudman Bill have caused liberal granting of waivers, allowing personnel to attrite with less than the

required 6 months notice. This may have affected the last few monthly observations in the data set. For this reason, careful analysis and consideration will be given to the time period from March to June 1987.

The data set for this project contains separate files of different categories of officers. When the task of recording the separation and retirement actions began, the starting times were different for each file. As a result, the files were different lengths. Therefore, the historical data base for this analysis required alteration. A complete data set was available and used for the period from March 1982 through May 1987.

Regression analysis will be used to identify a national economic indicator(s) that exhibits trends similar to that of Air Force Officer attrition. Monthly economic data is readily available in the monthly issues of the U.S. Government publication Economic Indicators.

Both sets of variables, historical and economic, will be incorporated into one model, enabling the Air Force to project officer losses based on historical trends and on current economic conditions.

## 2. Scope

This model is intended to accurately project, by month, the total number of officer personnel leaving the Air Force, before the end of the fiscal year. This projection model will not attempt to identify or to use behavioral

traits or other similar types of explanatory variables. This thesis focuses on the trends of historical attrition and economic conditions. The data will be used to support a model that projects Air Force officer losses from 1 to 12 months in advance, focusing on the 6 to 12 month projections. These projections will be done for the Non-Rated Line (NRL) category of Air Force officers eligible for separation and/or retirement, regardless of their job specialty, Air Force Specialty Code (AFSC), within the Air Force.

The NRL category is the largest and most homogeneous group of officers in the Air Force. This group is comprised of all Air Force Officers excluding Rated Officers; pilots, navigators, and strategic missile launch control officers. In my opinion, the motives for rated officers exiting the military are different than the NRL officers. Rated officers respond more to the actions of the airline industry. If the airline industry is in a period of growth, rated officers will exit the military. The periods of growth or decline in the airline industry are not necessarily the same for the economy as a whole. For this reason, Rated Officers are excluded from this study.

### 3. Assumptions

This model is only one of many the Air Force uses to forecast personnel end strengths and the effects of policy changes on Air Force military manpower. One similar model

used by the Air Force is the Air Force Computerized Officer Projection System (AFCOPS). The AFCOPS model is primarily used for making officer loss projections 2 years in advance. It is a Monte Carlo type model, using probabilities of past losses to predict future losses. The model's primary purpose is for determining the effects of budget changes on officer attrition.<sup>1</sup>

Another type of officer loss estimation model used by the Air Force is the Defense Officer Personnel Management System (DOPMS). The DOPMS model is a Markov Chain type model using cells and information flow between the cells. This model is primarily used for determining the effects of policy changes relative to manpower levels. The DOPMS model is capable of making projections in 5 year increments.<sup>2</sup>

As part of the Air Force's "On Track System" (a system specifically designed to produce current/up-to-date information) this model's purpose is to arrive at a total number of officer losses each month, up to the end of the current fiscal year.

#### E. LITERATURE REVIEW

Other loss projection models have been developed by other branches of the military, but the structure of the

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<sup>1</sup>Dremstedt, Statistical Techniques for Determining Officer Separation and Retirement Trends in the United States Air Force, Master's Thesis, Air Force Institute of Technology, 1982, p. 2.

<sup>2</sup>Ibid., p. 3.

other models is greatly different from the model Air Force is currently using. There is, however, one thread of continuity between the other models and the model I am now investigating, namely unemployment rates. The overall unemployment rate is the most significant economic influence in the separation of officers from the military.<sup>3</sup> According to other studies, the unemployment rates have the most explanatory power when they precede actual attrition by 12 months.<sup>4</sup>

#### F. EXPECTED OUTCOME

At the end of my research I expect to find that the nation-wide overall unemployment rate is a significant factor in predicting the attrition of Air Force Officers. The relationship between the unemployment rate and attrition should be negative. By this I mean as the unemployment rate increases, attrition in the form of separation and retirement should decrease. Based on my literature review, I anticipate the unemployment rate will lead attrition by one year. This should apply to both separation and retirement actions.

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<sup>3</sup>William John Esmann, Marine Officer Attrition Model, Master's Thesis, Naval Postgraduate School, Monterey, California, 1984, p. 23.

<sup>4</sup>Thomas F. Wilson, "Engineering Retention and the Economy," Student Report, Air Command and Staff College, 1982, p. 14.

## G. ORGANIZATION OF STUDY

The remainder of this thesis will cover an extensive literature review followed by an explanation of the structure of the data base. The analysis will begin with an clarification of the methodology used, succeeded by the actual analysis of retirement and separation data of Non-Rated Line (NRL) officers.

The empirical work will begin with the analysis of retirement actions using linear regression. The separation data will be analyzed secondly. Each section will close with a summary of findings for that particular section. The final chapter will summarize all the conclusions and make recommendations for further analysis in the area of loss projection models.

## II. LITERATURE REVIEW

Other researchers have previously investigated the relationship between attrition in the military and the state of the U.S. economy. This chapter reviews of some of the studies that pertain to the attrition of officers from the military.

### A. BRES AND ROWE

Edward Bres and Murray Rowe, 1979, compared various methods of attrition forecasting with a system being used by the Navy OP-130 in 1979. At that time OP-130 was using a weighted average of historical loss in a Markov flow matrix. Bres and Rowe gave a relatively good and brief explanation of various time series analysis methodologies. The interpretation included examples of each of the models, with their respective rationale and particular weaknesses. In addition to time series, two regression approaches were evaluated, ordinary least squares (OLS) and minimum absolute deviation (MAD) regression.

These techniques were evaluated by comparing their mean absolute errors. The procedure with the lower error was deemed to be the best. This was done for each cell in the Navy's promotion flow model. The cells were broken down by grade and years of service (YOS) cohorts.

The authors found that a 3-year autoregressive time series model produced significantly better results than the historical weighted average model used by the Navy at that time. However, comparison of the models is better done by measuring the predictability of the model rather than by comparing the mean absolute errors.

#### B. ESMANN

William Esmann, 1984, performed a study on Marine Corps Officer attrition. His intent was to quantify the connection between the state of the economy and Marine Corps Officer attrition. He separated the data by grade to categorize his loss predictions. He used a survey of all ranks of Marine Corps Officers in order to identify the major determinants of attrition. His survey revealed 3 major classes of variables: (1) military pay, (2) the economy, and (3) promotion potential.

When considering the economic explanatory variables, Esmann used various measures of economic activity to explain officer attrition. His choices were (1) managerial unemployment, (2) professional/technical unemployment, (3) consumer price index, and (4) gross national product, GNP. In the author's opinion (based on the definition of managerial and professional categories of unemployment provided by the Department of Labor), the managerial and professional/technical areas of unemployment are the closest

functional areas for military officers to consider when making their decision whether to stay or leave the military.

Esmann did not use the annualized cost of leaving, ACOL, model in his study. He felt there was an "intuitive" error built into the ACOL model. Specifically, the ACOL model relates voluntary attrition to the military/civilian pay ratio. Esmann interpreted this to mean that an individual will choose to leave the military if he/she perceives compensation better in the civilian sector than in the military. This interpretation is not correct.

The error he perceived is the under-emphasis of variables like patriotism, pride in service, and the individual's satisfaction with the military lifestyle, as significant factors relating to attrition. His opinion was based on his "regressions of attrition on civilian to military pay ratios which showed little explanatory power."<sup>1</sup>

Esmann's perception of the ACOL model was incorrect. The ACOL model does account for the taste an individual has towards military life.

Esmann argued that the economy did not cause a person to leave the military. His opinion was that an individual decided whether to separate from the military for reasons other than economic. The economy helped decide the timing of the separation but not the separation decision itself. His opinion was based on a series of interviews he had with

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<sup>1</sup>Esmann, p. 11.

Headquarters Marine Corps career planning officers. These officers correspond with hundreds of officers daily and, in his opinion, have good feedback on the reasons for officer attrition.

Esmann then used his selected explanatory variables (managerial/administrative unemployment, professional/technical unemployment, gross unemployment, and military/civilian pay ratio) in a time series analysis model. His resulting model showed that gross unemployment was the most significant economic factor in determining officer attrition.

Esmann noted that most attrition occurs in the summer months. The reason is not necessarily economic, but personal. Most commissioning programs assess officers in the summer months and also, most military parents choose to make changes in summer when their children are out of school.

#### C. KOSTIUK

Peter F. Kostiuk, 1986, looked at the effects of civilian employment rates on the attrition of Marine Corps Officers. The data on 20,000 active duty officers were obtained from Headquarters Marine Corps. The information was categorized into cells by community (general job classification), grade, years commissioned service (YCS), and fiscal year. His study was done on an annual basis.

The explanatory variables chosen were (1) historical attrition rates during the FY 77 to FY 84 time period, and (2) historical unemployment rates during the same time. The unemployment rates were lagged six months because of a requirement in the Marine Corps to give six month notice prior to leaving the service. Kostiuk believed that six months prior was the time when the person made up his/her mind whether to stay in the Marine Corps or return to the civilian sector. The selection of the 6 month lag seemed to be made arbitrarily, without testing. However, the reason is probably due to the 6 month notice that is required of all officers prior to any form of voluntary attrition.

Kostiuk chose the Logit form of regression. It is used for categorical response type variables (e.g., separating from the military?, Yes or No).

The researcher separated the last 12 months of data from the rest of the data bank for later comparison. After analysis, Kostiuk compared his predictions with the actual results during that time, FY 84. His comparison of the results was deficient because he compared raw numbers, without calculating percent errors. Raw numbers have little meaning alone.

Kostiuk concluded that unemployment rates do affect attrition rates. However, he made certain observations about the effects of unemployment rates with respect to an individual's grade and Years Commissioned Service (YCS).

According to Kostiuk, unemployment had no affect on the 0- 4 YCS group since they were serving their initial obligation. The 5-11 YCS group was the most affected by the unemployment rates. Little change was observed for the 12-16 YCS group, and the 17-20+ group was not affected at all by changes in unemployment rates. This is completely understandable due to the career implications of added YCS and the structure of the service's retirement program.

#### D. DREMSTEDT

In his graduate thesis, Albert Dremstedt, 1983, developed a model for officer loss estimation based on historical trends. Simultaneously he developed models using linear regression and Box-Jenkins time series analysis. His purpose was to predict/forecast officer losses in the Air Force so that accurate monthly and end of Fiscal Year (FY) strength levels could be estimated. He separated the losses into two categories. One category was persons separating from the Air Force and the other category was individuals retiring from the Air Force.

##### 1. Separations Analysis

Dremstedt did regression analysis of separation patterns using stepwise regression. (Generally, stepwise regression is not the best way to analyze data. The stepwise method selects the variables that explain the most variance in the dependent variable, whether they intuitively make sense or not.) Data was separated into two types of

Dates of Separation (DOS), one with a separation program designator (SPD) and one without SPD. DOS with SPD is defined as an officer career separation (a separation greater than one year after the officer's initial obligation). This type of separation requires a minimum of 180 days notification prior to the desired separation. DOS without SPD is defined as an officer eligible for separation immediately following (or within one year) of his/her initial obligation. Both types of data were used as independent variables in linear regression. Actual losses were used as the dependent variable.

The data for the analysis came from an Air Force report called Fiscal Year Computerized Officer Projection System, (FYCOPS). The FYCOPS report was designed to facilitate the tracking and control of normal separations. Basically, this model keeps track of the personnel eligible for separation/retirement and displays the number by month. The model also keeps track of the career personnel who have already submitted their applications for separation/retirement.

The linear regression  $R^2$ s ranged from .99 for a one-month projection to .75 for the 12-month projection. This sounds abnormally high until you understand the variables used. The independent variables are those eligible for separation or those who have already applied for separation. The dependent variable is the actual accomplished

separations. Given this type of information, a high  $R^2$  is understandable.

During the model's testing phase, Dremstedt noticed that the model was consistently over-estimating each month. He felt this was attributable to the large size of the data base. He also noted that if the data base was too large (measured by the numbers of observations), the model would react to change too slowly. On the other hand, if the number of observations was too small, outliers would have a significant impact and might bias the outcome. Hence, Dremstedt searched for the optimal number of monthly observations to use.

He ran separate regression analyses of each data set with its maximum number of observations (depending on the data set in question) taking one observation away each time, until a minimum of 12 observations was reached. He then plotted the adjusted  $R^2$ s and standard deviations for each regression output. Comparing these values graphically, he noticed the best  $R^2$  and the least standard deviation occurred at 23-24 months. To keep the period of time in whole years, he settled on 24 months as the optimal number of observations for accurate linear projections.

In testing the model, Dremstedt noted a 16.9% error rate. To reduce this rate, he changed the way data was entered into the regression. Instead of using 24 months of historical data for each of the 12 monthly predictions, he

used the previous predictions as part of the input data. In other words, he predicted the first month, then used 23 months of historical data and the first month's prediction as the 24 month observations for the second month's prediction. He continued this until he had predicted the entire year. The error rate fell to 9.6%, a 43.2% decrease. However, he cautioned this was done with only one sample. Before implementation, further analysis needs to be completed.

In Dremstedt's time series analysis of separations, he used an Autoregressive Integrated Moving Average (ARIMA) process model using the Box-Jenkins technique. The results were not as reliable as the linear form of regression.

## 2. Retirement Analysis

When analyzing retirement data, Dremstedt conducted a similar procedure. First, linear regression and then time-series analysis. The two main independent variables used were mandatory and voluntary retirements. Mandatory retirement consisted of disability, high year of tenure restrictions (an Air Force policy that separates officers who have reached their maximum allowable time in service at their current grade), and promotion failure (those officers twice non-selected for promotion to the next higher grade). He also used a third independent variable, time. This variable gave an order to the observations and reduced the amount of serial correlation.

Due to retirement policy changes in the late 1970s, the data were limited to just a few years. Once suitable data were obtained, the  $R^2$ s ranged from .99 for a one month projection to .82 for a 12 month projection.

The linear retirement model was tested in the same manner as the linear separations model. The first tests were done with 24 historical observations. The second tests were done with historical observations mixed with the prior monthly projections from the model. In this case no significant difference was noticed between the two testing methods. At this point, Dremstedt recommended future research to determine the optimal number of observations to use.

The time series analysis of retirements was completed the same way as the separations. Dremstedt's conclusion was that linear regression proved more accurate than time series analysis in the projection of officer losses in the Air Force.

### III. BACKGROUND

#### A. RELATED ISSUES

The Air Force uses different types of manpower prediction models for different purposes. Three different systems are currently being used. One system deals with the affects of current or proposed policy changes on future manpower strengths and requirements. The second system deals with the effects of proposed budget changes on future manpower needs. The third system, the "On Track System," is intended to model current manpower strengths (within the current fiscal year) in light of the current environment. The model I am modifying is being used in the "On Track System." A brief explanation of the other projection models would enhance the level of understanding of the Air Force manpower system.

##### 1. AFCOPS

The model simulating the effects of budget changes is the Air Force Computerized Officer Projection System (AFCOPS). AFCOPS is a stochastic, Monte Carlo type model that uses the records of officers without using their names. The model uses data from each officer's personnel record, and through linear regression is able to determine, using random probabilities, if the officer is likely to stay or leave the military. Loss rates are based on a 1 or 2 year

history. The model has built-in procedures to compensate for promotion and augmentation. The model also "ages" the officer as he/she progresses through his/her career.

The model is able to age the force by using the personal attributes of an officer. For example, if an officer is an O-3, rated, married, with 2 dependents, and is 28 years old, he/she occupies a location (cell) in a flow matrix. As time passes the officer is aged and promoted if necessary. The model is not concerned with whether the officer has a SPD code (separation program designator, accepted separation application) or not; it just considers probabilities.

The model automatically considers officers eligible for promotion, in the promotion zone, but it will not promote them. In other words, the officer will remain in his matrix location as an O-3, but will not be promoted to O-4. However, it will automatically consider an officer separated at the appropriate time if he/she is twice passed over for promotion.

The AFCOPS model makes predictions for End of Fiscal Year (EOFY) and for the next 5 years as well. The primary purpose of the projections is for estimating how the officer corps will respond to changes in monetary incentives brought about by changes in the budget.

## 2. DOPMS

The Defense Officer Personnel Management System (DOPMS) is a model that projects the effects of policy changes on future officer manpower strengths. This model is a Markov Chain type, using cellular locations of information pertaining to the officer's years of service (YOS), grade, rating, and whether the officer is regular or reserve. The data is accumulated without the names of the individuals.

A five year history is used to obtain the probability (rate) of transition from one cell location to another. DOPMS also uses economic factors and Annualized Cost of Leaving (ACOL) information in making its projections. DOPMS makes two year projections.

## 3. On Track System

This system is designed to make projections within the current fiscal year using current data. This up-to-date information is just as vital as, if not more important than, the longer range projections. To meet the proper end strength authorizations set by Congress, Air Force planners require up-to-date information.

### B. CURRENT "ON TRACK" SYSTEM

The current model used by the Air Force Military Personnel Center for projecting EOFY officer end strengths is a linear regression of the data provided by the FYCOPS report (in system data) with the historical attrition data. Each month the last 24 months data (actual attrition

numbers; both separations and retirements, as well as the number of officers eligible to separate and the number of officers whose retirement and separation applications were in the personnel system) are analyzed by Ordinary Least Squares (OLS) regression.

The FYCOPS figures (the number of officers eligible or applied) for each data file are then inserted in the estimated regression equation. Separation and retirement projections for that particular month and category of officer are calculated as follows:

$$\text{Separations}_t = \text{constant} + B_1 \times \text{NSPD}_t + B_2 \times \text{SPD}_t$$

$$\text{Retirements}_t = \text{constant} + B_1 \times \text{MAND}_t + B_2 \times \text{VOL}_t$$

- SPD is the number of officers who have already applied for and been accepted for separation.
- NSPD is the number of officers on their initial commitment who are eligible for separation.
- MAND is the number of officers who must retire because they have achieved their high year of tenure, i.e., the maximum years of service allowable at their current grade.
- VOL is the number of officers eligible for retirement and who have applied.
- Constants,  $B_1$ , and  $B_2$ , are the parameters estimated by the regression analysis.

This procedure is done for 24 monthly observations and for the total data file. The data files range from a minimum of 51 monthly observations to a maximum of 106

monthly observations. The varied lengths of the different data files is due to the different starting times for data collection. The data were initially collected for reasons other than input for the Officer Loss Projection model.

Once an estimate from each model (the 24 month projection and total data month projection) is obtained, the two are compared. If the two are similar, the number of losses may be considered good. I say "may" because the model has not been making accurate predictions in the last one to two years. The individual working with this model has realized that the model underpredicts early in the year and then catches up later, as the time remaining in the fiscal year becomes shorter (less than 6 months). Consequently, when an estimate (greater than 6 months in the future) is obtained, this individual adjusts the number upward to a (hopefully) more accurate estimate.

For this very reason, I chose to improve this model. The model, as it is currently used, lacks the ability to accurately predict beyond 6 months. Six months is the minimum notice required, by Air Force policy, for requested attrition actions. As a result, the less than six month predictions do not vary much from what is already known and in the Air Force's automated personnel system.

#### IV. METHODOLOGY

##### A. DATA COLLECTION

###### 1. Historical Attrition Data

The attrition related data for this thesis were obtained from the Air Force Military Personnel Center (AFMPC) at Randolph Air Force Base, San Antonio, Texas. The data consisted of five categories of Air Force Officers:

1. Line officers (LIN)--all officers excluding Chaplains, Legal (JAG) and Medical officers.
2. Non-Rated Line officers (NRL)
3. Pilots (PLT)
4. Navigators (NAV)
5. Officers in general (OFF).

Within each major category of officer, there are two categories of attrition, retirement and separation. Within each retirement and separation file are twelve sub-files. These sub-files are listings of the number of officers who have already left the Air Force in a given month, and the number of officers known eligible and applied for retirement/separation a certain number of months prior to their actual retirement/separation.

###### a. Separation Files

The data within the separation files consists of the number of officers who actually separated in a particular month, the number of officers with a separation

program designator (SPD code), and the number of officers without a separation program designator (NSPD). An SPD code is projected for a career officer (an officer in service at least one year past his/her initial commitment) once an application for separation has been accepted. NSPD is the variable name for the number of officers whose initial commitment will expire in a particular month, and have not yet taken action to terminate or extend their term of service. In other words, they are eligible for separation but their intentions are unknown. The files are formed as depicted below.

1st Column--ACC--number of accomplished separations in a month.

2nd Column--NSPD--number of officers eligible to separate.

3rd Column--SPD--number of career officers projected to separate.

b. Retirement

The retirement files consist of the actual number of officers who retired in a month, the known number of officers voluntarily retiring, and the known number of officers who must retire for mandatory reasons, X months prior to the actual retirement. The file is structured in the following manner.

1st Column--ACC--number of accomplished retirements

2nd Column--VOL--number of voluntary retirements

3rd Column--MAND--number of officers retiring for mandatory reasons

4th Column-SEQ--a number given to sequence the data\*

\*(this data was not used in my analysis).

These files are labelled by category of officer and by the number of months difference between the separation/retirement action and the time the data is known in the system. For example, LINSEP12 is a file of Line officers who separated in a given month (e.g., January) and the known number of officers intending to separate (already filed, SPD) or the number of officers known eligible for separation (have not filed, NSPD) 12 months prior to the attrition month (e.g., the preceding January. To cite another example, NRLRET9 is a file of Non-Rated Line officers who retired in a given month (for example, September), and the known number of officers intending to retire (voluntarily applied, VOL, or mandatorily projected, MAND) 9 months prior (January) to the (September) attrition month.

The data for these files are supplied by an Air Force counting system: the Fiscal Year Computerized Officer Projection System (FYCOPS). This system tracks officers throughout their careers. From the point of initial assessment, the system determines when an officer is eligible for separation or retirement. Through the automated personnel system within the Air Force, the system is updated and keeps track of when an officer is eligible for, or has actually requested, separation (been given a SPD code) or

retirement. These numbers are then used as input into the Officer Loss Projection model for end of fiscal year estimations. The structure and actual data files used in this analysis can be seen in Appendix A.

## 2. Historical Economic Data

The economic variables initially chosen for evaluation in my thesis were:

- 1) Composite Index of 12 Leading Economic Indicators, Business Conditions Digest, U.S. Department of Commerce, Bureau of Economic Analysis.
- 2) Number of National Help-wanted Advertisements, Employment and Earnings, U.S. Department of Labor, Bureau of Labor Statistics.
- 3) National Unemployment Rate, Employment and Earnings, U.S. Department of Labor, Bureau of Labor Statistics.

\* All of the above statistics were seasonally adjusted.

I selected these particular economic measures because of their ease of access and understanding to the general public. Most officers have an understanding of what these statistics imply for their future civilian job opportunities. Therefore, some relationship is expected between these variables and officer attrition. In addition to the variables listed above I created variables of change for unemployment and leading indicators. These additional variables were created by determining the amount of change from the month prior to the current month's statistic. These data may be found in Appendix B.

## B. STRUCTURING THE DATA

The data for this analysis required merging the "In System" data, provided by FYCOPS, and the economic data. Each "In System" data file consisted of three columns. The first column contained the actual number of personnel separated/retired in a month. I called this variable ACC, for accomplished attrition. In the separations files, the second column contained data on the number of personnel eligible for separation at the end of their initial commitment. This variable is called NSPD, no separation program designator. The third column in the separations file contained data on the number of career officers (officers with more than one year of service past their initial commitment) that had requested to be separated from the Air Force. This variable is called SPD. This group of officers requires a separation program designator to separate from the Air Force. In the retirement files, the second column contained data on how many officers had submitted requests for voluntary retirement: I called this variable VOL. The third column in the retirement data file is the number of officers who must retire due to promotion passover, high year of tenure, etc. This variable is called Mand for mandatory.

The way the "In System" data is sequenced is of special importance. Each file, whether it is SEP6 or RET6, matches

the actual attrition with the data that was known (in the system) 6 months prior to the month of attrition.

When the economic variables were merged with the In System data, each file had a different group of unemployment rates. Each file required unemployment rates which corresponded to the data available at X months prior to the attrition month. For example, the SEP6 file for June, has the actual number of officers that separated in June (ACC), the number of officers (on their initial commitment) known in January (six months prior) to be eligible for separation in June (NSPD), and the number of officers who had already applied and were accepted for separation (SPD) in June, known in January. The economic variable, therefore, had to be sequenced with the data known in the months prior.

In the above case, the unemployment rate from November was used. November was the most current monthly data available in the first week of January when the projection needed to be made. Although December had passed, the first week of January would not provide sufficient time to allow the statistic to be compiled and published. Therefore, November was the most current monthly unemployment rate available.

The sequencing resulted in a data file with the actual attrition in one month, the known, In System, data from X months prior (depending on which file was being used) and the monthly unemployment rate 2 months prior to that. The

complete data files used in this analysis are reproduced in Appendix C.

### C. ANALYSIS

The analysis was performed on the Naval Postgraduate School's IBM main-frame computer utilizing the SPSSX software package. The first step was to compute a Pearson Correlation Coefficient Matrix of all variables, independent and dependent. The Pearson Correlation is a measure of the linear relationship between the variables.

In ordinary least squares (OLS) regression, it is assumed that there exists no exact linear relationship among the independent variables. When the correlation between two explanatory variables is stronger than the correlation between an explanatory variable and the dependent variable multicollinearity exists. This is generally the result of the double counting of a causal relationship, and results in misspecification of the regression model. This high degree of correlation between the independent variables precluded the use of more than one economic variable at a time in the model. The help-wanted advertisements and leading economic indicators variables had a lesser effect on the model, so these variables were dropped from further analysis.

I chose to inspect the months 6, 9 and 12 in both retirement and separation. On the average, the coefficients showed a high negative relationship between help-wanted advertising (HW) and the unemployment rate (UN), between HW

and the leading economic indicators (IND) and between UN and IND (see Appendix D.) To clarify, as the unemployment rate decreases, the number of help wanted advertisements increases. This is because the employers find it necessary to advertise more to attract the additional workers needed from the decreasing pool of eligible workers.

Exploratory linear regression to check the significance of each independent variable on the dependent variable, (using t tests) indicated that the unemployment rate was the most significant of all the explanatory variables. Therefore, I reduced the list of economic variables down to only the overall civilian unemployment rate. The other economic variables did not demonstrate a significant (.05 or better level) relationship to the historical attrition data.

## V. DATA ANALYSIS/INTERPRETATION

The loss projection model currently being used by the Air Force is not predicting accurately beyond six months. Accuracy within the six month time period is due to the current Air Force policy requiring officers to submit their retirement/separation intentions at least six months prior to the desired date of termination. Once the decision has been made and the application for retirement/separation is accepted, there is little change.

Economic variables have no effect on the separation decision within the 6 month time period. However, beyond the six month period, economic variables may play a part in the officer's retirement/separation decision. Therefore, my analysis focused on the 6-12 month loss projections.

### A. INITIAL ANALYSIS

As I mentioned in the previous chapter, the overall National Unemployment Rate was determined to be the most significant economic variable. This was reinforced by my review of previous studies relating economic conditions to attrition.

I performed OLS regression of the independent variables: unemployment rate (UN), and the two variables for each of the two types of files, retirement and separation. The independent variables used in separation analysis are the

number of officers eligible to separate during a given month (NSPD), and the number of officers who have already applied for separation and been given a separation program designator (SPD) for that same month. The independent variables for the retirement file consists of: the number of officers accepted for voluntary retirement (VOL), and the number of officers who must mandatorily retire (MAND) during a given month. The regression was initially performed on the 6, 9, and 12 month projection data files. I performed this regression on the entire data file (51 monthly observations), and the most recent 24 monthly observations (excluding my test data). The models were specified as written below. Table 1 contains the results of those regressions.

$$\text{Retirement (ACC)} = \text{Constant} + A_1 * \text{VOL} + A_2 * \text{MAND} + A_3 * \text{UN} \\ + e_A \text{ (Random Error)}$$

$$\text{Separation (ACC)} = \text{Constant} + B_1 * \text{NSPD} + B_2 * \text{SPD} + B_3 * \text{UN} \\ + e_B \text{ (Random Error)}$$

The Durbin-Watson statistic can be used to test for serial correlation. Serial correlation occurs in time-series data when the errors ( $e_A$  and  $e_B$ ) in adjacent observations are correlated. This violates the assumption of linear regression that each error is independently drawn (i.e., that each variable is random and drawn from a

TABLE 1  
COMPARISON OF 24 vs 51 MONTHLY OBSERVATIONS

| <u>Projection</u> | <u>24 Months</u>     |                      | <u>51 Months</u>     |                      |
|-------------------|----------------------|----------------------|----------------------|----------------------|
|                   | <u>R<sup>2</sup></u> | <u>Durbin-Watson</u> | <u>R<sup>2</sup></u> | <u>Durbin-Watson</u> |
| Ret6              | .90                  | 1.1                  | .87                  | 1.1                  |
| Ret9              | .72                  | 1.3                  | .64                  | .94                  |
| Ret12             | .69                  | .94                  | .50                  | .77                  |
| Sep6              | .66                  | .81                  | .59                  | .75                  |
| Sep9              | .49                  | .84                  | .38                  | .65                  |
| Sep12             | .54                  | .86                  | .42                  | .72                  |

distribution with an expected value of zero, constant variance, and zero covariances).

If no serial correlation is present, the test statistic equals two. If positive correlation exists, the statistic will be below two. Alternatively, if negative correlation is present the test statistic will be greater than two. As can be seen from the above table, there is strong evidence of positive correlation in the regression equations.

In order to reduce the serial correlation in the equations, I sought a seasonal adjustment. I chose to identify the months of the calendar year as quarters. Each quarter of the year was identified beginning with January, February, and March being quarter 1, April, May, and June were coded as quarter 2, July, August, and September were

coded as quarter 3, and October, November and December were the default months and not coded. Depending on which month was being projected Q1, Q2 or Q3 was used in the monthly projection. Including these newly created dummy variables (Q1, Q2, Q3) into the equation greatly reduced the amount of serial correlation. The models were specified as written below. Table 2 reflects the new statistics.

$$\begin{aligned} \text{Retirements (ACC)} = & \text{Constant} + A_1 * \text{VOL} + A_2 * \text{MAND} + A_3 \\ & * \text{UN} + d_1 * \text{Q1} + d_2 * \text{Q2} + d_3 \\ & * \text{Q3} + e_R \end{aligned}$$

$$\begin{aligned} \text{Separations (ACC)} = & \text{Constant} + B_1 * \text{NSPD} + B_2 * \text{SPD} + B_3 \\ & * \text{UN} + d_1 * \text{Q1} + d_2 * \text{Q2} + d_3 \\ & * \text{Q3} + e_S \end{aligned}$$

TABLE 2  
STATISTICS AFTER INCLUSION OF Q1, Q2 AND Q3 DUMMY VARIABLES

| <u>Projection</u> | <u>R<sup>2</sup></u> | <u>24 Months</u>     |                      | <u>51 Months</u>     |  |
|-------------------|----------------------|----------------------|----------------------|----------------------|--|
|                   |                      | <u>Durbin-Watson</u> | <u>R<sup>2</sup></u> | <u>Durbin-Watson</u> |  |
| Ret6              | .93                  | 2.10                 | .91                  | 1.37                 |  |
| Ret9              | .86                  | 2.48                 | .75                  | 1.25                 |  |
| Ret12             | .86                  | 2.37                 | .63                  | 1.01                 |  |
| Sep6              | .93                  | 2.29                 | .70                  | 1.17                 |  |
| Sep9              | .85                  | 2.20                 | .58                  | 1.28                 |  |
| Sep12             | .77                  | 2.30                 | .60                  | 1.42                 |  |

As can be seen from Table 2, the serial correlation has been greatly reduced, especially for the 24 month models. The 24 month models provide a better fit, as measured by  $R^2$ , and also show less serial correlation. Considering these results, the information obtained from the literature review relative to the amount of historical observations to use, and the fact that the 1 through 6 month projections are made with 24 monthly observations, I remained with the 24 month model for the projections.

Most other studies of this type induced a time lag of 6-12 months between the economic condition and attrition. In this situation, no time lag appeared to be needed. The policy of six month notice prior to any form of attrition seemed to take care of that. In addition, the data base is structured so that each data file has a lag built in. For example, Sep9 is a file containing data on separations in a given month, and the data that was "in system" (known) nine months prior to the separation. Hence the time lags are already built into the current system.

#### B. MODEL SPECIFICATION

Different forms of regression were tested in an attempt to properly specify the regression model. They were: straight linear (all variables independent and dependent in their normal form), log-linear (log of the dependent variable with normal linear independent variables), linear-log (normal linear dependent variable with the log of all

independent variables), and log-log (log of both independent and dependent variables). The best model (in terms of highest adjusted  $R^2$  and Durbin-Watson statistic closest to two) was the OLS linear/linear model.

Following this, I analyzed all remaining projection months, seven, eight, 10 and 11. The actual regression analyses and the resulting coefficients can be found in Appendix E.

As can be seen in Table 3, the T tests show that whether the coefficients are significant at the .05 level depends on which model (monthly projection) is used. If I were developing a single model for a specific behavior, the variables with the insignificant T values would have been removed from consideration. However, my analysis requires the simultaneous development of 14 separate models. In one model the variable Q1 may be significant but in another it may not.

It is important to keep continuity in the entire system of models. In other words, all models within this system should be based upon the same set of variables. In attempting to develop one type of model for all applications, it was necessary to keep all variables in each equation. Each independent variable is significant in at least one monthly projection.

TABLE 3

## REGRESSION RESULTS

## RETIREMENT

| Monthly<br>Projection | Constant | Maand | Vol  | Un   | Q1   | Q2    | Q3    | Adj R2 | F    | D.W. |
|-----------------------|----------|-------|------|------|------|-------|-------|--------|------|------|
| Ret6                  | -411.5   | 1.77  | 1.61 | 60.5 | 1    | 32.7  | -17   | 0.94   | 64.3 | 2.4  |
| t values              | -3.1     | 2.6   | 6.2  | 3.4  | 0.07 | 1.6   | -1.2  |        |      |      |
| Ret7                  | -293.1   | -0.18 | 1.83 | 48.5 | 8.5  | 80.7  | -12.3 | 0.84   | 21.2 | 3.1  |
| t values              | -1.5     | -0.09 | 4.2  | 1.9  | 0.4  | 2.8   | -0.5  |        |      |      |
| Ret8                  | -236.4   | -0.25 | 2.3  | 39.9 | 9.4  | 95    | -5.8  | 0.82   | 18.5 | 2.7  |
| t values              | -1.4     | -0.25 | 4.2  | 1.9  | 0.4  | 3     | -0.2  |        |      |      |
| Ret9                  | -196.4   | -1.5  | 2.7  | 33.8 | 20.9 | 111.7 | 10    | 0.82   | 19.4 | 2.7  |
| t values              | -1.9     | -8.2  | 3.8  | 2.4  | 0.9  | 4.2   | 0.4   |        |      |      |
| Ret10                 | -252.2   | -1.9  | 3.2  | 41.9 | 11   | 112.2 | 6.2   | 0.82   | 19.2 | 2.4  |
| t values              | -1.9     | -0.9  | 3.6  | 2.3  | 0.5  | 4     | 0.26  |        |      |      |
| Ret11                 | 86.6     | 3.8   | 4.4  | -6.5 | -0.1 | 98.2  | 23.8  | 0.86   | 24.7 | 1.6  |
| t values              | 0.76     | 3     | 4.4  | -0.4 | 0    | 4     | 1.1   |        |      |      |
| Ret12                 | 1.84     | 2.08  | 5.4  | 6.7  | -3.7 | 113.9 | 19    | 0.78   | 14.5 | 2.5  |
| t values              | 0.01     | 1.4   | 2.6  | 0.4  | -0.1 | 3.6   | 0.7   |        |      |      |

TABLE 3 - (CONTINUED)

| SEPARATION | Monthly<br>Projection | Constant     | Nspd         | Spd          | Un            | Q1           | Q2          | Q3          | Adj R2 | F    | D.W. |
|------------|-----------------------|--------------|--------------|--------------|---------------|--------------|-------------|-------------|--------|------|------|
| Sep6       | t values              | 46<br>1.4    | 0.256<br>8.4 | 0.84<br>5.5  | -4<br>-0.9    | 8.8<br>2.4   | 31<br>8     | 7.1<br>1.8  | 0.91   | 41   | 2.36 |
| Sep7       | t values              | 66.8<br>1.5  | 0.22<br>6.3  | 0.68<br>2.7  | -5.4<br>-0.9  | 7.2<br>1.4   | 31.7<br>6.2 | 7.8<br>1.5  | 0.84   | 21.5 | 2.25 |
| Sep8       | t values              | 87.9<br>2.4  | 0.21<br>6.4  | 0.6<br>1.9   | -7.8<br>-1.5  | 4.6<br>0.95  | 33<br>6.5   | 6.3<br>1.1  | 0.84   | 21.5 | 2.44 |
| Sep9       | t values              | 121.8<br>4   | 0.24<br>6.6  | 0.69<br>1.4  | -12.8<br>-3   | 2.7<br>0.6   | 34.6<br>7.2 | 5.1<br>0.9  | 0.86   | 24.7 | 2.5  |
| Sep10      | t values              | 32.7<br>1.1  | 0.14<br>4    | 1.7<br>2.5   | -1.1<br>-0.2  | 0.73<br>0.12 | 41.2<br>6.2 | 16.2<br>2.4 | 0.75   | 12.7 | 2.4  |
| Sep11      | t values              | 136.8<br>4.5 | 0.17<br>6.2  | 0.42<br>0.6  | -14<br>-3.3   | 5<br>1       | 32.9<br>6.4 | 10.7<br>1.9 | 0.84   | 21.7 | 2.05 |
| Sep12      | t values              | 114.9<br>3.6 | 0.15<br>4.1  | 0.65<br>0.75 | -10.8<br>-2.3 | 4.5<br>0.7   | 27.8<br>4.1 | 13.1<br>1.9 | 0.75   | 12.6 | 2.1  |

### C. MODEL TESTING

The true test of any model is its predictive capability. In gathering the data for this analysis, I set aside the last year of data for testing purposes. In this case, the months June 1986 through May 1987 were the test months.

Taking the estimated values of the constants and the associated coefficients for each monthly projection model, I matched up the historical attrition data and the historical economic data with the appropriate variables. The actual mathematical calculations were performed using Lotus 123 spreadsheets. Appendix F contains the actual spreadsheets. Each spreadsheet contains the projection compared with the actual results for that particular model and month.

Table 4 shows the projections for each month compared with the actual attrition for that month. The error rate was determined by taking the absolute value of the difference between the model's projection and the actual attrition for a given month, then summing these values and dividing by the number of projections made, in this case twelve. The error rate for the entire system of models (6-12 month projections, retirement and separation) is 23.8 percent. This error rate is unacceptable.

### D. INTERPRETATION

My initial objective of this analysis was to link economic conditions with the attrition of Air Force officers in hopes of improving the accuracy of loss projections. It

TABLE 4

## MODEL PROJECTIONS VS ACTUAL ATTRITION

## Retirement

| <u>Monthly<br/>Projection</u> | <u>Jun 86</u> | <u>Jul</u> | <u>Aug</u> | <u>Sep</u> | <u>Oct</u> | <u>Nov</u> |
|-------------------------------|---------------|------------|------------|------------|------------|------------|
| Ret6                          | 156           | 192        | 179        | 214        | 300        | 174        |
| Ret7                          | 210           | 157        | 181        | 191        | 243        | 188        |
| Ret8                          | 230           | 170        | 189        | 192        | 228        | 179        |
| Ret9                          | 250           | 195        | 218        | 220        | 249        | 172        |
| Ret10                         | 247           | 151        | 184        | 176        | 229        | 149        |
| Ret11                         | 263           | 215        | 251        | 217        | 246        | 149        |
| Ret12                         | 292           | 213        | 223        | 174        | 242        | 122        |

|                             |     |     |     |     |     |     |
|-----------------------------|-----|-----|-----|-----|-----|-----|
| <u>Actual<br/>Attrition</u> | 159 | 262 | 246 | 233 | 283 | 178 |
|-----------------------------|-----|-----|-----|-----|-----|-----|

|       | <u>Dec</u> | <u>Jan 87</u> | <u>Feb</u> | <u>Mar</u> | <u>Apr</u> | <u>May</u> |
|-------|------------|---------------|------------|------------|------------|------------|
| Ret6  | 87         | 122           | 118        | 96         | 184        | 123        |
| Ret7  | 94         | 157           | 145        | 126        | 213        | 181        |
| Ret8  | 102        | 158           | 155        | 135        | 244        | 181        |
| Ret9  | 115        | 185           | 181        | 147        | 284        | 211        |
| Ret10 | 77         | 168           | 163        | 137        | 281        | 207        |
| Ret11 | 110        | 177           | 182        | 135        | 312        | 207        |
| Ret12 | 80         | 112           | 167        | 132        | 338        | 231        |

|                             |    |     |     |     |     |     |
|-----------------------------|----|-----|-----|-----|-----|-----|
| <u>Actual<br/>Attrition</u> | 87 | 126 | 156 | 134 | 173 | 111 |
|-----------------------------|----|-----|-----|-----|-----|-----|

## ERROR RATES

|               |                           |              |
|---------------|---------------------------|--------------|
| Ret6--15.3%   | Ret7--22.4%               | Ret8--24.1%  |
| Ret9--22.7%   | Ret10--31.9%              | Ret11--31.1% |
| Ret12 - 25.5% | Overall Error Rate--24.7% |              |

TABLE 4 - (CONTINUED)

## Separation

| <u>Monthly<br/>Projection</u> | <u>Jun 86</u> | <u>Jul</u>    | <u>Aug</u> | <u>Sep</u> | <u>Oct</u> | <u>Nov</u> |
|-------------------------------|---------------|---------------|------------|------------|------------|------------|
| Sep6                          | 109           | 65            | 89         | 71         | 98         | 50         |
| Sep7                          | 105           | 62            | 70         | 70         | 100        | 56         |
| Sep8                          | 105           | 58            | 66         | 68         | 101        | 63         |
| Sep9                          | 119           | 60            | 66         | 69         | 108        | 74         |
| Sep10                         | 124           | 71            | 71         | 70         | 78         | 55         |
| Sep11                         | 103           | 63            | 70         | 72         | 97         | 69         |
| Sep12                         | 98            | 67            | 69         | 78         | 93         | 66         |
| Actual<br>Attrition           | 102           | 82            | 124        | 105        | 138        | 75         |
| =====                         |               |               |            |            |            |            |
|                               | <u>Dec</u>    | <u>Jan 87</u> | <u>Feb</u> | <u>Mar</u> | <u>Apr</u> | <u>May</u> |
| Sep6                          | 49            | 77            | 67         | 67         | 81         | 84         |
| Sep7                          | 55            | 64            | 61         | 73         | 86         | 81         |
| Sep8                          | 58            | 64            | 56         | 60         | 95         | 87         |
| Sep9                          | 66            | 68            | 60         | 55         | 100        | 95         |
| Sep10                         | 57            | 59            | 47         | 43         | 92         | 92         |
| Sep11                         | 67            | 86            | 65         | 61         | 96         | 90         |
| Sep12                         | 64            | 82            | 68         | 62         | 88         | 88         |
| Actual<br>Attrition           | 79            | 81            | 55         | 72         | 71         | 72         |
| =====                         |               |               |            |            |            |            |

## ERROR RATES

Sep6-21.1%  
 Sep9-23.8%  
 Sep12-20.1%

Sep7-22.1%  
 Sep10-29.2%

Sep8-23.1%  
 Sep11-21.0%

Overall Error Rate-22.9%

appears that this has not happened. There are months where the models performed very well, a difference of less than 10 people on a 12 month projection, but that type of result is not consistent.

In general, the model tends to under-predict. At about the eighth monthly prediction in each model, the model's projections get very close to the actual attrition. There still seems to be some effect of serial correlation. The errors appear to take on a wave-like pattern. However, having tested the system only over a twelve month period may not have revealed the entire cyclical effect.

This may be due to the changes in the long term condition of the economy or other factors such as the changes in the tax laws. However, there may be a more significant reason for the lack of statistical significance of the unemployment rate on Air Force officer attrition.

The "in system" data obtained from FYCOPS is an aggregate number of officers, regardless of their grade or time in service. As was mentioned in the literature review chapter of this thesis, officers of different grades and times in service separate for different reasons. Some groups of officers react differently to changes in the unemployment rate than others do. According to Kostiuk (1986) the unemployment rate had little, if any, effect on the attrition of officers in the 0-4 and 12 and over years of service groups. In my opinion, this aggregation of

officer data contributed to the model's inability to make accurate projections using unemployment rates.

## VI. CONCLUSION AND RECOMMENDATION

### A. CONCLUSION

This analysis has resulted in conclusions different than expected. I originally had hoped to increase the accuracy of the six to 12 month officer loss estimates by including an economic variable with the historical attrition data. The reason for this was partially based on the review of the work of other researchers, and on an intuition that economic conditions (measured primarily by the overall civilian unemployment rate) affect attrition rates within the military services. In this analysis, however, the inclusion of unemployment data did not enhance the accuracy of loss projections.

The reason for this, I believe, is three fold. First, there appears to be some form of serial correlation not yet accounted for in the model. This may be due to policy changes within a fiscal year or a longer trend covering several years. Second, the known data (how many officers have submitted applications for attrition) is in aggregate form. That is, all officers are grouped together regardless of rank. It has been proven that officers of different grades and time in service react differently to changes in the economy. Third and perhaps more significant, is that one of the independent variables used to predict officer

losses is the number of officers that have already made the decision to leave the Air Force. Presumably, the only effect of unemployment is on the independent variable. There is no separate effect on the dependent variable. Therefore, the unemployment rate at the time of the decision to leave should not be expected to add explanatory power to the model. Unemployment rates may, however, significantly add to the ability to predict the decision to leave the Air Force, submit an application to leave/separate.

#### B. RECOMMENDATION

Perhaps a better way to predict the number of officer losses is to model the behavior that causes an officer to submit his/her application for retirement/separation. In this manner the regression equation would model causal relationships between economic indicators and behavior related to the attrition decision.

# APPENDIX A

## HISTORICAL ATTRITION DATA

FILE: NRLRET6 DATA

131 63 7 33  
 101 47 5 34  
 102 47 9 35  
 148 67 11 36  
 206 104 10 37  
 213 106 12 38  
 180 79 38 39  
 342 179 31 40  
 195 98 21 41  
 165 84 14 42  
 170 78 7 43  
 108 41 9 44  
 147 62 10 45  
 126 52 9 46  
 111 39 16 47  
 162 79 5 48  
 281 119 16 49  
 292 95 16 50  
 196 88 18 51  
 344 183 16 52  
 198 84 17 53  
 129 63 13 54  
 145 58 17 55

|          |          |          |    |
|----------|----------|----------|----|
| 149.0000 | 53.00000 | 20.00000 | 56 |
| 121.0000 | 44.00000 | 6.000000 | 57 |
| 154.0000 | 44.00000 | 6.000000 | 58 |
| 126.0000 | 44.00000 | 2.000000 | 59 |
| 186.0000 | 49.00000 | 4.000000 | 60 |
| 310.0000 | 114.0000 | 5.000000 | 61 |
| 421.0000 | 144.0000 | 20.00000 | 62 |
| 293.0000 | 131.0000 | 13.00000 | 63 |
| 319.0000 | 160.0000 | 9.000000 | 64 |
| 138.0000 | 63.00000 | 4.000000 | 65 |
| 91.00000 | 38.00000 | 15.00000 | 66 |
| 125.0000 | 57.00000 | 7.000000 | 67 |
| 164.0000 | 69.00000 | 12.00000 | 68 |
| 118.0000 | 30.00000 | 13.00000 | 69 |
| 128.0000 | 31.00000 | 25.00000 | 70 |
| 112.0000 | 40.00000 | 15.00000 | 71 |
| 134.0000 | 42.00000 | 11.00000 | 72 |
| 265.0000 | 88.00000 | 31.00000 | 73 |
| 290.0000 | 98.00000 | 26.00000 | 74 |
| 254.0000 | 116.0000 | 24.00000 | 75 |
| 224.0000 | 91.00000 | 34.00000 | 76 |
| 121.0000 | 53.00000 | 2.000000 | 77 |
| 112.0000 | 37.00000 | 14.00000 | 78 |
| 106.0000 | 41.00000 | 3.000000 | 79 |
| 114.0000 | 37.00000 | 17.00000 | 80 |
| 114.0000 | 37.00000 | 13.00000 | 81 |
| 112.0000 | 45.00000 | 15.00000 | 82 |
| 123.0000 | 43.00000 | 24.00000 | 83 |

FILE: NRLRET7 DATA

142 45 52 31  
 131 48 2 32  
 101 40 5 33  
 102 36 18 34  
 148 53 10 35  
 206 79 11 36  
 213 86 17 37  
 342 154 31 39  
 195 81 21 40  
 165 69 12 41  
 170 70 7 42  
 108 32 10 43  
 147 55 11 44  
 126 43 9 45  
 111 36 17 46  
 162 67 5 47  
 281 90 15 48  
 292 71 16 49  
 196 66 18 50  
 344 150 18 51  
 198 67 18 52  
 129 53 14 53  
 145 47 17 54

|          |          |          |    |
|----------|----------|----------|----|
| 149.0000 | 43.00000 | 22.00000 | 55 |
| 121.0000 | 33.00000 | 6.000000 | 56 |
| 154.0000 | 35.00000 | 17.00000 | 57 |
| 126.0000 | 31.00000 | 2.000000 | 58 |
| 186.0000 | 36.00000 | 3.000000 | 59 |
| 310.0000 | 89.00000 | 5.000000 | 60 |
| 421.0000 | 80.00000 | 5.000000 | 61 |
| 293.0000 | 98.00000 | 6.000000 | 62 |
| 319.0000 | 126.0000 | 7.000000 | 63 |
| 138.0000 | 55.00000 | 3.000000 | 64 |
| 91.00000 | 32.00000 | 15.00000 | 65 |
| 125.0000 | 42.00000 | 6.000000 | 66 |
| 164.0000 | 44.00000 | 4.000000 | 67 |
| 118.0000 | 24.00000 | 5.000000 | 68 |
| 128.0000 | 20.00000 | 5.000000 | 69 |
| 112.0000 | 31.00000 | 2.000000 | 70 |
| 134.0000 | 31.00000 | 1.000000 | 71 |
| 265.0000 | 67.00000 | 11.00000 | 72 |
| 290.0000 | 64.00000 | 8.000000 | 73 |
| 254.0000 | 87.00000 | 11.00000 | 74 |
| 224.0000 | 74.00000 | 14.00000 | 75 |
| 121.0000 | 44.00000 | 3.000000 | 76 |
| 112.0000 | 31.00000 | 8.000000 | 77 |
| 106.0000 | 33.00000 | 3.000000 | 78 |
| 114.0000 | 32.00000 | 17.00000 | 79 |
| 114.0000 | 31.00000 | 9.000000 | 80 |
| 112.0000 | 37.00000 | 8.000000 | 81 |
| 123.0000 | 38.00000 | 13.00000 | 82 |

FILE: NRLRET8 DATA

138 30 16 29  
 131 41 3 31  
 101 26 6 32  
 102 29 19 33  
 148 51 13 34  
 206 65 12 35  
 213 66 20 36  
 342 125 29 38  
 195 69 22 39  
 165 61 13 40  
 170 62 8 41  
 108 27 10 42  
 147 44 12 43  
 126 35 9 44  
 111 28 17 45  
 162 56 5 46  
 281 77 15 47  
 292 56 16 48  
 196 49 18 49  
 344 124 19 50  
 198 57 18 51  
 129 49 14 52  
 145 47 18 53

|          |          |               |    |
|----------|----------|---------------|----|
| 149.0000 | 36.00000 | 11.00000      | 54 |
| 121.0000 | 27.00000 | 6.000000      | 55 |
| 154.0000 | 28.00000 | 17.00000      | 56 |
| 126.0000 | 26.00000 | 8.000000      | 57 |
| 186.0000 | 31.00000 | 2.000000      | 58 |
| 310.0000 | 63.00000 | 5.000000      | 59 |
| 421.0000 | 60.00000 | 5.000000      | 60 |
| 293.0000 | 61.00000 | 6.000000      | 61 |
| 319.0000 | 103.0000 | 3.000000      | 62 |
| 138.0000 | 42.00000 | 3.000000      | 63 |
| 91.00000 | 27.00000 | 11.00000      | 64 |
| 125.0000 | 40.00000 | 5.000000      | 65 |
| 164.0000 | 33.00000 | 3.000000      | 66 |
| 118.0000 | 17.00000 | 4.000000      | 67 |
| 128.0000 | 15.00000 | 4.000000      | 68 |
| 112.0000 | 26.00000 | 2.000000      | 69 |
| 134.0000 | 20.00000 | 1.000000      | 70 |
| 265.0000 | 60.00000 | 11.00000      | 71 |
| 290.0000 | 53.00000 | 8.000000      | 72 |
| 254.0000 | 71.00000 | 7.000000      | 73 |
| 224.0000 | 57.00000 | 13.00000      | 74 |
| 121.0000 | 35.00000 | 3.000000      | 75 |
| 112.0000 | 24.00000 | 7.000000      | 76 |
| 106.0000 | 33.00000 | 0.0000000E+00 | 77 |
| 114.0000 | 28.00000 | 7.000000      | 78 |
| 114.0000 | 26.00000 | 6.000000      | 79 |
| 112.0000 | 34.00000 | 7.000000      | 80 |
| 123.0000 | 31.00000 | 11.00000      | 81 |

FILE: NRLRET9 DATA

138 23 16 28  
 131 36 3 30  
 101 22 9 31  
 102 27 17 32  
 148 41 13 33  
 206 62 20 34  
 213 55 20 35  
 342 98 30 37  
 195 53 20 38  
 165 61 13 39  
 170 61 8 40  
 108 23 10 41  
 147 40 13 42  
 126 31 9 43  
 111 28 17 44  
 162 44 5 45  
 281 66 15 46  
 292 50 17 47  
 196 44 18 48  
 344 103 19 49  
 198 47 20 50  
 129 43 14 51  
 145 38 19 52

|          |          |               |    |
|----------|----------|---------------|----|
| 149.0000 | 30.00000 | 11.00000      | 53 |
| 121.0000 | 25.00000 | 8.000000      | 54 |
| 154.0000 | 25.00000 | 17.00000      | 55 |
| 126.0000 | 22.00000 | 8.000000      | 56 |
| 186.0000 | 25.00000 | 24.00000      | 57 |
| 310.0000 | 52.00000 | 5.000000      | 58 |
| 421.0000 | 49.00000 | 4.000000      | 59 |
| 293.0000 | 46.00000 | 5.000000      | 60 |
| 319.0000 | 75.00000 | 1.000000      | 61 |
| 138.0000 | 33.00000 | 3.000000      | 62 |
| 91.00000 | 22.00000 | 9.000000      | 63 |
| 125.0000 | 38.00000 | 4.000000      | 64 |
| 164.0000 | 28.00000 | 3.000000      | 65 |
| 118.0000 | 14.00000 | 4.000000      | 66 |
| 128.0000 | 9.000000 | 3.000000      | 67 |
| 112.0000 | 22.00000 | 1.000000      | 68 |
| 134.0000 | 14.00000 | 1.000000      | 69 |
| 265.0000 | 42.00000 | 9.000000      | 70 |
| 290.0000 | 41.00000 | 6.000000      | 71 |
| 254.0000 | 52.00000 | 7.000000      | 72 |
| 224.0000 | 48.00000 | 9.000000      | 73 |
| 121.0000 | 25.00000 | 2.000000      | 74 |
| 112.0000 | 23.00000 | 4.000000      | 75 |
| 106.0000 | 29.00000 | 0.0000000E+00 | 76 |
| 114.0000 | 27.00000 | 7.000000      | 77 |
| 114.0000 | 23.00000 | 4.000000      | 78 |
| 112.0000 | 32.00000 | 7.000000      | 79 |
| 123.0000 | 28.00000 | 10.00000      | 80 |

FILE: NRLRET10 DATA

138 18 17 27  
 131 32 4 29  
 101 17 9 30  
 102 21 18 31  
 148 37 14 32  
 206 50 20 33  
 213 51 32 34  
 342 70 31 36  
 195 46 20 37  
 165 58 12 38  
 170 54 8 39  
 108 19 10 40  
 147 35 14 41  
 126 28 11 42  
 111 25 17 43  
 162 40 5 44  
 281 53 16 45  
 292 42 18 46  
 196 35 19 47  
 344 80 20 48  
 198 42 22 49  
 129 34 15 50  
 145 31 21 51

|          |          |               |    |
|----------|----------|---------------|----|
| 149.0000 | 27.00000 | 12.00000      | 52 |
| 121.0000 | 24.00000 | 8.000000      | 53 |
| 154.0000 | 23.00000 | 16.00000      | 54 |
| 126.0000 | 19.00000 | 9.000000      | 55 |
| 186.0000 | 23.00000 | 25.00000      | 56 |
| 310.0000 | 38.00000 | 20.00000      | 57 |
| 421.0000 | 39.00000 | 5.000000      | 58 |
| 293.0000 | 40.00000 | 5.000000      | 59 |
| 319.0000 | 63.00000 | 1.000000      | 60 |
| 138.0000 | 26.00000 | 3.000000      | 61 |
| 91.00000 | 21.00000 | 3.000000      | 62 |
| 125.0000 | 28.00000 | 4.000000      | 63 |
| 164.0000 | 26.00000 | 3.000000      | 64 |
| 118.0000 | 11.00000 | 4.000000      | 65 |
| 128.0000 | 8.000000 | 3.000000      | 66 |
| 112.0000 | 20.00000 | 1.000000      | 67 |
| 134.0000 | 14.00000 | 1.000000      | 68 |
| 265.0000 | 38.00000 | 9.000000      | 69 |
| 290.0000 | 37.00000 | 6.000000      | 70 |
| 254.0000 | 40.00000 | 4.000000      | 71 |
| 224.0000 | 35.00000 | 6.000000      | 72 |
| 121.0000 | 20.00000 | 1.000000      | 73 |
| 112.0000 | 18.00000 | 3.000000      | 74 |
| 106.0000 | 25.00000 | 0.0000000E+00 | 75 |
| 114.0000 | 19.00000 | 6.000000      | 76 |
| 114.0000 | 17.00000 | 3.000000      | 77 |
| 112.0000 | 27.00000 | 4.000000      | 78 |
| 123.0000 | 26.00000 | 7.000000      | 79 |

FILE: NRLRET11 DATA

138 17 17 26  
 131 22 4 28  
 101 17 9 29  
 102 20 18 30  
 148 32 14 31  
 206 39 16 32  
 213 36 34 33  
 342 57 32 35  
 195 31 22 36  
 165 44 12 37  
 170 44 7 38  
 108 18 10 39  
 147 32 15 40  
 126 25 11 41  
 111 20 17 42  
 162 29 5 43  
 281 39 17 44  
 292 32 20 45  
 196 27 19 46  
 344 70 21 47  
 198 35 22 48  
 129 26 15 49  
 145 34 15 50

|          |          |               |    |
|----------|----------|---------------|----|
| 149.0000 | 23.00000 | 13.00000      | 51 |
| 121.0000 | 23.00000 | 10.00000      | 52 |
| 154.0000 | 20.00000 | 15.00000      | 53 |
| 126.0000 | 14.00000 | 9.000000      | 54 |
| 186.0000 | 21.00000 | 25.00000      | 55 |
| 310.0000 | 32.00000 | 20.00000      | 56 |
| 421.0000 | 26.00000 | 39.00000      | 57 |
| 293.0000 | 32.00000 | 2.000000      | 58 |
| 319.0000 | 48.00000 | 1.000000      | 59 |
| 138.0000 | 21.00000 | 1.000000      | 60 |
| 91.00000 | 15.00000 | 2.000000      | 61 |
| 125.0000 | 28.00000 | 0.0000000E+00 | 62 |
| 164.0000 | 25.00000 | 0.0000000E+00 | 63 |
| 118.0000 | 9.000000 | 3.000000      | 64 |
| 128.0000 | 8.000000 | 0.0000000E+00 | 65 |
| 112.0000 | 17.00000 | 0.0000000E+00 | 66 |
| 134.0000 | 13.00000 | 0.0000000E+00 | 67 |
| 265.0000 | 30.00000 | 3.000000      | 68 |
| 290.0000 | 29.00000 | 4.000000      | 69 |
| 254.0000 | 30.00000 | 1.000000      | 70 |
| 224.0000 | 27.00000 | 2.000000      | 71 |
| 121.0000 | 15.00000 | 1.000000      | 72 |
| 112.0000 | 14.00000 | 1.000000      | 73 |
| 106.0000 | 21.00000 | 0.0000000E+00 | 74 |
| 114.0000 | 13.00000 | 5.000000      | 75 |
| 114.0000 | 15.00000 | 0.0000000E+00 | 76 |
| 112.0000 | 24.00000 | 2.000000      | 77 |
| 123.0000 | 22.00000 | 4.000000      | 78 |

FILE: NRLRET12 DATA

138 14 17 25  
 131 16 4 27  
 101 14 10 28  
 102 15 18 29  
 148 22 14 30  
 206 29 16 31  
 213 24 37 32  
 342 38 38 34  
 195 15 24 35  
 165 23 11 36  
 170 29 8 37  
 108 13 10 38  
 147 26 19 39  
 126 20 12 40  
 111 13 17 41  
 162 23 5 42  
 281 30 16 43  
 292 19 21 44  
 196 13 18 45  
 344 49 23 46  
 198 30 22 47  
 129 18 15 48  
 145 19 24 49

|          |          |               |    |
|----------|----------|---------------|----|
| 149.0000 | 26.00000 | 24.00000      | 50 |
| 121.0000 | 18.00000 | 10.00000      | 51 |
| 154.0000 | 17.00000 | 15.00000      | 52 |
| 126.0000 | 10.00000 | 9.000000      | 53 |
| 186.0000 | 14.00000 | 25.00000      | 54 |
| 310.0000 | 19.00000 | 20.00000      | 55 |
| 421.0000 | 20.00000 | 40.00000      | 56 |
| 293.0000 | 17.00000 | 31.00000      | 57 |
| 319.0000 | 29.00000 | 0.0000000E+00 | 58 |
| 138.0000 | 18.00000 | 1.000000      | 59 |
| 91.00000 | 14.00000 | 0.0000000E+00 | 60 |
| 125.0000 | 16.00000 | 0.0000000E+00 | 61 |
| 164.0000 | 19.00000 | 0.0000000E+00 | 62 |
| 118.0000 | 7.000000 | 2.000000      | 63 |
| 128.0000 | 7.000000 | 0.0000000E+00 | 64 |
| 112.0000 | 12.00000 | 0.0000000E+00 | 65 |
| 134.0000 | 9.000000 | 0.0000000E+00 | 66 |
| 265.0000 | 16.00000 | 2.000000      | 67 |
| 290.0000 | 17.00000 | 1.000000      | 68 |
| 254.0000 | 21.00000 | 1.000000      | 69 |
| 224.0000 | 17.00000 | 1.000000      | 70 |
| 121.0000 | 13.00000 | 1.000000      | 71 |
| 112.0000 | 10.00000 | 1.000000      | 72 |
| 105.0000 | 17.00000 | 0.0000000E+00 | 73 |
| 114.0000 | 8.000000 | 0.0000000E+00 | 74 |
| 114.0000 | 10.00000 | 0.0000000E+00 | 75 |
| 112.0000 | 21.00000 | 2.000000      | 76 |
| 123.0000 | 15.00000 | 3.000000      | 77 |

## FILE: NRLSEP6 DATA

## FILE: NRLSEP7 DATA

37 39 17  
 39 113 9  
 35 118 11  
 74 184 26  
 78 109 25  
 85 207 20  
 63 168 23  
 78 291 16  
 49 181 11  
 38 117 6  
 64 184 8  
 35 191 9  
 38 144 10  
 33 132 13  
 57 253 12  
 82 254 16  
 84 262 17  
 108 432 14  
 117 518 21  
 30 88 13  
 49 186 34  
 59 82 33  
 57 180 15

|          |          |
|----------|----------|
| 42.00000 | 206.0000 |
| 47.00000 | 176.0000 |
| 52.00000 | 141.0000 |
| 70.00000 | 96.00000 |
| 75.00000 | 72.00000 |
| 108.0000 | 226.0000 |
| 110.0000 | 157.0000 |
| 77.00000 | 111.0000 |
| 118.0000 | 265.0000 |
| 74.00000 | 103.0000 |
| 63.00000 | 47.00000 |
| 67.00000 | 68.00000 |
| 64.00000 | 106.0000 |
| 40.00000 | 64.00000 |
| 49.00000 | 55.00000 |
| 68.00000 | 64.00000 |
| 69.00000 | 66.00000 |
| 86.00000 | 63.00000 |
| 101.0000 | 63.00000 |
| 87.00000 | 52.00000 |
| 100.0000 | 159.0000 |
| 65.00000 | 68.00000 |
| 74.00000 | 60.00000 |
| 69.00000 | 69.00000 |
| 58.00000 | 64.00000 |
| 50.00000 | 36.00000 |
| 50.00000 | 41.00000 |
| 58.00000 | 33.00000 |

37 45 4  
 39 125 5  
 35 135 5  
 74 200 15  
 78 125 15  
 85 221 12  
 63 192 10  
 78 309 9  
 49 216 6  
 38 159 2  
 64 208 3  
 35 204 2  
 38 160 5  
 33 142 4  
 57 276 5  
 82 297 7  
 84 281 8  
 108 496 5  
 117 584 13  
 30 114 9  
 49 293 12  
 59 162 25  
 57 204 11

|          |          |          |          |
|----------|----------|----------|----------|
| 15.00000 | 42.00000 | 215.0000 | 15.00000 |
| 11.00000 | 47.00000 | 202.0000 | 11.00000 |
| 15.00000 | 52.00000 | 281.0000 | 7.000000 |
| 27.00000 | 70.00000 | 138.0000 | 16.00000 |
| 40.00000 | 75.00000 | 102.0000 | 27.00000 |
| 18.00000 | 108.0000 | 236.0000 | 14.00000 |
| 24.00000 | 110.0000 | 176.0000 | 12.00000 |
| 8.000000 | 77.00000 | 128.0000 | 7.000000 |
| 31.00000 | 118.0000 | 349.0000 | 14.00000 |
| 23.00000 | 74.00000 | 139.0000 | 6.000000 |
| 31.00000 | 63.00000 | 91.00000 | 13.00000 |
| 31.00000 | 67.00000 | 78.00000 | 23.00000 |
| 21.00000 | 64.00000 | 108.0000 | 15.00000 |
| 17.00000 | 40.00000 | 68.00000 | 10.00000 |
| 12.00000 | 49.00000 | 63.00000 | 10.00000 |
| 37.00000 | 68.00000 | 69.00000 | 24.00000 |
| 25.00000 | 69.00000 | 85.00000 | 10.00000 |
| 30.00000 | 86.00000 | 69.00000 | 20.00000 |
| 36.00000 | 101.0000 | 67.00000 | 21.00000 |
| 27.00000 | 87.00000 | 57.00000 | 18.00000 |
| 38.00000 | 100.0000 | 224.0000 | 11.00000 |
| 45.00000 | 65.00000 | 98.00000 | 28.00000 |
| 42.00000 | 74.00000 | 65.00000 | 36.00000 |
| 42.00000 | 69.00000 | 85.00000 | 24.00000 |
| 32.00000 | 58.00000 | 82.00000 | 21.00000 |
| 29.00000 | 50.00000 | 46.00000 | 26.00000 |
| 22.00000 | 50.00000 | 50.00000 | 22.00000 |
| 24.00000 | 58.00000 | 37.00000 | 18.00000 |

## FILE: NRLSEP8 DATA

37 52 2  
 39 138 5  
 35 147 3  
 74 231 13  
 78 129 10  
 85 237 8  
 63 221 3  
 78 329 7  
 49 227 2  
 38 185 2  
 64 233 1  
 35 224 2  
 38 172 2  
 33 147 4  
 57 286 4  
 82 325 6  
 84 307 6  
 108 534 4  
 117 644 6  
 30 134 8  
 49 374 9  
 59 231 8  
 57 241 7

42.00000 222.0000  
 47.00000 208.0000  
 52.00000 310.0000  
 70.00000 222.0000  
 75.00000 161.0000  
 108.0000 261.0000  
 110.0000 182.0000  
 77.00000 135.0000  
 118.0000 378.0000  
 74.00000 171.0000  
 63.00000 120.0000  
 67.00000 104.0000  
 64.00000 118.0000  
 40.00000 71.00000  
 49.00000 68.00000  
 68.00000 87.00000  
 69.00000 109.0000  
 86.00000 80.00000  
 101.0000 70.00000  
 87.00000 61.00000  
 100.0000 248.0000  
 65.00000 135.0000  
 74.00000 95.00000  
 69.00000 96.00000  
 58.00000 88.00000  
 50.00000 61.00000  
 50.00000 61.00000  
 58.00000 50.00000

## FILE: NRLSEP9 DATA

37 64 1  
 39 142 5  
 35 151 2  
 74 253 10  
 78 138 8  
 85 250 3  
 63 233 3  
 78 346 4  
 49 252 0  
 38 201 2  
 64 257 0  
 35 258 2  
 38 186 2  
 33 154 3  
 57 303 3  
 82 337 5  
 84 325 5  
 108 567 4  
 117 678 5  
 30 157 4  
 49 424 4  
 59 284 6  
 57 275 4

|          |          |          |          |
|----------|----------|----------|----------|
| 16.00000 | 42.00000 | 253.0000 | 7.000000 |
| 13.00000 | 47.00000 | 225.0000 | 14.00000 |
| 9.000000 | 52.00000 | 330.0000 | 11.00000 |
| 8.000000 | 70.00000 | 245.0000 | 9.000000 |
| 20.00000 | 75.00000 | 262.0000 | 11.00000 |
| 13.00000 | 108.0000 | 290.0000 | 14.00000 |
| 7.000000 | 110.0000 | 212.0000 | 6.000000 |
| 3.000000 | 77.00000 | 161.0000 | 3.000000 |
| 14.00000 | 118.0000 | 398.0000 | 7.000000 |
| 4.000000 | 74.00000 | 182.0000 | 4.000000 |
| 12.00000 | 63.00000 | 139.0000 | 6.000000 |
| 14.00000 | 67.00000 | 129.0000 | 13.00000 |
| 12.00000 | 64.00000 | 132.0000 | 11.00000 |
| 10.00000 | 40.00000 | 82.00000 | 7.000000 |
| 7.000000 | 49.00000 | 71.00000 | 7.000000 |
| 16.00000 | 68.00000 | 98.00000 | 12.00000 |
| 11.00000 | 69.00000 | 121.0000 | 11.00000 |
| 20.00000 | 86.00000 | 82.00000 | 13.00000 |
| 12.00000 | 101.0000 | 84.00000 | 10.00000 |
| 11.00000 | 87.00000 | 66.00000 | 8.000000 |
| 7.000000 | 100.0000 | 257.0000 | 5.000000 |
| 9.000000 | 65.00000 | 147.0000 | 7.000000 |
| 25.00000 | 74.00000 | 118.0000 | 12.00000 |
| 21.00000 | 69.00000 | 120.0000 | 10.00000 |
| 10.00000 | 58.00000 | 96.00000 | 13.00000 |
| 20.00000 | 50.00000 | 70.00000 | 12.00000 |
| 17.00000 | 50.00000 | 79.00000 | 17.00000 |
| 20.00000 | 58.00000 | 55.00000 | 19.00000 |

## FILE: NRLSEP10 DATA

## FILE: NRLSEP11 DATA

37 74 1  
 39 155 2  
 35 162 1  
 74 268 8  
 78 144 5  
 85 258 2  
 63 245 1  
 78 381 4  
 49 273 0  
 38 216 0  
 64 276 0  
 35 281 1  
 38 210 2  
 33 172 3  
 57 317 3  
 82 356 5  
 84 346 5  
 108 595 4  
 117 712 2  
 30 171 3  
 49 459 0  
 59 314 8  
 57 301 4

37 78 1  
 39 173 1  
 35 181 1  
 74 282 8  
 78 149 5  
 85 272 1  
 63 260 1  
 78 404 3  
 49 287 0  
 38 242 0  
 64 294 0  
 35 304 1  
 38 229 2  
 33 187 3  
 57 342 2  
 82 390 5  
 84 373 1  
 108 624 2  
 117 746 1  
 30 181 2  
 49 487 0  
 59 346 1  
 57 336 2

|          |          |          |          |          |              |
|----------|----------|----------|----------|----------|--------------|
| 42.00000 | 285.0000 | 7.000000 | 42.00000 | 320.0000 | 6.000000     |
| 47.00000 | 249.0000 | 7.000000 | 47.00000 | 275.0000 | 5.000000     |
| 52.00000 | 351.0000 | 11.00000 | 52.00000 | 394.0000 | 7.000000     |
| 70.00000 | 260.0000 | 14.00000 | 70.00000 | 280.0000 | 16.00000     |
| 75.00000 | 297.0000 | 10.00000 | 75.00000 | 305.0000 | 9.000000     |
| 108.0000 | 43.00000 | 11.00000 | 108.0000 | 461.0000 | 11.00000     |
| 110.0000 | 245.0000 | 5.000000 | 110.0000 | 377.0000 | 4.000000     |
| 77.00000 | 189.0000 | 1.000000 | 77.00000 | 203.0000 | 0.000000E+00 |
| 118.0000 | 414.0000 | 7.000000 | 118.0000 | 451.0000 | 4.000000     |
| 74.00000 | 192.0000 | 6.000000 | 74.00000 | 202.0000 | 5.000000     |
| 63.00000 | 154.0000 | 6.000000 | 63.00000 | 164.0000 | 4.000000     |
| 67.00000 | 141.0000 | 10.00000 | 67.00000 | 163.0000 | 8.000000     |
| 64.00000 | 156.0000 | 10.00000 | 64.00000 | 174.0000 | 6.000000     |
| 40.00000 | 102.0000 | 4.000000 | 40.00000 | 116.0000 | 4.000000     |
| 49.00000 | 80.00000 | 5.000000 | 49.00000 | 98.00000 | 4.000000     |
| 68.00000 | 108.0000 | 12.00000 | 68.00000 | 130.0000 | 10.00000     |
| 69.00000 | 125.0000 | 8.000000 | 69.00000 | 133.0000 | 8.000000     |
| 86.00000 | 103.0000 | 11.00000 | 86.00000 | 108.0000 | 9.000000     |
| 101.0000 | 89.00000 | 7.000000 | 101.0000 | 105.0000 | 6.000000     |
| 87.00000 | 69.00000 | 6.000000 | 87.00000 | 74.00000 | 6.000000     |
| 100.0000 | 275.0000 | 5.000000 | 100.0000 | 296.0000 | 5.000000     |
| 65.00000 | 151.0000 | 4.000000 | 65.00000 | 162.0000 | 4.000000     |
| 74.00000 | 127.0000 | 7.000000 | 74.00000 | 135.0000 | 5.000000     |
| 69.00000 | 148.0000 | 7.000000 | 69.00000 | 154.0000 | 5.000000     |
| 58.00000 | 108.0000 | 12.00000 | 58.00000 | 128.0000 | 5.000000     |
| 50.00000 | 72.00000 | 12.00000 | 50.00000 | 94.00000 | 12.00000     |
| 50.00000 | 91.00000 | 8.000000 | 50.00000 | 97.00000 | 7.000000     |
| 58.00000 | 67.00000 | 19.00000 | 58.00000 | 77.00000 | 9.000000     |

FILE: NRLSEP12 DATA

37 89 1  
 39 186 1  
 35 198 0  
 74 300 5  
 78 161 4  
 85 287 1  
 63 266 1  
 78 416 2  
 49 306 0  
 38 266 0  
 64 319 0  
 35 320 1  
 38 245 1  
 33 200 0  
 57 380 2  
 82 421 4  
 84 398 1  
 108 665 2  
 117 785 1  
 30 193 1  
 49 511 0  
 59 379 1  
 57 361 0

|          |          |          |
|----------|----------|----------|
| 42.00000 | 360.0000 | 8.000000 |
| 47.00000 | 307.0000 | 4.000000 |
| 52.00000 | 431.0000 | 2.000000 |
| 70.00000 | 338.0000 | 10.00000 |
| 75.00000 | 329.0000 | 11.00000 |
| 108.0000 | 493.0000 | 13.00000 |
| 110.0000 | 418.0000 | 4.000000 |
| 77.00000 | 333.0000 | 1.000000 |
| 118.0000 | 480.0000 | 3.000000 |
| 74.00000 | 233.0000 | 3.000000 |
| 63.00000 | 174.0000 | 3.000000 |
| 67.00000 | 169.0000 | 2.000000 |
| 64.00000 | 194.0000 | 5.000000 |
| 40.00000 | 129.0000 | 4.000000 |
| 49.00000 | 114.0000 | 4.000000 |
| 68.00000 | 149.0000 | 6.000000 |
| 69.00000 | 147.0000 | 6.000000 |
| 86.00000 | 110.0000 | 11.00000 |
| 101.0000 | 111.0000 | 5.000000 |
| 87.00000 | 82.00000 | 7.000000 |
| 100.0000 | 310.0000 | 5.000000 |
| 65.00000 | 174.0000 | 1.000000 |
| 74.00000 | 146.0000 | 4.000000 |
| 69.00000 | 157.0000 | 3.000000 |
| 58.00000 | 141.0000 | 4.000000 |
| 50.00000 | 111.0000 | 6.000000 |
| 50.00000 | 110.0000 | 5.000000 |
| 58.00000 | 86.00000 | 6.000000 |

APPENDIX B

HISTORICAL ECONOMIC  
DATA FILES USED IN ANALYSIS

Help Wanted Advertising  
Seasonally Adjusted, the year 1967=100  
January 1980 through April 1987  
(In thousands)

|           | 80  | 81  | 82  | 83  | 84  | 85  | 86  | 87  |
|-----------|-----|-----|-----|-----|-----|-----|-----|-----|
| January   | 154 | 128 | 106 | 83  | 123 | 140 | 143 | 142 |
| February  | 151 | 129 | 103 | 83  | 129 | 141 | 142 | 147 |
| March     | 145 | 125 | 96  | 83  | 124 | 141 | 138 | 150 |
| April     | 122 | 118 | 88  | 81  | 124 | 132 | 132 | 144 |
| May       | 112 | 118 | 87  | 87  | 125 | 132 | 128 |     |
| June      | 115 | 121 | 85  | 92  | 134 | 141 | 141 |     |
| July      | 118 | 123 | 83  | 100 | 138 | 141 | 140 |     |
| August    | 117 | 119 | 78  | 97  | 128 | 134 | 134 |     |
| September | 122 | 112 | 73  | 98  | 129 | 136 | 135 |     |
| October   | 127 | 110 | 76  | 111 | 135 | 140 | 141 |     |
| November  | 134 | 111 | 78  | 114 | 137 | 144 | 147 |     |
| December  | 130 | 109 | 83  | 121 | 145 | 145 | 145 |     |

Source: U.S. Department of Commerce, Bureau of Economic  
Analysis, "Survey of Current Business".

Total Civilian Unemployment Rates  
16 years and older, Seasonally adjusted  
January 1980 through April 1987

|           | 80  | 81  | 82   | 83   | 84  | 85  | 86  | 87  |
|-----------|-----|-----|------|------|-----|-----|-----|-----|
| January   | 6.2 | 7.4 | 8.6  | 10.4 | 8.0 | 7.4 | 6.8 | 6.7 |
| February  | 6.2 | 7.3 | 8.8  | 10.4 | 7.8 | 7.3 | 7.2 | 6.7 |
| March     | 6.3 | 7.3 | 9.0  | 10.3 | 7.8 | 7.3 | 7.2 | 6.6 |
| April     | 6.9 | 7.3 | 9.3  | 10.2 | 7.8 | 7.3 | 7.1 | 6.3 |
| May       | 7.6 | 7.6 | 9.4  | 10.1 | 7.5 | 7.3 | 7.2 |     |
| June      | 7.5 | 7.3 | 9.5  | 10.0 | 7.2 | 7.3 | 7.1 |     |
| July      | 7.6 | 7.0 | 9.8  | 9.5  | 7.5 | 7.3 | 7.0 |     |
| August    | 7.6 | 7.2 | 9.9  | 9.5  | 7.5 | 7.1 | 6.8 |     |
| September | 7.4 | 7.5 | 10.2 | 9.2  | 7.4 | 7.1 | 7.0 |     |
| October   | 7.6 | 8.0 | 10.5 | 8.8  | 7.3 | 7.1 | 6.9 |     |
| November  | 7.5 | 8.4 | 10.7 | 8.4  | 7.1 | 7.0 | 6.9 |     |
| December  | 7.4 | 8.9 | 10.8 | 8.2  | 7.2 | 6.9 | 6.7 |     |

Source: U.S. Department of Labor, Bureau of Labor Standards, "Employment and Earnings".

Changes in Unemployment Rates  
January 1980 through April 1987  
(Changes are from prior month)

|           | 80  | 81  | 82  | 83  | 84  | 85  | 86  | 87  |
|-----------|-----|-----|-----|-----|-----|-----|-----|-----|
| January   | .3  | 0   | -.3 | -.4 | -.2 | .2  | -.1 | 0   |
| February  | 0   | -.1 | .2  | 0   | -.2 | -.1 | .4  | 0   |
| March     | .1  | 0   | .2  | -.1 | 0   | 0   | 0   | -.1 |
| April     | .6  | 0   | .3  | -.1 | 0   | 0   | -.1 | -.3 |
| May       | .7  | .3  | .1  | -.1 | -.3 | 0   | .1  |     |
| June      | -.1 | -.3 | .1  | -.1 | -.3 | 0   | -.1 |     |
| July      | .1  | -.3 | .3  | -.5 | .3  | 0   | -.1 |     |
| August    | 0   | .2  | .1  | 0   | 0   | -.2 | -.2 |     |
| September | -.2 | .3  | .3  | -.3 | -.1 | 0   | .2  |     |
| October   | .2  | .5  | .3  | -.4 | -.1 | 0   | -.1 |     |
| November  | -.1 | .4  | .2  | -.4 | -.2 | -.1 | 0   |     |
| December  | -.1 | .5  | .1  | -.2 | .1  | -.1 | -.2 |     |

Source: U.S. Department of Labor, Bureau of Labor Statistics, "Employment and Earnings". Simple subtraction of one month's statistic from the preceding month's statistic. Derived from the previously listed unemployment rate chart.

Index of Leading Economic Indicators  
(Composite of 12 Leading Indicators)  
Seasonally Adjusted  
January 1980 through April 1987

|           | 80    | 81    | 82    | 83    | 84    | 85    | 86    | 87    |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|
| January   | 134.7 | 142.1 | 135.1 | 145.2 | 164.5 | 165.5 | 174.1 | 183.8 |
| February  | 134.1 | 140.4 | 135.7 | 147.4 | 166.5 | 166.5 | 175.0 | 187.1 |
| March     | 131.5 | 141.7 | 134.7 | 150.2 | 167.2 | 167.2 | 176.4 | 187.5 |
| April     | 126.2 | 144.6 | 136.0 | 152.5 | 168.1 | 165.9 | 178.1 | 186.6 |
| May       | 123.0 | 144.5 | 136.2 | 154.4 | 168.2 | 166.9 | 178.5 |       |
| June      | 123.9 | 143.2 | 135.5 | 157.3 | 166.7 | 167.3 | 178.3 |       |
| July      | 128.1 | 142.9 | 136.2 | 158.2 | 163.9 | 168.5 | 179.7 |       |
| August    | 130.7 | 142.4 | 136.1 | 158.9 | 164.4 | 169.3 | 180.1 |       |
| September | 134.4 | 139.3 | 137.5 | 160.0 | 165.7 | 170.2 | 179.9 |       |
| October   | 135.0 | 136.9 | 138.6 | 162.4 | 164.2 | 171.2 | 181.2 |       |
| November  | 136.5 | 137.0 | 139.4 | 162.5 | 165.1 | 171.1 | 182.7 |       |
| December  | 136.4 | 136.2 | 140.9 | 163.4 | 164.1 | 174.0 | 186.6 |       |

Source: U.S. Department of Commerce, Bureau of Economic Analysis, "Business Conditions Digest".

Changes in the Leading Economic Indicators Index  
January 1980 through April 1987  
(Changes are from the previous month)

|           | 80   | 81   | 82   | 83  | 84   | 85   | 86  | 87   |
|-----------|------|------|------|-----|------|------|-----|------|
| January   | -.5  | 5.7  | -1.1 | 4.3 | .9   | 1.4  | .1  | -2.8 |
| February  | -.6  | -1.7 | .6   | 1.8 | 2.0  | 1.0  | .9  | 3.3  |
| March     | -2.6 | .7   | -1.0 | 2.8 | .7   | .7   | 1.4 | .4   |
| April     | -5.3 | 2.9  | 1.3  | 2.3 | .9   | -1.3 | 1.7 | -.9  |
| May       | -3.2 | -.1  | .2   | 1.9 | .1   | 1.0  | .4  |      |
| June      | .9   | -.7  | -.7  | 2.9 | -1.5 | .4   | -.2 |      |
| July      | 4.2  | -.3  | .7   | .9  | -2.8 | .8   | 1.4 |      |
| August    | 2.6  | -.5  | -.1  | .7  | .5   | .8   | .4  |      |
| September | 3.7  | -3.1 | 1.4  | 1.1 | 1.3  | .9   | -.2 |      |
| October   | .6   | -2.4 | 1.1  | 2.4 | -.5  | 1.0  | 1.3 |      |
| November  | .5   | .1   | .8   | .1  | .9   | -.1  | 1.5 |      |
| December  | -.1  | -.8  | 1.5  | .9  | -1.0 | 2.9  | 3.9 |      |

Source: U.S. Department of Commerce, Bureau of Economic Analysis, "Business Conditions Digest". Calculated by taking the difference between two consecutive months.

# APPENDIX C

## ATTRITION AND ECONOMIC DATA AS SEQUENCED IN REGRESSION ANALYSIS

FILE: NRLREI6L DATA

| ACC      | VOL      | HAND     | SEQ | UNCHG | IND   | UN  | HW  | INDCHG |
|----------|----------|----------|-----|-------|-------|-----|-----|--------|
| 186.0000 | 49.00000 | 4.000000 | 60  | -.4   | 162.5 | 8.4 | 114 | .1     |
| 310.0000 | 114.0000 | 5.000000 | 61  | -.2   | 163.4 | 8.2 | 121 | .9     |
| 421.0000 | 144.0000 | 20.00000 | 62  | -.2   | 164.5 | 8.0 | 123 | .9     |
| 293.0000 | 131.0000 | 13.00000 | 63  | -.2   | 166.5 | 7.8 | 129 | 2.0    |
| 319.0000 | 160.0000 | 9.000000 | 64  | 0     | 167.2 | 7.8 | 124 | .7     |
| 138.0000 | 63.00000 | 4.000000 | 65  | 0     | 168.1 | 7.8 | 124 | .9     |
| 91.00000 | 38.00000 | 15.00000 | 66  | -.3   | 168.2 | 7.5 | 125 | .1     |
| 125.0000 | 57.00000 | 7.000000 | 67  | -.3   | 166.9 | 7.2 | 134 | -1.5   |
| 164.0000 | 69.00000 | 12.00000 | 68  | .3    | 163.9 | 7.5 | 138 | -2.8   |
| 118.0000 | 30.00000 | 13.00000 | 69  | 0     | 164.5 | 7.5 | 128 | .5     |
| 128.0000 | 31.00000 | 25.00000 | 70  | -.1   | 165.9 | 7.4 | 129 | 1.3    |
| 112.0000 | 40.00000 | 15.00000 | 71  | -.1   | 164.2 | 7.3 | 135 | -.5    |
| 134.0000 | 42.00000 | 11.00000 | 72  | -.2   | 165.3 | 7.1 | 137 | .9     |
| 265.0000 | 88.00000 | 31.00000 | 73  | .1    | 164.3 | 7.2 | 145 | -1     |
| 290.0000 | 98.00000 | 26.00000 | 74  | .2    | 165.5 | 7.4 | 140 | 1.4    |
| 254.0000 | 116.0000 | 24.00000 | 75  | -.1   | 166.5 | 7.3 | 141 | 1      |
| 224.0000 | 91.00000 | 34.00000 | 76  | 0     | 167.2 | 7.3 | 141 | .7     |
| 121.0000 | 53.00000 | 2.000000 | 77  | 0     | 165.9 | 7.3 | 132 | -1.3   |
| 112.0000 | 37.00000 | 14.00000 | 78  | 0     | 166.9 | 7.3 | 132 | 1      |
| 105.0000 | 41.00000 | 3.000000 | 79  | 0     | 167.3 | 7.3 | 141 | .4     |
| 114.0000 | 37.00000 | 17.00000 | 80  | 0     | 168.5 | 7.3 | 141 | .8     |
| 114.0000 | 37.00000 | 13.00000 | 81  | -.2   | 169.3 | 7.1 | 134 | .8     |
| 112.0000 | 45.00000 | 15.00000 | 82  | 0     | 170.2 | 7.1 | 136 | .9     |
| 123.0000 | 43.00000 | 24.00000 | 83  | 0     | 171.2 | 7.1 | 140 | 1      |

FILE: NRLRET7L DATA

| ACC      | VOL      | MAND     | SEQ | UNCHG | IND   | UN  | HW  | INDCHG |
|----------|----------|----------|-----|-------|-------|-----|-----|--------|
| 186.0000 | 36.00000 | 3.000000 | 59  | -.4   | 162.5 | 8.4 | 114 | .1     |
| 310.0000 | 89.00000 | 5.000000 | 60  | -.2   | 163.4 | 8.2 | 121 | .9     |
| 421.0000 | 80.00000 | 5.000000 | 61  | -.2   | 164.5 | 8.0 | 123 | .9     |
| 293.0000 | 98.00000 | 6.000000 | 62  | -.2   | 166.5 | 7.8 | 129 | 2.0    |
| 319.0000 | 126.0000 | 7.000000 | 63  | 0     | 167.2 | 7.8 | 124 | .7     |
| 138.0000 | 55.00000 | 3.000000 | 64  | 0     | 168.1 | 7.8 | 124 | .9     |
| 91.00000 | 32.00000 | 15.00000 | 65  | -.3   | 168.2 | 7.5 | 125 | .1     |
| 125.0000 | 42.00000 | 6.000000 | 66  | -.3   | 166.9 | 7.2 | 134 | -1.5   |
| 164.0000 | 44.00000 | 4.000000 | 67  | .3    | 163.9 | 7.5 | 138 | -2.8   |
| 118.0000 | 24.00000 | 5.000000 | 68  | 0     | 164.5 | 7.5 | 128 | .5     |
| 128.0000 | 20.00000 | 5.000000 | 69  | -.1   | 165.9 | 7.4 | 129 | 1.3    |
| 112.0000 | 31.00000 | 2.000000 | 70  | -.1   | 164.2 | 7.3 | 135 | -.5    |
| 134.0000 | 31.00000 | 1.000000 | 71  | -.2   | 165.3 | 7.1 | 137 | .9     |
| 265.0000 | 67.00000 | 11.00000 | 72  | .1    | 164.3 | 7.2 | 145 | -1     |
| 290.0000 | 64.00000 | 8.000000 | 73  | .2    | 165.5 | 7.4 | 140 | 1.4    |
| 254.0000 | 87.00000 | 11.00000 | 74  | -.1   | 166.5 | 7.3 | 141 | 1      |
| 224.0000 | 74.00000 | 14.00000 | 75  | 0     | 167.2 | 7.3 | 141 | .7     |
| 121.0000 | 44.00000 | 3.000000 | 76  | 0     | 165.9 | 7.3 | 132 | -1.3   |
| 112.0000 | 31.00000 | 8.000000 | 77  | 0     | 166.9 | 7.3 | 132 | 1      |
| 106.0000 | 33.00000 | 3.000000 | 78  | 0     | 167.3 | 7.3 | 141 | .4     |
| 114.0000 | 32.00000 | 17.00000 | 79  | 0     | 168.5 | 7.3 | 141 | .8     |
| 114.0000 | 31.00000 | 9.000000 | 80  | -.2   | 169.3 | 7.1 | 134 | .8     |
| 112.0000 | 37.00000 | 8.000000 | 81  | 0     | 170.2 | 7.1 | 136 | .9     |
| 123.0000 | 38.00000 | 13.00000 | 82  | 0     | 171.2 | 7.1 | 140 | 1      |

FILE: NRLRET8L DATA

| ACC      | VOL      | HAND         | SEQ | UNCHG | IND   | UN  | HW  | INDCHG |
|----------|----------|--------------|-----|-------|-------|-----|-----|--------|
| 186.0000 | 31.00000 | 2.000000     | 58  | -.4   | 162.4 | 8.8 | 111 | 2.4    |
| 310.0000 | 63.00000 | 5.000000     | 59  | -.4   | 162.5 | 8.4 | 114 | .1     |
| 421.0000 | 60.00000 | 5.000000     | 60  | -.2   | 163.4 | 8.2 | 121 | .9     |
| 293.0000 | 61.00000 | 6.000000     | 61  | -.2   | 164.5 | 8.0 | 123 | .9     |
| 319.0000 | 103.0000 | 3.000000     | 62  | -.2   | 166.5 | 7.8 | 129 | 2.0    |
| 138.0000 | 42.00000 | 3.000000     | 63  | 0     | 167.2 | 7.8 | 124 | .7     |
| 91.00000 | 27.00000 | 11.00000     | 64  | 0     | 168.1 | 7.8 | 124 | .9     |
| 125.0000 | 40.00000 | 5.000000     | 65  | -.3   | 168.2 | 7.5 | 125 | .1     |
| 164.0000 | 33.00000 | 3.000000     | 66  | -.3   | 166.9 | 7.2 | 134 | -1.5   |
| 118.0000 | 17.00000 | 4.000000     | 67  | .3    | 163.9 | 7.5 | 138 | -2.8   |
| 128.0000 | 15.00000 | 4.000000     | 68  | 0     | 164.5 | 7.5 | 128 | .5     |
| 112.0000 | 26.00000 | 2.000000     | 69  | -.1   | 165.9 | 7.4 | 129 | 1.3    |
| 134.0000 | 20.00000 | 1.000000     | 70  | -.1   | 164.2 | 7.3 | 135 | -.5    |
| 265.0000 | 60.00000 | 11.00000     | 71  | -.2   | 165.3 | 7.1 | 137 | .9     |
| 290.0000 | 53.00000 | 8.000000     | 72  | .1    | 164.3 | 7.2 | 145 | -1     |
| 254.0000 | 71.00000 | 7.000000     | 73  | .2    | 165.5 | 7.4 | 140 | 1.4    |
| 224.0000 | 57.00000 | 13.00000     | 74  | -.1   | 166.5 | 7.3 | 141 | 1      |
| 121.0000 | 35.00000 | 3.000000     | 75  | 0     | 167.2 | 7.3 | 141 | .7     |
| 112.0000 | 24.00000 | 7.000000     | 76  | 0     | 165.9 | 7.3 | 132 | -1.3   |
| 106.0000 | 33.00000 | 0.000000E+00 | 77  | 0     | 166.9 | 7.3 | 132 | 1      |
| 114.0000 | 28.00000 | 7.000000     | 78  | 0     | 167.3 | 7.3 | 141 | .4     |
| 114.0000 | 26.00000 | 6.000000     | 79  | 0     | 168.5 | 7.3 | 141 | .8     |
| 112.0000 | 34.00000 | 7.000000     | 80  | -.2   | 169.3 | 7.1 | 134 | .8     |
| 123.0000 | 31.00000 | 11.00000     | 81  | 0     | 170.2 | 7.1 | 136 | .9     |

FILE: NRLRET9L DATA

| ACC      | VOL      | MAND          | SEQ | UNCHG | IND   | UN  | HW  | INDCHG |
|----------|----------|---------------|-----|-------|-------|-----|-----|--------|
| 186.0000 | 25.00000 | 24.00000      | 57  | 0     | 158.9 | 9.5 | 97  | .7     |
| 310.0000 | 52.00000 | 5.00000       | 58  | -.3   | 160.0 | 9.2 | 98  | 1.1    |
| 421.0000 | 49.00000 | 4.00000       | 59  | -.4   | 162.4 | 8.8 | 111 | 2.4    |
| 293.0000 | 46.00000 | 5.00000       | 60  | -.4   | 162.5 | 8.4 | 114 | .1     |
| 319.0000 | 75.00000 | 1.00000       | 61  | -.2   | 163.4 | 8.2 | 121 | .9     |
| 133.0000 | 33.00000 | 3.00000       | 62  | -.2   | 164.5 | 8.0 | 123 | .9     |
| 91.00000 | 22.00000 | 9.00000       | 63  | -.2   | 166.5 | 7.8 | 129 | 2.0    |
| 125.0000 | 38.00000 | 4.00000       | 64  | 0     | 167.2 | 7.8 | 124 | .7     |
| 164.0000 | 28.00000 | 3.00000       | 65  | 0     | 168.1 | 7.8 | 124 | .9     |
| 118.0000 | 14.00000 | 4.00000       | 66  | -.3   | 168.2 | 7.5 | 125 | .1     |
| 123.0000 | 9.00000  | 3.00000       | 67  | -.3   | 166.9 | 7.2 | 134 | -1.5   |
| 112.0000 | 22.00000 | 1.00000       | 68  | .3    | 163.9 | 7.5 | 138 | -2.8   |
| 134.0000 | 14.00000 | 1.00000       | 69  | 0     | 164.5 | 7.5 | 128 | .5     |
| 265.0000 | 42.00000 | 9.00000       | 70  | -.1   | 165.9 | 7.4 | 129 | 1.3    |
| 293.0000 | 41.00000 | 6.00000       | 71  | -.1   | 164.2 | 7.3 | 135 | -.5    |
| 254.0000 | 52.00000 | 7.00000       | 72  | -.2   | 165.3 | 7.1 | 137 | .9     |
| 224.0000 | 48.00000 | 9.00000       | 73  | .1    | 164.3 | 7.2 | 145 | -1     |
| 121.0000 | 25.00000 | 2.00000       | 74  | .2    | 165.5 | 7.4 | 140 | 1.4    |
| 112.0000 | 23.00000 | 4.00000       | 75  | -.1   | 166.5 | 7.3 | 141 | 1      |
| 106.0000 | 29.00000 | 0.0000000E+00 | 76  | 0     | 167.2 | 7.3 | 141 | .7     |
| 114.0000 | 27.00000 | 7.00000       | 77  | 0     | 165.9 | 7.3 | 132 | -1.3   |
| 114.0000 | 23.00000 | 4.00000       | 78  | 0     | 166.9 | 7.3 | 132 | 1      |
| 112.0000 | 32.00000 | 7.00000       | 79  | 0     | 167.3 | 7.3 | 141 | .4     |
| 123.0000 | 28.00000 | 10.00000      | 80  | 0     | 168.5 | 7.3 | 141 | .8     |

| AGE | WCL      | MALE     | SEQ | UNCHG | IND   | UN  | HW  | INDCHG |
|-----|----------|----------|-----|-------|-------|-----|-----|--------|
| 180 | 23 00000 | 25 00000 | 56  | 0     | 158.9 | 9.5 | 97  | .7     |
| 181 | 38 00000 | 25 00000 | 57  | -.3   | 160.0 | 9.2 | 98  | 1.1    |
| 182 | 39 00000 | 3 000000 | 58  | -.4   | 162.4 | 8.8 | 111 | 2.4    |
| 183 | 4 000000 | 5 000000 | 59  | -.4   | 162.5 | 8.4 | 114 | .1     |
| 184 | 5 000000 | 2 000000 | 60  | -.2   | 163.4 | 8.2 | 121 | .9     |
| 185 | 26 00000 | 3 000000 | 61  | -.2   | 164.5 | 8.0 | 123 | .9     |
| 186 | 27 00000 | 3 000000 | 62  | -.2   | 166.5 | 7.8 | 129 | 2.0    |
| 187 | 28 00000 | 4 000000 | 63  | 0     | 167.2 | 7.8 | 124 | .7     |
| 188 | 29 00000 | 3 000000 | 64  | 0     | 168.1 | 7.8 | 124 | .9     |
| 189 | 34 00000 | 4 000000 | 65  | -.3   | 168.2 | 7.5 | 125 | .1     |
| 190 | 35 00000 | 3 000000 | 66  | -.3   | 166.9 | 7.2 | 134 | -1.5   |
| 191 | 36 00000 | 4 000000 | 67  | .3    | 163.9 | 7.5 | 138 | -2.8   |
| 192 | 37 00000 | 3 000000 | 68  | 0     | 164.5 | 7.5 | 128 | .5     |
| 193 | 38 00000 | 6 000000 | 69  | -.1   | 165.9 | 7.4 | 129 | 1.3    |
| 194 | 39 00000 | 4 000000 | 70  | -.1   | 164.2 | 7.3 | 135 | -.5    |
| 195 | 4 000000 | 4 000000 | 71  | -.2   | 165.3 | 7.1 | 137 | .9     |
| 196 | 5 000000 | 6 000000 | 72  | .1    | 164.3 | 7.2 | 145 | -.1    |
| 197 | 2 000000 | 3 000000 | 73  | .2    | 165.5 | 7.4 | 140 | 1.4    |
| 198 | 2 000000 | 3 000000 | 74  | -.1   | 166.5 | 7.3 | 141 | 1      |
| 199 | 2 000000 | 3 000000 | 75  | 0     | 167.2 | 7.3 | 141 | .7     |
| 200 | 2 000000 | 3 000000 | 76  | 0     | 165.9 | 7.3 | 132 | -1.3   |
| 201 | 2 000000 | 3 000000 | 77  | 0     | 166.9 | 7.3 | 132 | 1      |
| 202 | 2 000000 | 4 000000 | 78  | 0     | 167.3 | 7.3 | 141 | .4     |
| 203 | 2 000000 | 3 000000 | 79  | 0     | 168.5 | 7.3 | 141 | .8     |

FILE: NRRETAIL DATA

| ACC      | VOL      | HAND         | SEQ | UNCHG | IND   | UN  | HW  | INDCHG |
|----------|----------|--------------|-----|-------|-------|-----|-----|--------|
| 186.0000 | 21.00000 | 25.00000     | 55  | -5    | 158.2 | 9.5 | 100 | .9     |
| 310.0000 | 32.00000 | 20.00000     | 56  | 0     | 158.9 | 9.5 | 97  | .7     |
| 421.0000 | 26.00000 | 39.00000     | 57  | -3    | 160.0 | 9.2 | 98  | 1.1    |
| 293.0000 | 32.00000 | 2.000000     | 58  | -4    | 162.4 | 8.8 | 111 | 2.4    |
| 319.0000 | 48.00000 | 1.000000     | 59  | -4    | 162.5 | 8.4 | 114 | .1     |
| 138.0000 | 21.00000 | 1.000000     | 60  | -2    | 163.4 | 8.2 | 121 | .9     |
| 91.00000 | 15.00000 | 2.000000     | 61  | -2    | 164.5 | 8.0 | 123 | .9     |
| 125.0000 | 28.00000 | 0.000000E+00 | 62  | -2    | 166.5 | 7.8 | 129 | 2.0    |
| 164.0000 | 25.00000 | 0.000000E+00 | 63  | 0     | 167.2 | 7.8 | 124 | .7     |
| 118.0000 | 9.000000 | 3.000000     | 64  | 0     | 168.1 | 7.8 | 124 | .9     |
| 128.0000 | 8.000000 | 0.000000E+00 | 65  | -3    | 168.2 | 7.5 | 125 | .1     |
| 112.0000 | 17.00000 | 0.000000E+00 | 66  | -3    | 166.9 | 7.2 | 134 | -1.5   |
| 134.0000 | 13.00000 | 0.000000E+00 | 67  | .3    | 163.9 | 7.5 | 138 | -2.8   |
| 265.0000 | 30.00000 | 3.000000     | 68  | 0     | 164.5 | 7.5 | 128 | .5     |
| 290.0000 | 29.00000 | 4.000000     | 69  | -1    | 165.9 | 7.4 | 129 | 1.3    |
| 254.0000 | 30.00000 | 1.000000     | 70  | -1    | 164.2 | 7.3 | 135 | -5     |
| 224.0000 | 27.00000 | 2.000000     | 71  | -2    | 165.3 | 7.1 | 137 | .9     |
| 121.0000 | 15.00000 | 1.000000     | 72  | .1    | 164.3 | 7.2 | 145 | -1     |
| 112.0000 | 14.00000 | 1.000000     | 73  | .2    | 165.5 | 7.4 | 140 | 1.4    |
| 106.0000 | 21.00000 | 0.000000E+00 | 74  | -1    | 166.5 | 7.3 | 141 | J      |
| 114.0000 | 13.00000 | 5.000000     | 75  | 0     | 167.2 | 7.3 | 141 | .7     |
| 114.0000 | 15.00000 | 0.000000E+00 | 76  | 0     | 165.9 | 7.3 | 132 | -1.3   |
| 112.0000 | 24.00000 | 2.000000     | 77  | 0     | 166.9 | 7.3 | 132 | 1      |
| 123.0000 | 22.00000 | 4.000000     | 78  | 0     | 167.3 | 7.3 | 141 | .4     |

FILE: NRRET12L DATA

| ACC      | VOL      | MAND          | SEQ | UNCHG | IND   | UN   | HW  | INDCHG |
|----------|----------|---------------|-----|-------|-------|------|-----|--------|
| 186.0000 | 14.00000 | 25.00000      | 54  | -.1   | 154.4 | 10.1 | 87  | 1.9    |
| 310.0000 | 19.00000 | 20.00000      | 55  | -.1   | 157.3 | 10.0 | 92  | 2.9    |
| 421.0000 | 20.00000 | 40.00000      | 56  | -.5   | 158.2 | 9.5  | 100 | .9     |
| 293.0000 | 17.00000 | 31.00000      | 57  | 0     | 158.9 | 9.5  | 97  | .7     |
| 319.0000 | 29.00000 | 0.0000000E+00 | 58  | -.3   | 160.0 | 9.2  | 98  | 1.1    |
| 138.0000 | 18.00000 | 1.000000      | 59  | -.4   | 162.4 | 8.8  | 111 | 2.4    |
| 91.00000 | 14.00000 | 0.0000000E+00 | 60  | -.4   | 162.5 | 8.4  | 114 | .1     |
| 125.0000 | 16.00000 | 0.0000000E+00 | 61  | -.2   | 163.4 | 8.2  | 121 | .9     |
| 164.0000 | 19.00000 | 0.0000000E+00 | 62  | -.2   | 164.5 | 8.0  | 123 | .9     |
| 118.0000 | 7.000000 | 2.000000      | 63  | -.2   | 166.5 | 7.8  | 129 | 2.0    |
| 128.0000 | 7.000000 | 0.0000000E+00 | 64  | 0     | 167.2 | 7.8  | 124 | .7     |
| 112.0000 | 12.00000 | 0.0000000E+00 | 65  | 0     | 168.1 | 7.8  | 124 | .9     |
| 134.0000 | 9.000000 | 0.0000000E+00 | 66  | -.3   | 168.2 | 7.5  | 125 | .1     |
| 265.0000 | 16.00000 | 2.000000      | 67  | -.3   | 166.9 | 7.2  | 134 | -1.5   |
| 290.0000 | 17.00000 | 1.000000      | 68  | .3    | 163.9 | 7.5  | 138 | -2.8   |
| 254.0000 | 21.00000 | 1.000000      | 69  | 0     | 164.5 | 7.5  | 128 | .5     |
| 224.0000 | 17.00000 | 1.000000      | 70  | -.1   | 165.9 | 7.4  | 129 | 1.3    |
| 121.0000 | 13.00000 | 1.000000      | 71  | -.1   | 164.2 | 7.3  | 135 | -.5    |
| 112.0000 | 10.00000 | 1.000000      | 72  | -.2   | 165.3 | 7.1  | 137 | .9     |
| 106.0000 | 17.00000 | 0.0000000E+00 | 73  | .1    | 164.3 | 7.2  | 145 | -1     |
| 114.0000 | 8.000000 | 0.0000000E+00 | 74  | .2    | 165.5 | 7.4  | 140 | 1.4    |
| 114.0000 | 10.00000 | 0.0000000E+00 | 75  | -.1   | 166.5 | 7.3  | 141 | .1     |
| 112.0000 | 21.00000 | 2.000000      | 76  | 0     | 167.2 | 7.3  | 141 | .7     |
| 123.0000 | 15.00000 | 3.000000      | 77  | 0     | 165.9 | 7.3  | 132 | -1.3   |

FILE: NRLSEP6L DATA

| ACC      | NSPD     | SPD      | UNCHG | IND   | UN  | HW  | INDCHG |
|----------|----------|----------|-------|-------|-----|-----|--------|
| 75.00000 | 72.00000 | 40.00000 | -.4   | 162.5 | 8.4 | 114 | .1     |
| 108.0000 | 226.0000 | 18.00000 | -.2   | 163.4 | 8.2 | 121 | .9     |
| 110.0000 | 157.0000 | 24.00000 | -.2   | 164.5 | 8.0 | 123 | .9     |
| 77.00000 | 111.0000 | 8.000000 | -.2   | 166.5 | 7.8 | 129 | 2.0    |
| 118.0000 | 265.0000 | 31.00000 | 0     | 167.2 | 7.8 | 124 | .7     |
| 74.00000 | 103.0000 | 23.00000 | 0     | 168.1 | 7.8 | 124 | .9     |
| 63.00000 | 47.00000 | 31.00000 | -.3   | 168.2 | 7.5 | 125 | .1     |
| 67.00000 | 68.00000 | 31.00000 | -.3   | 166.9 | 7.2 | 134 | -1.5   |
| 64.00000 | 106.0000 | 21.00000 | .3    | 163.9 | 7.5 | 138 | -2.8   |
| 40.00000 | 64.00000 | 17.00000 | 0     | 164.5 | 7.5 | 128 | .5     |
| 49.00000 | 55.00000 | 12.00000 | -.1   | 165.9 | 7.4 | 129 | 1.3    |
| 68.00000 | 64.00000 | 37.00000 | -.1   | 164.2 | 7.3 | 135 | -.5    |
| 69.00000 | 66.00000 | 25.00000 | -.2   | 165.3 | 7.1 | 137 | .9     |
| 86.00000 | 63.00000 | 30.00000 | .1    | 164.3 | 7.2 | 145 | -1     |
| 101.0000 | 63.00000 | 36.00000 | .2    | 165.5 | 7.4 | 140 | 1.4    |
| 87.00000 | 52.00000 | 27.00000 | -.1   | 166.5 | 7.3 | 141 | 1      |
| 100.0000 | 159.0000 | 38.00000 | 0     | 167.2 | 7.3 | 141 | .7     |
| 65.00000 | 68.00000 | 45.00000 | 0     | 165.9 | 7.3 | 132 | -1.3   |
| 74.00000 | 60.00000 | 42.00000 | 0     | 166.9 | 7.3 | 132 | 1      |
| 69.00000 | 69.00000 | 42.00000 | 0     | 167.3 | 7.3 | 141 | .4     |
| 58.00000 | 64.00000 | 32.00000 | 0     | 168.5 | 7.3 | 141 | .8     |
| 50.00000 | 36.00000 | 29.00000 | -.2   | 169.3 | 7.1 | 134 | .8     |
| 50.00000 | 41.00000 | 22.00000 | 0     | 170.2 | 7.1 | 136 | .9     |
| 58.00000 | 33.00000 | 24.00000 | 0     | 171.2 | 7.1 | 140 | 1      |

FILE: NRLSEP7L DATA

| ACC      | NSPD     | SPD      | UNCHG | IND   | UN  | HW  | INDCHG |
|----------|----------|----------|-------|-------|-----|-----|--------|
| 75.00000 | 102.0000 | 27.00000 | -.4   | 162.5 | 8.4 | 114 | .1     |
| 108.0000 | 236.0000 | 14.00000 | -.2   | 163.4 | 8.2 | 121 | .9     |
| 110.0000 | 176.0000 | 12.00000 | -.2   | 164.5 | 8.0 | 123 | .9     |
| 77.00000 | 128.0000 | 7.000000 | -.2   | 166.5 | 7.8 | 129 | 2.0    |
| 118.0000 | 349.0000 | 14.00000 | 0     | 167.2 | 7.8 | 124 | .7     |
| 74.00000 | 139.0000 | 6.000000 | 0     | 168.1 | 7.8 | 124 | .9     |
| 63.00000 | 91.00000 | 13.00000 | -.3   | 168.2 | 7.5 | 125 | .1     |
| 67.00000 | 78.00000 | 23.00000 | -.3   | 166.9 | 7.2 | 134 | -1.5   |
| 64.00000 | 108.0000 | 15.00000 | .3    | 163.9 | 7.5 | 138 | -2.8   |
| 40.00000 | 68.00000 | 10.00000 | 0     | 164.5 | 7.5 | 128 | .5     |
| 49.00000 | 63.00000 | 10.00000 | -.1   | 165.9 | 7.4 | 129 | 1.3    |
| 68.00000 | 69.00000 | 24.00000 | -.1   | 164.2 | 7.3 | 135 | -.5    |
| 69.00000 | 85.00000 | 10.00000 | -.2   | 165.3 | 7.1 | 137 | .9     |
| 86.00000 | 69.00000 | 20.00000 | .1    | 164.3 | 7.2 | 145 | -1     |
| 101.0000 | 67.00000 | 21.00000 | .2    | 165.5 | 7.4 | 140 | 1.4    |
| 87.00000 | 57.00000 | 18.00000 | -.1   | 166.5 | 7.3 | 141 | 1      |
| 100.0000 | 224.0000 | 11.00000 | 0     | 167.2 | 7.3 | 141 | .7     |
| 65.00000 | 98.00000 | 28.00000 | 0     | 165.9 | 7.3 | 132 | -1.3   |
| 74.00000 | 65.00000 | 36.00000 | 0     | 166.9 | 7.3 | 132 | 1      |
| 69.00000 | 85.00000 | 24.00000 | 0     | 167.3 | 7.3 | 141 | .4     |
| 58.00000 | 82.00000 | 21.00000 | 0     | 168.5 | 7.3 | 141 | .8     |
| 50.00000 | 46.00000 | 26.00000 | -.2   | 169.3 | 7.1 | 134 | .8     |
| 50.00000 | 50.00000 | 22.00000 | 0     | 170.2 | 7.1 | 136 | .9     |
| 58.00000 | 37.00000 | 18.00000 | 0     | 171.2 | 7.1 | 140 | 1      |

FILE: NRLSEP8L DATA

| ACC      | NSPD     | SPD      | UNCHG | IND   | UN  | HW  | INDCHG |
|----------|----------|----------|-------|-------|-----|-----|--------|
| 75.00000 | 161.0000 | 20.00000 | -.4   | 162.4 | 8.8 | 111 | 2.4    |
| 108.0000 | 261.0000 | 13.00000 | -.4   | 162.5 | 8.4 | 114 | .1     |
| 110.0000 | 182.0000 | 7.000000 | -.2   | 163.4 | 8.2 | 121 | .9     |
| 77.00000 | 135.0000 | 3.000000 | -.2   | 164.5 | 8.0 | 123 | .9     |
| 118.0000 | 378.0000 | 14.00000 | -.2   | 166.5 | 7.8 | 129 | 2.0    |
| 74.00000 | 171.0000 | 4.000000 | 0     | 167.2 | 7.8 | 124 | .7     |
| 63.00000 | 120.0000 | 12.00000 | 0     | 168.1 | 7.8 | 124 | .9     |
| 67.00000 | 104.0000 | 14.00000 | -.3   | 168.2 | 7.5 | 125 | .1     |
| 64.00000 | 118.0000 | 12.00000 | -.3   | 166.9 | 7.2 | 134 | -1.5   |
| 40.00000 | 71.00000 | 10.00000 | .3    | 163.9 | 7.5 | 138 | -2.8   |
| 49.00000 | 68.00000 | 7.000000 | 0     | 164.5 | 7.5 | 128 | .5     |
| 68.00000 | 87.00000 | 16.00000 | -.1   | 165.9 | 7.4 | 129 | 1.3    |
| 69.00000 | 109.0000 | 11.00000 | -.1   | 164.2 | 7.3 | 135 | -.5    |
| 86.00000 | 80.00000 | 20.00000 | -.2   | 165.3 | 7.1 | 137 | .9     |
| 101.0000 | 70.00000 | 12.00000 | .1    | 164.3 | 7.2 | 145 | -1     |
| 87.00000 | 61.00000 | 11.00000 | .2    | 165.5 | 7.4 | 140 | 1.4    |
| 100.0000 | 48.0000  | 7.000000 | -.1   | 166.5 | 7.3 | 141 | 1      |
| 65.00000 | 135.0000 | 9.000000 | 0     | 167.2 | 7.3 | 141 | .7     |
| 74.00000 | 95.00000 | 25.00000 | 0     | 165.9 | 7.3 | 132 | -1.3   |
| 69.00000 | 96.00000 | 21.00000 | 0     | 166.9 | 7.3 | 132 | 1      |
| 58.00000 | 88.00000 | 10.00000 | 0     | 167.3 | 7.3 | 141 | .4     |
| 50.00000 | 61.00000 | 20.00000 | 0     | 168.5 | 7.3 | 141 | .8     |
| 50.00000 | 61.00000 | 17.00000 | -.2   | 169.3 | 7.1 | 134 | .8     |
| 58.00000 | 50.00000 | 20.00000 | 0     | 170.2 | 7.1 | 136 | .9     |

FILE: NPLSEP9L DATA

| ACC      | NSPD     | SPD      | UNCHG | IND   | UN  | HW  | INDCHG |
|----------|----------|----------|-------|-------|-----|-----|--------|
| 75.00000 | 262.0000 | 11.00000 | 0     | 158.9 | 9.5 | 97  | .7     |
| 108.0000 | 290.0000 | 14.00000 | -.3   | 160.0 | 9.2 | 98  | 1.1    |
| 110.0000 | 212.0000 | 6.000000 | -.4   | 162.4 | 8.8 | 111 | 2.4    |
| 77.00000 | 161.0000 | 3.000000 | -.4   | 162.5 | 8.4 | 114 | .1     |
| 118.0000 | 398.0000 | 7.000000 | -.2   | 163.4 | 8.2 | 121 | .9     |
| 74.00000 | 182.0000 | 4.000000 | -.2   | 164.5 | 8.0 | 123 | .9     |
| 63.00000 | 139.0000 | 6.000000 | -.2   | 166.5 | 7.8 | 129 | 2.0    |
| 67.00000 | 129.0000 | 13.00000 | 0     | 167.2 | 7.8 | 124 | .7     |
| 64.00000 | 132.0000 | 11.00000 | 0     | 168.1 | 7.8 | 124 | .9     |
| 40.00000 | 82.00000 | 7.000000 | -.3   | 168.2 | 7.5 | 125 | .1     |
| 49.00000 | 71.00000 | 7.000000 | -.3   | 166.9 | 7.2 | 134 | -1.5   |
| 23.00000 | 98.00000 | 12.00000 | .3    | 163.9 | 7.5 | 138 | -2.8   |
| 69.00000 | 121.0000 | 11.00000 | 0     | 164.5 | 7.5 | 128 | .5     |
| 86.00000 | 82.00000 | 13.00000 | -.1   | 165.9 | 7.4 | 129 | 1.3    |
| 161.0000 | 84.00000 | 10.00000 | -.1   | 164.2 | 7.3 | 135 | -.5    |
| 87.00000 | 66.00000 | 8.000000 | -.2   | 165.3 | 7.1 | 137 | .9     |
| 100.0000 | 257.0000 | 5.000000 | .1    | 164.3 | 7.2 | 145 | -1     |
| 65.00000 | 147.0000 | 7.000000 | .2    | 165.5 | 7.4 | 140 | 1.4    |
| 74.00000 | 118.0000 | 12.00000 | -.1   | 166.5 | 7.3 | 141 | 1      |
| 69.00000 | 120.0000 | 10.00000 | 0     | 167.2 | 7.3 | 141 | .7     |
| 58.00000 | 96.00000 | 13.00000 | 0     | 165.9 | 7.3 | 132 | -1.3   |
| 50.00000 | 70.00000 | 12.00000 | 0     | 165.9 | 7.3 | 132 | 1      |
| 50.00000 | 79.00000 | 17.00000 | 0     | 167.3 | 7.3 | 141 | .4     |
| 53.00000 | 55.00000 | 19.00000 | 0     | 168.5 | 7.3 | 141 | .8     |

FILE: NRSEP10L DATA

| ACC      | NSPD     | SPD      | UNCHG | IND   | UN  | HW  | INDCHG |
|----------|----------|----------|-------|-------|-----|-----|--------|
| 75.00000 | 297.0000 | 10.00000 | 0     | 158.9 | 9.5 | 97  | .7     |
| 108.0000 | 43.00000 | 11.00000 | -.3   | 160.0 | 9.2 | 98  | 1.1    |
| 110.0000 | 245.0000 | 5.000000 | -.4   | 162.4 | 8.8 | 111 | 2.4    |
| 77.00000 | 189.0000 | 1.000000 | -.4   | 162.5 | 8.4 | 114 | .1     |
| 118.0000 | 414.0000 | 7.000000 | -.2   | 163.4 | 8.2 | 121 | .9     |
| 74.00000 | 192.0000 | 6.000000 | -.2   | 164.5 | 8.0 | 123 | .9     |
| 63.00000 | 154.0000 | 6.000000 | -.2   | 166.5 | 7.8 | 129 | 2.0    |
| 67.00000 | 141.0000 | 10.00000 | 0     | 167.2 | 7.8 | 124 | .7     |
| 64.00000 | 156.0000 | 10.00000 | 0     | 168.1 | 7.8 | 124 | .9     |
| 40.00000 | 102.0000 | 4.000000 | -.3   | 168.2 | 7.5 | 125 | .1     |
| 49.00000 | 80.00000 | 5.000000 | -.3   | 166.9 | 7.2 | 134 | -1.5   |
| 68.00000 | 108.0000 | 12.00000 | .3    | 163.9 | 7.5 | 138 | -2.8   |
| 69.00000 | 125.0000 | 8.000000 | 0     | 164.5 | 7.5 | 128 | .5     |
| 86.00000 | 103.0000 | 11.00000 | -.1   | 165.9 | 7.4 | 129 | 1.3    |
| 101.0000 | 89.00000 | 7.000000 | -.1   | 164.2 | 7.3 | 135 | -.5    |
| 87.00000 | 69.00000 | 6.000000 | -.2   | 165.3 | 7.1 | 137 | .9     |
| 100.0000 | 275.0000 | 5.000000 | .1    | 164.3 | 7.2 | 145 | -1     |
| 65.00000 | 151.0000 | 4.000000 | .2    | 165.5 | 7.4 | 140 | 1.4    |
| 74.00000 | 127.0000 | 7.000000 | -.1   | 166.5 | 7.3 | 141 | 1      |
| 69.00000 | 148.0000 | 7.000000 | 0     | 167.2 | 7.3 | 141 | .7     |
| 58.00000 | 108.0000 | 12.00000 | 0     | 165.9 | 7.3 | 132 | -1.3   |
| 50.00000 | 72.00000 | 12.00000 | 0     | 166.9 | 7.3 | 132 | 1      |
| 50.00000 | 91.00000 | 8.000000 | 0     | 167.3 | 7.3 | 141 | .4     |
| 58.00000 | 67.00000 | 19.00000 | 0     | 168.5 | 7.3 | 141 | .8     |

|  | NSPD     | SPD          | UNCHG | IND   | UN  | HW  | INDCHG |
|--|----------|--------------|-------|-------|-----|-----|--------|
|  | 305.0000 | 9.000000     | -5    | 158.2 | 9.5 | 100 | .9     |
|  | 461.0000 | 11.00000     | 0     | 158.9 | 9.5 | 97  | .7     |
|  | 377.0000 | 4.000000     | -3    | 160.0 | 9.2 | 98  | 1.1    |
|  | 203.0000 | 0.000000E+00 | -4    | 162.4 | 8.8 | 111 | 2.4    |
|  | 451.0000 | 4.000000     | -4    | 162.5 | 8.4 | 114 | .1     |
|  | 202.0000 | 5.000000     | -2    | 163.4 | 8.2 | 121 | .9     |
|  | 164.0000 | 4.000000     | -2    | 164.5 | 8.0 | 123 | .9     |
|  | 163.0000 | 8.000000     | -2    | 166.5 | 7.8 | 129 | 2.0    |
|  | 174.0000 | 6.000000     | 0     | 167.2 | 7.8 | 124 | .7     |
|  | 116.0000 | 4.000000     | 0     | 168.1 | 7.8 | 124 | .9     |
|  | 98.00000 | 4.000000     | -3    | 168.2 | 7.5 | 125 | .1     |
|  | 130.0000 | 10.00000     | -3    | 166.9 | 7.2 | 134 | -1.5   |
|  | 133.0000 | 8.000000     | .3    | 163.9 | 7.5 | 138 | -2.8   |
|  | 108.0000 | 9.000000     | 0     | 164.5 | 7.5 | 128 | .5     |
|  | 105.0000 | 6.000000     | -1    | 165.9 | 7.4 | 129 | 1.3    |
|  | 74.00000 | 6.000000     | -1    | 164.2 | 7.3 | 135 | -5     |
|  | 296.0000 | 5.000000     | -2    | 165.3 | 7.1 | 137 | .9     |
|  | 162.0000 | 4.000000     | .1    | 164.3 | 7.2 | 145 | -1     |
|  | 135.0000 | 5.000000     | .2    | 165.5 | 7.4 | 140 | 1.4    |
|  | 154.0000 | 5.000000     | -1    | 166.5 | 7.3 | 141 | 1      |
|  | 128.0000 | 5.000000     | 0     | 167.2 | 7.3 | 141 | .7     |
|  | 94.00000 | 12.00000     | 0     | 165.9 | 7.3 | 132 | -1.3   |
|  | 97.00000 | 7.000000     | 0     | 166.9 | 7.3 | 132 | 1      |
|  | 77.00000 | 9.000000     | 0     | 167.3 | 7.3 | 141 | .4     |

FILE: NRSEPI2L DATA

| ACC      | NSPD     | SPD      | UNCHG | IND   | UN   | HW  | INDCHG |
|----------|----------|----------|-------|-------|------|-----|--------|
| 75.00000 | 329.0000 | 11.00000 | -.1   | 154.4 | 10.1 | 87  | 1.9    |
| 108.0000 | 493.0000 | 13.00000 | -.1   | 157.3 | 10.0 | 92  | 2.9    |
| 110.0000 | 418.0000 | 4.000000 | -.5   | 158.2 | 9.5  | 100 | .9     |
| 77.00000 | 333.0000 | 1.000000 | 0     | 158.9 | 9.5  | 97  | .7     |
| 118.0000 | 480.0000 | 3.000000 | -.3   | 160.0 | 9.2  | 98  | 1.1    |
| 74.00000 | 233.0000 | 3.000000 | -.4   | 162.4 | 8.8  | 111 | 2.4    |
| 63.00000 | 174.0000 | 3.000000 | -.4   | 162.5 | 8.4  | 114 | .1     |
| 67.00000 | 169.0000 | 2.000000 | -.2   | 163.4 | 8.2  | 121 | .9     |
| 64.00000 | 194.0000 | 5.000000 | -.2   | 164.5 | 8.0  | 123 | .9     |
| 40.00000 | 129.0000 | 4.000000 | -.2   | 166.5 | 7.8  | 129 | 2.0    |
| 49.00000 | 114.0000 | 4.000000 | 0     | 167.2 | 7.8  | 124 | .7     |
| 68.00000 | 149.0000 | 6.000000 | 0     | 168.1 | 7.8  | 124 | .9     |
| 69.00000 | 147.0000 | 6.000000 | -.3   | 168.2 | 7.5  | 125 | .1     |
| 86.00000 | 110.0000 | 11.00000 | -.3   | 166.9 | 7.2  | 134 | -1.5   |
| 101.0000 | 111.0000 | 5.000000 | .3    | 163.9 | 7.5  | 138 | -2.8   |
| 87.00000 | 82.00000 | 7.000000 | 0     | 164.5 | 7.5  | 128 | .5     |
| 100.0000 | 310.0000 | 5.000000 | -.1   | 165.9 | 7.4  | 129 | 1.3    |
| 65.00000 | 174.0000 | 1.000000 | -.1   | 164.2 | 7.3  | 135 | -.5    |
| 74.00000 | 146.0000 | 4.000000 | -.2   | 165.3 | 7.1  | 137 | .9     |
| 69.00000 | 157.0000 | 3.000000 | .1    | 164.3 | 7.2  | 145 | -1     |
| 58.00000 | 141.0000 | 4.000000 | .2    | 165.5 | 7.4  | 140 | 1.4    |
| 50.00000 | 111.0000 | 6.000000 | -.1   | 166.5 | 7.3  | 141 | 1      |
| 50.00000 | 110.0000 | 5.000000 | 0     | 167.2 | 7.3  | 141 | .7     |
| 58.00000 | 86.00000 | 6.000000 | 0     | 165.9 | 7.3  | 132 | -1.3   |

03 DEC 87 NRLRET6L REGRESSION  
08:01:08 NAVAL POSTGRADUATE SCHOOL

IBM 3033AP VM/SP CMS

----- PEARSON CORRELATION COEFFICIENTS -----

PEARSON CORRELATION TEST OF ECONOMIC  
VARIABLES CONSIDERED IN ANALYSIS

|      | VOL                        | MAND                       | ACC                        | HW                         | UN                         | IND                        |
|------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| VOL  | 1.0000<br>( 24)<br>P= .    | .1561<br>( 24)<br>P= .233  | .9366<br>( 24)<br>P= .000  | -.1745<br>( 24)<br>P= .207 | .4722<br>( 24)<br>P= .010  | -.2351<br>( 24)<br>P= .134 |
| MAND | .1561<br>( 24)<br>P= .233  | 1.0000<br>( 24)<br>P= .    | .2584<br>( 24)<br>P= .111  | .5293<br>( 24)<br>P= .004  | -.3670<br>( 24)<br>P= .039 | .1256<br>( 24)<br>P= .279  |
| ACC  | .9366<br>( 24)<br>P= .000  | .2584<br>( 24)<br>P= .111  | 1.0000<br>( 24)<br>P= .    | -.2141<br>( 24)<br>P= .158 | .5443<br>( 24)<br>P= .003  | -.3947<br>( 24)<br>P= .028 |
| HW   | -.1745<br>( 24)<br>P= .207 | .5293<br>( 24)<br>P= .004  | -.2141<br>( 24)<br>P= .158 | 1.0000<br>( 24)<br>P= .    | -.8328<br>( 24)<br>P= .000 | .3293<br>( 24)<br>P= .058  |
| UN   | .4722<br>( 24)<br>P= .010  | -.3670<br>( 24)<br>P= .039 | .5443<br>( 24)<br>P= .003  | -.8328<br>( 24)<br>P= .000 | 1.0000<br>( 24)<br>P= .    | -.5428<br>( 24)<br>P= .003 |
| IND  | -.2351<br>( 24)<br>P= .134 | .1256<br>( 24)<br>P= .279  | -.3947<br>( 24)<br>P= .028 | .3293<br>( 24)<br>P= .058  | -.5428<br>( 24)<br>P= .003 | 1.0000<br>( 24)<br>P= .    |

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NRLRET9L REGRESSION  
NAVAL POSTGRADUATE SCHOOL

IBM 3033AP

VM/SP CMS

----- P E A R S O N C O R R E L A T I O N C O E F F I C I E N T S -----

|      | VOL                        | MAND                       | ACC                        | HW                         | UN                         | IND                        |
|------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| VOL  | 1.0000<br>( 24)<br>P= .    | -.0139<br>( 24)<br>P= .474 | .7885<br>( 24)<br>P= .000  | -.2676<br>( 24)<br>P= .103 | .3267<br>( 24)<br>P= .060  | -.4289<br>( 24)<br>P= .018 |
| MAND | -.0139<br>( 24)<br>P= .474 | 1.0000<br>( 24)<br>P= .    | .0621<br>( 24)<br>P= .387  | -.3411<br>( 24)<br>P= .051 | .3899<br>( 24)<br>P= .030  | -.3723<br>( 24)<br>P= .037 |
| ACC  | .7885<br>( 24)<br>P= .000  | .0621<br>( 24)<br>P= .387  | 1.0000<br>( 24)<br>P= .    | -.5013<br>( 24)<br>P= .006 | .5064<br>( 24)<br>P= .006  | -.6124<br>( 24)<br>P= .001 |
| HW   | -.2676<br>( 24)<br>P= .103 | -.3411<br>( 24)<br>P= .051 | -.5013<br>( 24)<br>P= .006 | 1.0000<br>( 24)<br>P= .    | -.9450<br>( 24)<br>P= .000 | .7168<br>( 24)<br>P= .000  |
| UN   | .3267<br>( 24)<br>P= .060  | .3899<br>( 24)<br>P= .030  | .5064<br>( 24)<br>P= .006  | -.9450<br>( 24)<br>P= .000 | 1.0000<br>( 24)<br>P= .    | -.7964<br>( 24)<br>P= .000 |
| IND  | -.4289<br>( 24)<br>P= .018 | -.3723<br>( 24)<br>P= .037 | -.6124<br>( 24)<br>P= .001 | .7168<br>( 24)<br>P= .000  | -.7964<br>( 24)<br>P= .000 | 1.0000<br>( 24)<br>P= .    |

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NAVAL POSTGRADUATE SCHOOL

IBM 3033AP

VM/SP CMS

----- PEARSON CORRELATION COEFFICIENTS -----

|      | VOL                        | MAND                       | ACC                        | HW                         | UN                         | IND                        |
|------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| VOL  | 1.0000<br>( 24)<br>P= .    | .2136<br>( 24)<br>P= .158  | .6078<br>( 24)<br>P= .001  | -.3785<br>( 24)<br>P= .034 | .3826<br>( 24)<br>P= .032  | -.4500<br>( 24)<br>P= .014 |
| MAND | .2136<br>( 24)<br>P= .158  | 1.0000<br>( 24)<br>P= .    | .6559<br>( 24)<br>P= .000  | -.7019<br>( 24)<br>P= .000 | .7543<br>( 24)<br>P= .000  | -.7614<br>( 24)<br>P= .000 |
| ACC  | .6078<br>( 24)<br>P= .001  | .6559<br>( 24)<br>P= .000  | 1.0000<br>( 24)<br>P= .    | -.5494<br>( 24)<br>P= .003 | .5512<br>( 24)<br>P= .003  | -.5745<br>( 24)<br>P= .002 |
| HW   | -.3785<br>( 24)<br>P= .034 | -.7019<br>( 24)<br>P= .000 | -.5494<br>( 24)<br>P= .003 | 1.0000<br>( 24)<br>P= .    | -.9709<br>( 24)<br>P= .000 | .8454<br>( 24)<br>P= .000  |
| UN   | .3826<br>( 24)<br>P= .032  | .7543<br>( 24)<br>P= .000  | .5512<br>( 24)<br>P= .003  | -.9709<br>( 24)<br>P= .000 | 1.0000<br>( 24)<br>P= .    | -.9048<br>( 24)<br>P= .000 |
| IND  | -.4500<br>( 24)<br>P= .014 | -.7614<br>( 24)<br>P= .000 | -.5745<br>( 24)<br>P= .002 | .8454<br>( 24)<br>P= .000  | -.9048<br>( 24)<br>P= .000 | 1.0000<br>( 24)<br>P= .    |

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NRLSEP6L REGRESSION  
NAVAL POSTGRADUATE SCHOOL

IBM 3033AP

VN/SP CMS

----- PEARSON CORRELATION COEFFICIENTS -----

|      | NSPD                       | SPD                        | ACC                        | HW                         | UN                         | IND                        |
|------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| NSPD | 1.0000<br>( 24)<br>P= .    | -.1283<br>( 24)<br>P= .275 | .7704<br>( 24)<br>P= .000  | -.4141<br>( 24)<br>P= .022 | .5983<br>( 24)<br>P= .001  | -.2870<br>( 24)<br>P= .087 |
| SPD  | -.1283<br>( 24)<br>P= .275 | 1.0000<br>( 24)<br>P= .    | .1584<br>( 24)<br>P= .230  | .1841<br>( 24)<br>P= .195  | -.1731<br>( 24)<br>P= .209 | -.0078<br>( 24)<br>P= .486 |
| ACC  | .7704<br>( 24)<br>P= .000  | .1584<br>( 24)<br>P= .230  | 1.0000<br>( 24)<br>P= .    | -.1704<br>( 24)<br>P= .213 | .4818<br>( 24)<br>P= .009  | -.3264<br>( 24)<br>P= .060 |
| HW   | -.4141<br>( 24)<br>P= .022 | .1841<br>( 24)<br>P= .195  | -.1704<br>( 24)<br>P= .213 | 1.0000<br>( 24)<br>P= .    | -.8328<br>( 24)<br>P= .000 | .3293<br>( 24)<br>P= .058  |
| UN   | .5983<br>( 24)<br>P= .001  | -.1731<br>( 24)<br>P= .209 | .4818<br>( 24)<br>P= .009  | -.8328<br>( 24)<br>P= .000 | 1.0000<br>( 24)<br>P= .    | -.5428<br>( 24)<br>P= .003 |
| IND  | -.2870<br>( 24)<br>P= .087 | -.0078<br>( 24)<br>P= .486 | -.3264<br>( 24)<br>P= .060 | .3293<br>( 24)<br>P= .058  | -.5428<br>( 24)<br>P= .003 | 1.0000<br>( 24)<br>P= .    |

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NRLSEP9L REGRESSION  
NAVAL POSTGRADUATE SCHOOL

IBM 3033AP

VH/SP CHS

----- PEARSON CORRELATION COEFFICIENTS -----

|      | NSPD                       | SPD                        | ACC                        | HW                         | UN                         | IND                        |
|------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| NSPD | 1.0000<br>( 24)<br>P= .    | -.3359<br>( 24)<br>P= .054 | .7011<br>( 24)<br>P= .000  | -.5676<br>( 24)<br>P= .002 | .6883<br>( 24)<br>P= .000  | -.6819<br>( 24)<br>P= .000 |
| SPD  | -.3359<br>( 24)<br>P= .054 | 1.0000<br>( 24)<br>P= .    | -.2536<br>( 24)<br>P= .116 | .1469<br>( 24)<br>P= .247  | -.1452<br>( 24)<br>P= .249 | .2495<br>( 24)<br>P= .120  |
| ACC  | .7011<br>( 24)<br>P= .000  | -.2536<br>( 24)<br>P= .116 | 1.0000<br>( 24)<br>P= .    | -.3471<br>( 24)<br>P= .048 | .4359<br>( 24)<br>P= .017  | -.6498<br>( 24)<br>P= .000 |
| HW   | -.5676<br>( 24)<br>P= .002 | .1469<br>( 24)<br>P= .247  | -.3471<br>( 24)<br>P= .048 | 1.0000<br>( 24)<br>P= .    | -.9450<br>( 24)<br>P= .000 | .7168<br>( 24)<br>P= .000  |
| UN   | .6883<br>( 24)<br>P= .000  | -.1452<br>( 24)<br>P= .249 | .4359<br>( 24)<br>P= .017  | -.9450<br>( 24)<br>P= .000 | 1.0000<br>( 24)<br>P= .    | -.7964<br>( 24)<br>P= .000 |
| IND  | -.6819<br>( 24)<br>P= .000 | .2495<br>( 24)<br>P= .120  | -.6498<br>( 24)<br>P= .000 | .7168<br>( 24)<br>P= .000  | -.7964<br>( 24)<br>P= .000 | 1.0000<br>( 24)<br>P= .    |

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NRSEP12L REGRESSION  
NAVAL POSTGRADUATE SCHOOL

IBM 3033AP

VM/SP CHS

----- PEARSON CORRELATION COEFFICIENTS -----

|      | NSPD                       | SPD                        | ACC                        | HW                         | UN                         | IND                        |
|------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| NSPD | 1.0000<br>( 24)<br>P= .    | .1487<br>( 24)<br>P= .244  | .7087<br>( 24)<br>P= .000  | -.8251<br>( 24)<br>P= .000 | .8365<br>( 24)<br>P= .000  | -.7919<br>( 24)<br>P= .000 |
| SPD  | .1487<br>( 24)<br>P= .244  | 1.0000<br>( 24)<br>P= .    | .2458<br>( 24)<br>P= .123  | -.2251<br>( 24)<br>P= .145 | .2142<br>( 24)<br>P= .157  | -.1894<br>( 24)<br>P= .188 |
| ACC  | .7087<br>( 24)<br>P= .000  | .2458<br>( 24)<br>P= .123  | 1.0000<br>( 24)<br>P= .    | -.4882<br>( 24)<br>P= .008 | .4617<br>( 24)<br>P= .012  | -.5375<br>( 24)<br>P= .003 |
| HW   | -.8251<br>( 24)<br>P= .000 | -.2251<br>( 24)<br>P= .145 | -.4882<br>( 24)<br>P= .008 | 1.0000<br>( 24)<br>P= .    | -.9709<br>( 24)<br>P= .000 | .8454<br>( 24)<br>P= .000  |
| UN   | .8365<br>( 24)<br>P= .000  | .2142<br>( 24)<br>P= .157  | .4617<br>( 24)<br>P= .012  | -.9709<br>( 24)<br>P= .000 | 1.0000<br>( 24)<br>P= .    | -.9048<br>( 24)<br>P= .000 |
| IND  | -.7919<br>( 24)<br>P= .000 | -.1894<br>( 24)<br>P= .188 | -.5375<br>( 24)<br>P= .003 | .8454<br>( 24)<br>P= .000  | -.9048<br>( 24)<br>P= .000 | 1.0000<br>( 24)<br>P= .    |

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(COEFFICIENT / (CASES) / 1-TAILED SIG)

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# APPENDIX E

## REGRESSION RESULTS

### TITLE NRLRET6L REGRESSION

|                   |          |                      |    |                |             |
|-------------------|----------|----------------------|----|----------------|-------------|
| MULTIPLE R        | .97867   | ANALYSIS OF VARIANCE | DF | SUM OF SQUARES | MEAN SQUARE |
| R SQUARE          | .95779   | REGRESSION           | 6  | 182116.42202   | 30352.73700 |
| ADJUSTED R SQUARE | .94289   | RESIDUAL             | 17 | 8026.07798     | 472.12223   |
| STANDARD ERROR    | 21.72837 |                      |    |                |             |

F = 64.29000 SIGNIF F = .0000

| ----- VARIABLES IN THE EQUATION ----- |             |            |          |              |
|---------------------------------------|-------------|------------|----------|--------------|
| VARIABLE                              | B           | SE B       | BETA     | T SIG T      |
| UN                                    | 60.517820   | 17.553736  | .236886  | 3.448 .0031  |
| Q3                                    | -17.000141  | 13.844359  | -.082703 | -1.228 .2362 |
| Q1                                    | 1.030608    | 13.302150  | .005014  | .077 .9391   |
| MAND                                  | 1.775684    | .669712    | .173788  | 2.651 .0168  |
| VOL                                   | 1.616066    | .195241    | .694439  | 8.277 .0000  |
| Q2                                    | 32.721589   | 19.489060  | .159185  | 1.679 .1114  |
| (CONSTANT)                            | -411.517625 | 130.145664 |          | -3.162 .0057 |

# TITLE NRLRET7L REGRESSION

|                   |          |                      |  |          |                  |             |
|-------------------|----------|----------------------|--|----------|------------------|-------------|
| MULTIPLE R        | .93931   | ANALYSIS OF VARIANCE |  | DF       | SUM OF SQUARES   | MEAN SQUARE |
| R SQUARE          | .88230   | REGRESSION           |  | 6        | 167763.19996     | 27960.53333 |
| ADJUSTED R SQUARE | .84076   | RESIDUAL             |  | 17       | 22379.30004      | 1316.42941  |
| STANDARD ERROR    | 36.28263 | F =                  |  | 21.23968 | SIGNIF F = .0000 |             |

| ----- VARIABLES IN THE EQUATION ----- |             |            |          |        |       |
|---------------------------------------|-------------|------------|----------|--------|-------|
| VARIABLE                              | B           | SE B       | BETA     | T      | SIG T |
| Q3                                    | -12.324478  | 23.761334  | -.059956 | -.519  | .6107 |
| UN                                    | 48.529037   | 25.721882  | .189958  | 1.887  | .0764 |
| Q1                                    | 8.561401    | 21.303305  | .041650  | .402   | .6928 |
| MAND                                  | -.180941    | 1.947915   | -.008697 | -.093  | .9271 |
| VOL                                   | 1.831093    | .428277    | .555028  | 4.275  | .0005 |
| Q2                                    | 80.738125   | 28.578922  | .392776  | 2.825  | .0117 |
| (CONSTANT)                            | -293.111430 | 191.194349 |          | -1.533 | .1437 |

# TITLE NRLRET8L REGRESSION

|                   |          |                      |    |                |             |
|-------------------|----------|----------------------|----|----------------|-------------|
| MULTIPLE R        | .93141   | ANALYSIS OF VARIANCE | DF | SUM OF SQUARES | MEAN SQUARE |
| R SQUARE          | .86753   | REGRESSION           | 6  | 164954.45877   | 27492.40979 |
| ADJUSTED R SQUARE | .82078   | RESIDUAL             | 17 | 25188.04123    | 1481.64948  |
| STANDARD ERROR    | 38.49220 |                      |    |                |             |

F = 18.55527 SIGNIF F = .0000

| VARIABLE   | B           | SE B       | BETA     | T      | SIG T |
|------------|-------------|------------|----------|--------|-------|
| Q3         | -5.822478   | 26.322535  | -.028325 | -.221  | .8276 |
| UN         | 39.889748   | 21.182462  | .192677  | 1.883  | .0769 |
| VOL        | 2.296519    | .546789    | .525619  | 4.200  | .0006 |
| M&ND       | -.256428    | 2.807468   | -.009624 | -.091  | .9283 |
| Q1         | 9.427419    | 22.737457  | .045863  | .415   | .6836 |
| Q2         | 94.994454   | 31.187513  | .462131  | 3.046  | .0073 |
| (CONSTANT) | -236.368506 | 161.246219 |          | -1.466 | .1609 |

# TITLE NRLRET9L REGRESSION

|                   |          |                      |    |                |             |
|-------------------|----------|----------------------|----|----------------|-------------|
| MULTIPLE R        | .93404   | ANALYSIS OF VARIANCE | DF | SUM OF SQUARES | MEAN SQUARE |
| R SQUARE          | .87244   | REGRESSION           | 6  | 165887.68047   | 27647.94674 |
| ADJUSTED R SQUARE | .82742   | RESIDUAL             | 17 | 24254.81953    | 1426.75409  |
| STANDARD ERROR    | 37.77240 |                      |    |                |             |

F = 19.37821 SIGNIF F = .0000

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

| VARIABLE   | B           | SE B       | BETA     | T      | SIG T |
|------------|-------------|------------|----------|--------|-------|
| UN         | 33.779338   | 14.148450  | .242816  | 2.387  | .0288 |
| Q1         | 20.934663   | 23.163548  | .101843  | .904   | .3787 |
| Q3         | 10.067871   | 23.210019  | .048978  | .434   | .6699 |
| MAND       | -1.524896   | 1.854107   | -.081264 | -.822  | .4222 |
| VOL        | 2.721504    | .721620    | .453336  | 3.771  | .0015 |
| Q2         | 111.751619  | 26.382899  | .543651  | 4.236  | .0006 |
| (CONSTANT) | -196.373598 | 101.543237 |          | -1.934 | .0700 |

# TITLE NRRET101 REGRESSION

|                   |          |                      |          |            |                |             |
|-------------------|----------|----------------------|----------|------------|----------------|-------------|
| MULTIPLE R        | .93361   | ANALYSIS OF VARIANCE |          | DF         | SUM OF SQUARES | MEAN SQUARE |
| R SQUARE          | .87163   |                      |          | 6          | 165734.64367   | 27622.44061 |
| ADJUSTED R SQUARE | .82633   | REGRESSION           |          | 17         | 24407.85633    | 1435.75625  |
| STANDARD ERROR    | 37.89137 | RESIDUAL             |          |            |                |             |
|                   |          | F =                  | 19.23895 | SIGNIF F = |                | .0000       |

| ----- VARIABLES IN THE EQUATION ----- |             |            |          |        |       |
|---------------------------------------|-------------|------------|----------|--------|-------|
| VARIABLE                              | B           | SE B       | BETA     | T      | SIG T |
| Q3                                    | 6.190464    | 23.397427  | .030115  | .265   | .7945 |
| UN                                    | 41.958038   | 18.122403  | .301607  | 2.315  | .0334 |
| Q1                                    | 11.000217   | 22.551434  | .053514  | .488   | .6319 |
| VOL                                   | 3.215136    | .898168    | .427901  | 3.580  | .0023 |
| MAND                                  | -1.944079   | 2.078676   | -.123147 | -.935  | .3628 |
| Q2                                    | 112.218029  | 27.490563  | .545920  | 4.082  | .0008 |
| (CONSTANT)                            | -252.222875 | 127.990009 |          | -1.971 | .0653 |

# TITLE NRRETIIL REGRESSION

|                   |          |                      |    |                |             |
|-------------------|----------|----------------------|----|----------------|-------------|
| MULTIPLE R        | .94714   | ANALYSIS OF VARIANCE | DF | SUM OF SQUARES | MEAN SQUARE |
| R SQUARE          | .89708   | REGRESSION           | 6  | 170572.69500   | 28428.78250 |
| ADJUSTED R SQUARE | .86075   | RESIDUAL             | 17 | 19569.80500    | 1151.16500  |
| STANDARD ERROR    | 33.92882 |                      |    |                |             |

F = 24.69566 SIGNIF F = .0000

## VARIABLES IN THE EQUATION

|           | B         | SE B       | BETA  | T     | SIG T |
|-----------|-----------|------------|-------|-------|-------|
| 23.813215 | 20.117958 | .115847    | 1.184 | .2528 |       |
| 4.433473  | .994506   | .440988    | 4.428 | .0004 |       |
| 2.4331    | 1.237375  | .398091    | 3.075 | .0069 |       |
| 2.1383    | 19.870281 | -4.163E-04 | -.004 | .9966 |       |
| 2.23345   | 23.970878 | .477898    | 4.098 | .0007 |       |
| 2.23345   | 15.823439 | -.053550   | -.416 | .6827 |       |
| 2.23345   | 13.849093 |            | .761  | .4571 |       |

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AD-A188 842 THE EFFECTS OF ECONOMIC CONDITIONS ON OVERALL AIR FORCE OFFICER ATTRITION(U) NAVAL POSTGRADUATE SCHOOL MONTEREY CA G R GRIMES DEC 87 2/2

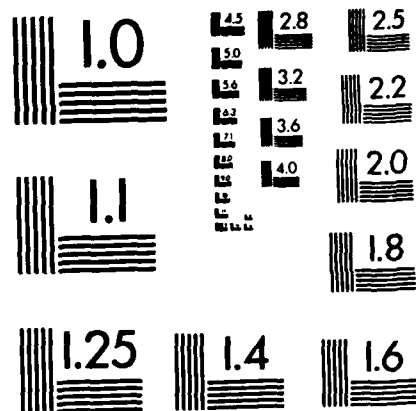
AD-A188 842 THE EFFECTS OF ECONOMIC CONDITIONS ON OVERALL AIR FORCE OFFICER ATTRITION(U) NAVAL POSTGRADUATE SCHOOL MONTEREY CA G R GRIMES DEC 87 2/2

UNCLASSIFIED CH G R GRIMES DEC 07 F/G 5/9 NL

UNCLASSIFIED CH G R GRIMES DEC 07 F/G 5/9 NL

UNCLASSIFIED CH G R GRIMES DEC 07 F/G 5/9 NL

[illegible]



# TITLE NRRET12L REGRESSION

|                   |          |                      |    |                |             |
|-------------------|----------|----------------------|----|----------------|-------------|
| MULTIPLE R        | .91494   | ANALYSIS OF VARIANCE | DF | SUM OF SQUARES | MEAN SQUARE |
| R SQUARE          | .83712   | REGRESSION           | 6  | 159171.90782   | 26528.65130 |
| ADJUSTED R SQUARE | .77963   | RESIDUAL             | 17 | 30970.59218    | 1821.79954  |
| STANDARD ERROR    | 42.68254 |                      |    |                |             |

F = 14.56178 SIGNIF F = .0000

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

| VARIABLE   | B          | SE B       | BETA     | T     | SIG T |
|------------|------------|------------|----------|-------|-------|
| UN         | 6.705556   | 16.215690  | .070099  | .414  | .6844 |
| Q3         | 19.021186  | 25.961217  | .092535  | .733  | .4737 |
| Q1         | -3.744207  | 25.053906  | -.018215 | -.149 | .8830 |
| VOL        | 5.428588   | 2.082144   | .312104  | 2.607 | .0184 |
| Q2         | 113.948474 | 31.404935  | .554339  | 3.628 | .0021 |
| HAND       | 2.082003   | 1.504901   | .257032  | 1.383 | .1844 |
| (CONSTANT) | 1.841626   | 117.601889 |          | .016  | .9877 |

# TITLE NRLSEP6L REGRESSION

|                   |         |                      |    |                |             |
|-------------------|---------|----------------------|----|----------------|-------------|
| MULTIPLE R        | .96713  | ANALYSIS OF VARIANCE | DF | SUM OF SQUARES | MEAN SQUARE |
| R SQUARE          | .93535  | REGRESSION           | 6  | 9350.95977     | 1558.49330  |
| ADJUSTED R SQUARE | .91253  | RESIDUAL             | 17 | 646.37356      | 38.02197    |
| STANDARD ERROR    | 6.16620 |                      |    |                |             |

F = 40.98928 SIGNIF F = .0000

| ----- VARIABLES IN THE EQUATION ----- |           |           |          |             |
|---------------------------------------|-----------|-----------|----------|-------------|
| VARIABLE                              | B         | SE B      | BETA     | T SIG T     |
| UN                                    | -4.036233 | 4.687341  | -.068902 | -.861 .4012 |
| Q3                                    | 7.138798  | 3.971658  | .151457  | 1.797 .0901 |
| Q1                                    | 8.766716  | 3.643391  | .185995  | 2.406 .0278 |
| SPD                                   | .841421   | .152481   | .389291  | 5.518 .0000 |
| Q2                                    | 30.922021 | 3.838487  | .656043  | 8.056 .0000 |
| NSPD                                  | .256383   | .030655   | .720346  | 8.364 .0000 |
| (CONSTANT)                            | 46.019693 | 33.750203 |          | 1.364 .1905 |

# TITLE NRLSEP7L REGRESSION

|                   |         |                      |          |                |             |
|-------------------|---------|----------------------|----------|----------------|-------------|
| MULTIPLE R        | .94007  | ANALYSIS OF VARIANCE | DF       | SUM OF SQUARES | MEAN SQUARE |
| R SQUARE          | .88373  | REGRESSION           | 6        | 8834.97251     | 1472.49542  |
| ADJUSTED R SQUARE | .84270  | RESIDUAL             | 17       | 1162.36083     | 68.37417    |
| STANDARD ERROR    | 8.26887 |                      |          |                |             |
|                   |         | F =                  | 21.53584 | SIGNIF F =     | .0000       |

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

| VARIABLE   | B         | SE B      | BETA     | T     | SIG T |
|------------|-----------|-----------|----------|-------|-------|
| Q3         | 7.814134  | 5.344547  | .165785  | 1.462 | .1620 |
| SPD        | .684863   | .254423   | .248085  | 2.692 | .0154 |
| UN         | -5.459290 | 6.256666  | -.093194 | -.873 | .3951 |
| Q1         | 7.163311  | 4.858149  | .151977  | 1.474 | .1586 |
| Q2         | 31.726317 | 5.128106  | .673107  | 6.187 | .0000 |
| NSPD       | .225759   | .035634   | .788634  | 6.336 | .0000 |
| (CONSTANT) | 66.789087 | 44.782125 |          | 1.491 | .1542 |

# TITLE NRLSEP8L REGRESSION

|                   |         |                      |    |                |             |
|-------------------|---------|----------------------|----|----------------|-------------|
| MULTIPLE R        | .93992  | ANALYSIS OF VARIANCE | DF | SUM OF SQUARES | MEAN SQUARE |
| R SQUARE          | .88344  |                      | 6  | 8832.06638     | 1472.01106  |
| ADJUSTED R SQUARE | .84230  | REGRESSION           |    |                |             |
| STANDARD ERROR    | 8.27920 | RESIDUAL             | 17 | 1165.26695     | 68.54511    |

F = 21.47507 SIGNIF F = .0000

| ----- VARIABLES IN THE EQUATION ----- |           |           |          |        |       |
|---------------------------------------|-----------|-----------|----------|--------|-------|
| VARIABLE                              | B         | SE B      | BETA     | T      | SIG T |
| Q3                                    | 6.278723  | 5.581630  | .133210  | 1.125  | .2763 |
| UN                                    | -7.810049 | 5.057738  | -.164520 | -1.544 | .1410 |
| SPD                                   | .602399   | .319603   | .166597  | 1.885  | .0767 |
| Q1                                    | 4.599941  | 4.878188  | .097592  | .943   | .3589 |
| Q2                                    | 33.058326 | 5.095472  | .701367  | 6.488  | .0000 |
| NSPD                                  | .209094   | .032548   | .779505  | 6.424  | .0000 |
| (CONSTANT)                            | 87.920331 | 36.478939 |          | 2.410  | .0276 |

# TITLE NRLSEP9L REGRESSION

|                   |         |                      |          |                |             |
|-------------------|---------|----------------------|----------|----------------|-------------|
| MULTIPLE R        | .94711  | ANALYSIS OF VARIANCE | DF       | SUM OF SQUARES | MEAN SQUARE |
| R SQUARE          | .89701  | REGRESSION           | 6        | 8967.70724     | 1494.61787  |
| ADJUSTED R SQUARE | .86066  | RESIDUAL             | 17       | 1029.62609     | 60.56624    |
| STANDARD ERROR    | 7.78243 |                      |          |                |             |
|                   |         | F =                  | 24.67741 | SIGNIF F =     | .0000       |

| VARIABLE   | B          | SE B      | BETA     | T      | SIG T |
|------------|------------|-----------|----------|--------|-------|
| UN         | -12.812224 | 4.271528  | -.401651 | -2.999 | .0081 |
| Q1         | 2.766617   | 4.652575  | .058697  | .595   | .5599 |
| Q3         | 5.115747   | 5.840285  | .108536  | .876   | .3933 |
| SPD        | .693479    | .497789   | .133381  | 1.393  | .1815 |
| Q2         | 34.609537  | 4.774637  | .734277  | 7.249  | .0000 |
| NSPD       | .235578    | .035597   | .959389  | 6.618  | .0000 |
| (CONSTANT) | 121.767027 | 30.365574 |          | 4.010  | .0009 |

# TITLE NRSEPIOL REGRESSION

|                   |          |                      |    |                |             |
|-------------------|----------|----------------------|----|----------------|-------------|
| MULTIPLE R        | .90448   | ANALYSIS OF VARIANCE | DF | SUM OF SQUARES | MEAN SQUARE |
| R SQUARE          | .81808   | REGRESSION           | 6  | 8178.57011     | 1363.09502  |
| ADJUSTED R SQUARE | .75387   | RESIDUAL             | 17 | 1818.76322     | 106.98607   |
| STANDARD ERROR    | 10.34341 |                      |    |                |             |

F = 12.74086 SIGNIF F = .0000

| ----- VARIABLES IN THE EQUATION ----- |           |           |          |       |       |
|---------------------------------------|-----------|-----------|----------|-------|-------|
| VARIABLE                              | B         | SE B      | BETA     | T     | SIG T |
| Q3                                    | 16.198569 | 6.885357  | .343669  | 2.353 | .0309 |
| UN                                    | -1.065417 | 4.274370  | -.033400 | -.249 | .8061 |
| Q1                                    | .734370   | 6.068650  | .015580  | .121  | .9051 |
| SPD                                   | 1.725949  | .681213   | .310212  | 2.534 | .0214 |
| Q2                                    | 41.165076 | 6.649331  | .873360  | 6.191 | .0000 |
| NSPD                                  | .143834   | .036034   | .595794  | 3.992 | .0009 |
| (CONSTANT)                            | 32.741595 | 29.916810 |          | 1.094 | .2890 |

# TITLE NRSEPL1L REGRESSION

|                   |         |                      |    |                |             |
|-------------------|---------|----------------------|----|----------------|-------------|
| MULTIPLE R        | .94059  | ANALYSIS OF VARIANCE | DF | SUM OF SQUARES | MEAN SQUARE |
| R SQUARE          | .88471  | REGRESSION           | 6  | 8844.73028     | 1474.12171  |
| ADJUSTED R SQUARE | .84402  | RESIDUAL             | 17 | 1152.60305     | 67.80018    |
| STANDARD ERROR    | 8.23409 |                      |    |                |             |

F = 21.74215 SIGNIF F = .0000

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

| VARIABLE   | B          | SE B      | BETA     | T      | SIG T |
|------------|------------|-----------|----------|--------|-------|
| Q3         | 10.694937  | 5.604019  | .226904  | 1.908  | .0734 |
| UN         | -14.005973 | 4.213887  | -.497097 | -3.324 | .0040 |
| Q1         | 5.022765   | 4.892952  | .106563  | 1.027  | .3190 |
| SPD        | .421594    | .711379   | .056018  | .593   | .5612 |
| Q2         | 32.882510  | 5.115220  | .697636  | 6.428  | .0000 |
| NSPD       | .174384    | .028291   | .938835  | 6.164  | .0000 |
| (CONSTANT) | 136.840413 | 30.228517 |          | 4.527  | .0003 |

# TITLE NRSEP12L REGRESSION

|                   |          |                      |    |                |             |
|-------------------|----------|----------------------|----|----------------|-------------|
| MULTIPLE R        | .90391   | ANALYSIS OF VARIANCE | DF | SUM OF SQUARES | MEAN SQUARE |
| R SQUARE          | .81704   | REGRESSION           | 6  | 8168.26685     | 1361.37781  |
| ADJUSTED R SQUARE | .75247   | RESIDUAL             | 17 | 1829.06648     | 107.59215   |
| STANDARD ERROR    | 10.37266 |                      |    |                |             |

F = 12.65313 SIGNIF F = .0000

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

| VARIABLE   | B          | SE B      | BETA     | T      | SIG T |
|------------|------------|-----------|----------|--------|-------|
| UN         | -10.823471 | 4.605429  | -.493450 | -2.350 | .0311 |
| Q3         | 13.108623  | 6.596998  | .278113  | 1.987  | .0633 |
| Q1         | 4.531617   | 6.472133  | .096143  | .700   | .4933 |
| SPD        | .650295    | .868406   | .093310  | .749   | .4642 |
| Q2         | 27.860831  | 6.714754  | .591096  | 4.149  | .0007 |
| NSPD       | .155022    | .037496   | .912358  | 4.134  | .0007 |
| (CONSTANT) | 114.919192 | 31.260152 |          | 3.676  | .0019 |

# APPENDIX F

## MODEL PROJECTIONS OF TEST PERIOD DATA

### Six Month Projections

Ret6lin

| Constant | Coeff  | Un  | Coeff | Vol | Coeff | Mand | Qtr    |
|----------|--------|-----|-------|-----|-------|------|--------|
| -411.518 | 60.518 | 7   | 1.616 | 58  | 1.775 | 10   | 32.722 |
| -411.518 | 60.518 | 6.9 | 1.616 | 110 | 1.775 | 14   | -17    |
| -411.518 | 60.518 | 6.8 | 1.616 | 106 | 1.775 | 14   | -17    |
| -411.518 | 60.518 | 7.2 | 1.616 | 108 | 1.775 | 18   | -17    |
| -411.518 | 60.518 | 7.2 | 1.616 | 149 | 1.775 | 20   |        |
| -411.518 | 60.518 | 7.1 | 1.616 | 81  | 1.775 | 14   |        |
| -411.518 | 60.518 | 7.2 | 1.616 | 30  | 1.775 | 8    |        |
| -411.518 | 60.518 | 7.1 | 1.616 | 55  | 1.775 | 8    | 1.03   |
| -411.518 | 60.518 | 7   | 1.616 | 57  | 1.775 | 7    | 1.03   |
| -411.518 | 60.518 | 6.8 | 1.616 | 48  | 1.775 | 10   | 1.03   |
| -411.518 | 60.518 | 7   | 1.616 | 62  | 1.775 | 22   | 32.722 |
| -411.518 | 60.518 | 6.9 | 1.616 | 39  | 1.775 | 12   | 32.722 |

| Month   | Pred<br>Losses | Rounded | Acc<br>Losses | Error | Percent<br>Error | Absolute<br>Value | Avg %<br>Error |
|---------|----------------|---------|---------------|-------|------------------|-------------------|----------------|
| June 86 | 156.31         | 156     | 159           | -3    | -1.92            | 1.92              | 15.3           |
| Jul     | 191.67         | 192     | 262           | -70   | -36.46           | 36.46             |                |
| Aug     | 179.15         | 179     | 246           | -67   | -37.43           | 37.43             |                |
| Sep     | 213.69         | 214     | 233           | -19   | -8.88            | 8.88              |                |
| Oct     | 300.50         | 300     | 283           | 17    | 5.67             | 5.67              |                |
| Nov     | 173.91         | 174     | 178           | -4    | -2.30            | 2.30              |                |
| Dec     | 86.89          | 87      | 87            | 0     | 0.00             | 0.00              |                |
| Jan 87  | 122.27         | 122     | 126           | -4    | -3.28            | 3.28              |                |
| Feb     | 117.68         | 118     | 156           | -38   | -32.20           | 32.20             |                |
| Mar     | 96.35          | 96      | 134           | -38   | -39.58           | 39.58             |                |
| Apr     | 184.07         | 184     | 173           | 11    | 5.98             | 5.98              |                |
| May     | 123.10         | 123     | 111           | 12    | 9.76             | 9.76              |                |

# Seven Month Projections

Ret7lin

| Constant | Coeff | Un  | Coeff | Vol | Coeff | Mand | Qtr    |
|----------|-------|-----|-------|-----|-------|------|--------|
| -293.11  | 48.53 | 7.1 | 1.83  | 43  | -0.18 | 4    | 80.74  |
| -293.11  | 48.53 | 7   | 1.83  | 68  | -0.18 | 12   | -12.32 |
| -293.11  | 48.53 | 6.9 | 1.83  | 84  | -0.18 | 10   | -12.32 |
| -293.11  | 48.53 | 6.8 | 1.83  | 92  | -0.18 | 12   | -12.32 |
| -293.11  | 48.53 | 7.2 | 1.83  | 111 | -0.18 | 89   |        |
| -293.11  | 48.53 | 7.2 | 1.83  | 73  | -0.18 | 13   |        |
| -293.11  | 48.53 | 7.1 | 1.83  | 24  | -0.18 | 6    |        |
| -293.11  | 48.53 | 7.2 | 1.83  | 51  | -0.18 | 7    | 8.56   |
| -293.11  | 48.53 | 7.1 | 1.83  | 47  | -0.18 | 7    | 8.56   |
| -293.11  | 48.53 | 7   | 1.83  | 39  | -0.18 | 5    | 8.56   |
| -293.11  | 48.53 | 6.8 | 1.83  | 53  | -0.18 | 11   | 80.74  |
| -293.11  | 48.53 | 7   | 1.83  | 30  | -0.18 | 8    | 80.74  |

| Month  | Pred<br>Losses | Acc<br>Losses | Error   | Rounded | Percent<br>Error | Absolute<br>Value | Avg %<br>Error |
|--------|----------------|---------------|---------|---------|------------------|-------------------|----------------|
| Jun 86 | 210.16         | 159           | 51.16   | 51      | 32.08            | 32.08             | 22.4           |
| Jul    | 156.56         | 262           | -105.44 | -105    | -40.08           | 40.08             |                |
| Aug    | 181.35         | 246           | -64.65  | -65     | -26.42           | 26.42             |                |
| Sep    | 190.77         | 233           | -42.23  | -42     | -18.03           | 18.03             |                |
| Oct    | 243.42         | 283           | -39.58  | -40     | -14.13           | 14.13             |                |
| Nov    | 187.56         | 178           | 9.56    | 10      | 5.62             | 5.62              |                |
| Dec    | 94.29          | 87            | 7.29    | 7       | 8.05             | 8.05              |                |
| Jan 87 | 156.94         | 126           | 30.94   | 31      | 24.60            | 24.60             |                |
| Feb    | 144.76         | 156           | -11.24  | -11     | -7.05            | 7.05              |                |
| Mar    | 125.63         | 134           | -8.37   | -8      | -5.97            | 5.97              |                |
| Apr    | 212.64         | 173           | 39.64   | 40      | 23.12            | 23.12             |                |
| May    | 180.80         | 111           | 69.80   | 70      | 63.06            | 63.06             |                |

# Eight Month Projections

Ret8lin

| Constant | Coeff | Un  | Coeff | Vol | Coeff | Mand | Qtr   |
|----------|-------|-----|-------|-----|-------|------|-------|
| -236.39  | 39.89 | 7.1 | 2.3   | 39  | -0.26 | 5    | 95    |
| -236.39  | 39.89 | 7.1 | 2.3   | 57  | -0.26 | 8    | -5.82 |
| -236.39  | 39.89 | 7   | 2.3   | 67  | -0.26 | 10   | -5.82 |
| -236.39  | 39.89 | 6.9 | 2.3   | 70  | -0.26 | 8    | -5.82 |
| -236.39  | 39.89 | 6.8 | 2.3   | 85  | -0.26 | 8    |       |
| -236.39  | 39.89 | 7.2 | 2.3   | 57  | -0.26 | 10   |       |
| -236.39  | 39.89 | 7.2 | 2.3   | 23  | -0.26 | 6    |       |
| -236.39  | 39.89 | 7.1 | 2.3   | 45  | -0.26 | 7    | 9.43  |
| -236.39  | 39.89 | 7.2 | 2.3   | 42  | -0.26 | 7    | 9.43  |
| -236.39  | 39.89 | 7.1 | 2.3   | 35  | -0.26 | 5    | 9.43  |
| -236.39  | 39.89 | 7   | 2.3   | 47  | -0.26 | 9    | 95    |
| -236.39  | 39.89 | 6.8 | 2.3   | 23  | -0.26 | 6    | 95    |

| Month  | Pred<br>Losses | Acc<br>Losses | Error  | Rounded | Percent<br>Error | Absolute<br>Value | Avg %<br>Error |
|--------|----------------|---------------|--------|---------|------------------|-------------------|----------------|
| Jun 86 | 230.23         | 159           | 71.23  | 71      | 44.65            | 44.65             | 24.1           |
| Jul    | 170.03         | 262           | -91.97 | -92     | -35.11           | 35.11             |                |
| Aug    | 188.52         | 246           | -57.48 | -57     | -23.17           | 23.17             |                |
| Sep    | 191.95         | 233           | -41.05 | -41     | -17.60           | 17.60             |                |
| Oct    | 228.28         | 283           | -54.72 | -55     | -19.43           | 19.43             |                |
| Nov    | 179.32         | 178           | 1.32   | 1       | 0.56             | 0.56              |                |
| Dec    | 102.16         | 87            | 15.16  | 15      | 17.24            | 17.24             |                |
| Jan 87 | 157.94         | 126           | 31.94  | 32      | 25.40            | 25.40             |                |
| Feb    | 155.03         | 156           | -0.97  | -1      | -0.64            | 0.64              |                |
| Mar    | 135.46         | 134           | 1.46   | 1       | 0.75             | 0.75              |                |
| Apr    | 243.60         | 173           | 70.60  | 71      | 41.04            | 41.04             |                |
| May    | 181.20         | 111           | 70.20  | 70      | 63.06            | 63.06             |                |

# Nine Month Projections

Ret9lin

| Constant | Coeff | Un  | Coeff | Vol | Coeff  | Mand | Qtr    |
|----------|-------|-----|-------|-----|--------|------|--------|
| -196.374 | 33.78 | 7.1 | 2.722 | 32  | -1.525 | 5    | 111.75 |
| -196.374 | 33.78 | 7.1 | 2.722 | 48  | -1.525 | 7    | 10.07  |
| -196.374 | 33.78 | 7.1 | 2.722 | 55  | -1.525 | 10   | 10.07  |
| -196.374 | 33.78 | 7   | 2.722 | 59  | -1.525 | 6    | 10.07  |
| -196.374 | 33.78 | 6.9 | 2.722 | 74  | -1.525 | 7    |        |
| -196.374 | 33.78 | 6.8 | 2.722 | 46  | -1.525 | 9    |        |
| -196.374 | 33.78 | 7.2 | 2.722 | 19  | -1.525 | 11   |        |
| -196.374 | 33.78 | 7.2 | 2.722 | 39  | -1.525 | 7    | 20.93  |
| -196.374 | 33.78 | 7.1 | 2.722 | 39  | -1.525 | 7    | 20.93  |
| -196.374 | 33.78 | 7.2 | 2.722 | 28  | -1.525 | 2    | 20.93  |
| -196.374 | 33.78 | 7.1 | 2.722 | 44  | -1.525 | 6    | 111.75 |
| -196.374 | 33.78 | 7   | 2.722 | 19  | -1.525 | 5    | 111.75 |

| Month  | Pred<br>Losses | Rounded | Acc<br>Losses | Error | Percent<br>Error | Absolute<br>Value | Avg %<br>Error |
|--------|----------------|---------|---------------|-------|------------------|-------------------|----------------|
| Jun 86 | 249.94         | 250     | 159           | 91    | 36.40            | 36.40             | 22.7           |
| Jul    | 194.87         | 195     | 262           | -67   | -34.36           | 34.36             |                |
| Aug    | 218.49         | 218     | 246           | -28   | -12.84           | 12.84             |                |
| Sep    | 219.90         | 220     | 233           | -13   | -5.91            | 5.91              |                |
| Oct    | 248.81         | 249     | 283           | -34   | -13.65           | 13.65             |                |
| Nov    | 172.27         | 172     | 178           | -6    | -3.49            | 3.49              |                |
| Dec    | 115.34         | 115     | 87            | 28    | 24.35            | 24.35             |                |
| Jan 87 | 184.61         | 185     | 126           | 59    | 31.89            | 31.89             |                |
| Feb    | 181.23         | 181     | 156           | 25    | 13.81            | 13.81             |                |
| Mar    | 147.04         | 147     | 134           | 13    | 8.84             | 8.84              |                |
| Apr    | 284.13         | 284     | 173           | 111   | 39.08            | 39.08             |                |
| May    | 211.18         | 211     | 111           | 100   | 47.39            | 47.39             |                |

# Ten Month Projections

Ret10lin

| Constant | Coeff | Un  | Coeff | Vol | Coef  | Mand | Qtr    |
|----------|-------|-----|-------|-----|-------|------|--------|
| -252.22  | 41.96 | 7.3 | 3.22  | 28  | -1.94 | 5    | 112.22 |
| -252.22  | 41.96 | 7.1 | 3.22  | 35  | -1.94 | 7    | 6.19   |
| -252.22  | 41.96 | 7.1 | 3.22  | 44  | -1.94 | 5    | 6.19   |
| -252.22  | 41.96 | 7.1 | 3.22  | 41  | -1.94 | 4    | 6.19   |
| -252.22  | 41.96 | 7   | 3.22  | 60  | -1.94 | 3    |        |
| -252.22  | 41.96 | 6.9 | 3.22  | 37  | -1.94 | 4    |        |
| -252.22  | 41.96 | 6.8 | 3.22  | 16  | -1.94 | 4    |        |
| -252.22  | 41.96 | 7.2 | 3.22  | 34  | -1.94 | 1    | 11     |
| -252.22  | 41.96 | 7.2 | 3.22  | 34  | -1.94 | 4    | 11     |
| -252.22  | 41.96 | 7.1 | 3.22  | 26  | -1.94 | 2    | 11     |
| -252.22  | 41.96 | 7.2 | 3.22  | 40  | -1.94 | 5    | 112.22 |
| -252.22  | 41.96 | 7.1 | 3.22  | 17  | -1.94 | 3    | 112.22 |

| Month  | Pred<br>Losses | Acc<br>Losses | Error   | Rounded | Percent<br>Error | Absolute<br>Value | Avg %<br>Error |
|--------|----------------|---------------|---------|---------|------------------|-------------------|----------------|
| Jun 86 | 246.77         | 159           | 87.77   | 88      | 55.35            | 55.35             | 31.9           |
| Jul    | 151.01         | 262           | -110.99 | -111    | -42.37           | 42.37             |                |
| Aug    | 183.87         | 246           | -62.13  | -62     | -25.20           | 25.20             |                |
| Sep    | 176.15         | 233           | -56.85  | -57     | -24.46           | 24.46             |                |
| Oct    | 228.88         | 283           | -54.12  | -54     | -19.08           | 19.08             |                |
| Nov    | 148.68         | 178           | -29.32  | -29     | -16.29           | 16.29             |                |
| Dec    | 76.87          | 87            | -10.13  | -10     | -11.49           | 11.49             |                |
| Jan 87 | 168.43         | 126           | 42.43   | 42      | 33.33            | 33.33             |                |
| Feb    | 162.61         | 156           | 6.61    | 7       | 4.49             | 4.49              |                |
| Mar    | 136.54         | 134           | 2.54    | 3       | 2.24             | 2.24              |                |
| Apr    | 281.21         | 173           | 108.21  | 108     | 62.43            | 62.43             |                |
| May    | 206.84         | 111           | 95.84   | 96      | 86.49            | 86.49             |                |

# Eleven Month Projections

Ret1111in

| Constant | Coeff | Un  | Coeff | Vol | Coeff | Mand | Qtr   |
|----------|-------|-----|-------|-----|-------|------|-------|
| 86.64    | -6.58 | 7.3 | 4.4   | 26  | 3.8   | 3    | 98.26 |
| 86.64    | -6.58 | 7.3 | 4.4   | 33  | 3.8   | 2    | 23.81 |
| 86.64    | -6.58 | 7.1 | 4.4   | 39  | 3.8   | 4    | 23.81 |
| 86.64    | -6.58 | 7.1 | 4.4   | 34  | 3.8   | 1    | 23.81 |
| 86.64    | -6.58 | 7.1 | 4.4   | 46  | 3.8   | 1    |       |
| 86.64    | -6.58 | 7   | 4.4   | 23  | 3.8   | 2    |       |
| 86.64    | -6.58 | 6.9 | 4.4   | 13  | 3.8   | 3    |       |
| 86.64    | -6.58 | 6.8 | 4.4   | 29  | 3.8   | 2    | -0.09 |
| 86.64    | -6.58 | 7.2 | 4.4   | 29  | 3.8   | 4    | -0.09 |
| 86.64    | -6.58 | 7.2 | 4.4   | 21  | 3.8   | 1    | -0.09 |
| 86.64    | -6.58 | 7.1 | 4.4   | 37  | 3.8   | 3    | 98.26 |
| 86.64    | -6.58 | 7.2 | 4.4   | 15  | 3.8   | 1    | 98.26 |

| Month  | Pred<br>Losses | Acc<br>Losses | Error  | Rounded | Percent<br>Error | Absolute<br>Value | Avg %<br>Error |
|--------|----------------|---------------|--------|---------|------------------|-------------------|----------------|
| Jun 86 | 262.67         | 159           | 103.67 | 104     | 65.41            | 65.41             | 31.1           |
| Jul    | 215.22         | 262           | -46.78 | -47     | -17.94           | 17.94             |                |
| Aug    | 250.53         | 246           | 4.53   | 5       | 2.03             | 2.03              |                |
| Sep    | 217.13         | 233           | -15.87 | -16     | -6.87            | 6.87              |                |
| Oct    | 246.12         | 283           | -36.88 | -37     | -13.07           | 13.07             |                |
| Nov    | 149.38         | 178           | -28.62 | -29     | -16.29           | 16.29             |                |
| Dec    | 109.84         | 87            | 22.84  | 23      | 26.44            | 26.44             |                |
| Jan 87 | 177.01         | 126           | 51.01  | 51      | 40.48            | 40.48             |                |
| Feb    | 181.97         | 156           | 25.97  | 26      | 16.67            | 16.67             |                |
| Mar    | 135.37         | 134           | 1.37   | 1       | 0.75             | 0.75              |                |
| Apr    | 312.38         | 173           | 139.38 | 139     | 80.35            | 80.35             |                |
| May    | 207.32         | 111           | 96.32  | 96      | 86.49            | 86.49             |                |

# Twelve Month Projections

Ret12lin

| Constant | Coeff | Un  | Coeff | Vol | Coeff | Mand | Qtr    |
|----------|-------|-----|-------|-----|-------|------|--------|
| 1.842    | 6.706 | 7.3 | 5.429 | 23  | 2.082 | 1    | 113.95 |
| 1.842    | 6.706 | 7.3 | 5.429 | 26  | 2.082 | 1    | 19.02  |
| 1.842    | 6.706 | 7.3 | 5.429 | 27  | 2.082 | 3    | 19.02  |
| 1.842    | 6.706 | 7.1 | 5.429 | 19  | 2.082 | 1    | 19.02  |
| 1.842    | 6.706 | 7.1 | 5.429 | 35  | 2.082 | 1    |        |
| 1.842    | 6.706 | 7.1 | 5.429 | 13  | 2.082 | 1    |        |
| 1.842    | 6.706 | 7   | 5.429 | 5   | 2.082 | 2    |        |
| 1.842    | 6.706 | 6.9 | 5.429 | 12  | 2.082 | 1    | -3.74  |
| 1.842    | 6.706 | 6.8 | 5.429 | 22  | 2.082 | 2    | -3.74  |
| 1.842    | 6.706 | 7.2 | 5.429 | 15  | 2.082 | 2    | -3.74  |
| 1.842    | 6.706 | 7.2 | 5.429 | 32  | 2.082 | 0    | 113.95 |
| 1.842    | 6.706 | 7.1 | 5.429 | 12  | 2.082 | 1    | 113.95 |

| Month  | Pred<br>Losses | Rounded | Acc<br>Losses | Error | Percent<br>Error | Absolute<br>Value | Avg %<br>Error |
|--------|----------------|---------|---------------|-------|------------------|-------------------|----------------|
| Jun 86 | 291.69         | 292     | 159           | 133   | 45.55            | 45.55             | 25.5           |
| Jul    | 213.05         | 213     | 262           | -49   | -23.00           | 23.00             |                |
| Aug    | 222.64         | 223     | 246           | -23   | -10.31           | 10.31             |                |
| Sep    | 173.71         | 174     | 233           | -59   | -33.91           | 33.91             |                |
| Oct    | 241.55         | 242     | 283           | -41   | -16.94           | 16.94             |                |
| Nov    | 122.11         | 122     | 178           | -56   | -45.90           | 45.90             |                |
| Dec    | 80.09          | 80      | 87            | -7    | -8.75            | 8.75              |                |
| Jan 87 | 111.60         | 112     | 126           | -14   | -12.50           | 12.50             |                |
| Feb    | 167.30         | 167     | 156           | 11    | 6.59             | 6.59              |                |
| Mar    | 131.98         | 132     | 134           | -2    | -1.52            | 1.52              |                |
| Apr    | 337.80         | 338     | 173           | 165   | 48.82            | 48.82             |                |
| May    | 230.63         | 231     | 111           | 120   | 51.95            | 51.95             |                |

# Six Month Projections

Sep6lin

| Constant | Coeff | Un  | Coeff | Nspd | Coeff | Spd | Qtr   |
|----------|-------|-----|-------|------|-------|-----|-------|
| 46.2     | 4.036 | 7   | 0.256 | 89   | 0.841 | 45  | 30.92 |
| 46.2     | 4.036 | 6.9 | 0.256 | 36   | 0.841 | 36  | 7.139 |
| 46.2     | 4.036 | 6.8 | 0.256 | 70   | 0.841 | 54  | 7.139 |
| 46.2     | 4.036 | 7.2 | 0.256 | 92   | 0.841 | 28  | 7.139 |
| 46.2     | 4.036 | 7.2 | 0.256 | 198  | 0.841 | 36  |       |
| 46.2     | 4.036 | 7.1 | 0.256 | 64   | 0.841 | 19  |       |
| 46.2     | 4.036 | 7.2 | 0.256 | 52   | 0.841 | 22  |       |
| 46.2     | 4.036 | 7.1 | 0.256 | 88   | 0.841 | 34  | 8.767 |
| 46.2     | 4.036 | 7   | 0.256 | 67   | 0.841 | 27  | 8.767 |
| 46.2     | 4.036 | 6.8 | 0.256 | 43   | 0.841 | 34  | 8.767 |
| 46.2     | 4.036 | 7   | 0.256 | 69   | 0.841 | 17  | 30.92 |
| 46.2     | 4.036 | 6.9 | 0.256 | 40   | 0.841 | 29  | 30.92 |

| Month  | Pred<br>Losses | Rounded | Acc<br>Losses | Error | Percent<br>Error | Absolute<br>Value | Avg %<br>Error |
|--------|----------------|---------|---------------|-------|------------------|-------------------|----------------|
| Jun 86 | 109.50         | 109     | 102           | 7     | 6.42             | 6.42              | 27.4           |
| Jul    | 64.98          | 65      | 82            | -17   | -26.15           | 26.15             |                |
| Aug    | 89.23          | 89      | 124           | -35   | -39.33           | 39.33             |                |
| Sep    | 71.38          | 71      | 105           | -34   | -47.89           | 47.89             |                |
| Oct    | 98.10          | 98      | 138           | -40   | -40.82           | 40.82             |                |
| Nov    | 49.91          | 50      | 75            | -25   | -50.00           | 50.00             |                |
| Dec    | 48.95          | 49      | 79            | -30   | -61.22           | 61.22             |                |
| Jan 87 | 77.43          | 77      | 81            | -4    | -5.19            | 5.19              |                |
| Feb    | 66.57          | 67      | 55            | 12    | 17.91            | 17.91             |                |
| Mar    | 67.12          | 67      | 72            | -5    | -7.46            | 7.46              |                |
| Apr    | 80.83          | 81      | 71            | 10    | 12.35            | 12.35             |                |
| may    | 83.90          | 84      | 72            | 12    | 14.29            | 14.29             |                |

# Seven Month Projections

Sep7lin

| Constant | Coeff | Un  | Coeff | Nspd | Coeff | Spd | Qtr   |
|----------|-------|-----|-------|------|-------|-----|-------|
| 66.79    | -5.46 | 7.1 | 0.226 | 98   | 0.685 | 34  | 31.73 |
| 66.79    | -5.46 | 7   | 0.226 | 48   | 0.685 | 21  | 7.81  |
| 66.79    | -5.46 | 6.9 | 0.226 | 75   | 0.685 | 23  | 7.81  |
| 66.79    | -5.46 | 6.8 | 0.226 | 97   | 0.685 | 16  | 7.81  |
| 66.79    | -5.46 | 7.2 | 0.226 | 265  | 0.685 | 19  |       |
| 66.79    | -5.46 | 7.2 | 0.226 | 82   | 0.685 | 15  |       |
| 66.79    | -5.46 | 7.1 | 0.226 | 75   | 0.685 | 15  |       |
| 66.79    | -5.46 | 7.2 | 0.226 | 103  | 0.685 | 9   | 7.16  |
| 66.79    | -5.46 | 7.1 | 0.226 | 77   | 0.685 | 12  | 7.16  |
| 66.79    | -5.46 | 7   | 0.226 | 65   | 0.685 | 18  | 7.16  |
| 66.79    | -5.46 | 6.8 | 0.226 | 79   | 0.685 | 10  | 31.73 |
| 66.79    | -5.46 | 7   | 0.226 | 57   | 0.685 | 12  | 31.73 |

| Month  | Pred<br>Losses | Rounded | Acc<br>Losses | Error | Percent<br>Error | Absolute<br>Value | Avg %<br>Error |
|--------|----------------|---------|---------------|-------|------------------|-------------------|----------------|
| Jun 86 | 105.19         | 105     | 102           | 3     | 2.86             | 2.86              | 29.8           |
| Jul    | 61.61          | 62      | 82            | -20   | -32.26           | 32.26             |                |
| Aug    | 69.63          | 70      | 124           | -54   | -77.14           | 77.14             |                |
| Sep    | 70.35          | 70      | 105           | -35   | -50.00           | 50.00             |                |
| Oct    | 100.38         | 100     | 138           | -38   | -38.00           | 38.00             |                |
| Nov    | 56.29          | 56      | 75            | -19   | -33.93           | 33.93             |                |
| Dec    | 55.25          | 55      | 79            | -24   | -43.64           | 43.64             |                |
| Jan 87 | 64.08          | 64      | 81            | -17   | -26.56           | 26.56             |                |
| Feb    | 60.81          | 61      | 55            | 6     | 9.84             | 9.84              |                |
| Mar    | 62.75          | 63      | 72            | -9    | -14.29           | 14.29             |                |
| Apr    | 86.10          | 86      | 71            | 15    | 17.44            | 17.44             |                |
| May    | 81.40          | 81      | 72            | 9     | 11.11            | 11.11             |                |

# Eight Month Projections

Sep8lin

| Constant | Coeff | Un  | Coeff | Nspd | Coeff | Spd | Qtr   |
|----------|-------|-----|-------|------|-------|-----|-------|
| 87.92    | -7.81 | 7.1 | 0.2   | 117  | 0.6   | 27  | 33.06 |
| 87.92    | -7.81 | 7.1 | 0.2   | 58   | 0.6   | 13  | 6.28  |
| 87.92    | -7.81 | 7   | 0.2   | 83   | 0.6   | 16  | 6.28  |
| 87.92    | -7.81 | 6.9 | 0.2   | 101  | 0.6   | 12  | 6.28  |
| 87.92    | -7.81 | 6.8 | 0.2   | 288  | 0.6   | 14  |       |
| 87.92    | -7.81 | 7.2 | 0.2   | 140  | 0.6   | 5   |       |
| 87.92    | -7.81 | 7.2 | 0.2   | 97   | 0.6   | 11  |       |
| 87.92    | -7.81 | 7.1 | 0.2   | 120  | 0.6   | 5   | 4.6   |
| 87.92    | -7.81 | 7.2 | 0.2   | 85   | 0.6   | 5   | 4.6   |
| 87.92    | -7.81 | 7.1 | 0.2   | 71   | 0.6   | 14  | 4.6   |
| 87.92    | -7.81 | 7   | 0.2   | 115  | 0.6   | 9   | 33.06 |
| 87.92    | -7.81 | 6.8 | 0.2   | 65   | 0.6   | 10  | 33.06 |

| Month  | Pred<br>Los: | Acc<br>Rounded | Acc<br>Losses | Error | Percent<br>Error | Absolute<br>Value | Avg %<br>Error |
|--------|--------------|----------------|---------------|-------|------------------|-------------------|----------------|
| Jun 86 | 105.13       | 105            | 102           | 3     | 2.86             | 2.86              | 30.8           |
| Jul    | 58.15        | 58             | 82            | -24   | -41.38           | 41.38             |                |
| Aug    | 65.73        | 66             | 124           | -58   | -87.88           | 87.88             |                |
| Sep    | 67.71        | 68             | 105           | -37   | -54.41           | 54.41             |                |
| Oct    | 100.81       | 101            | 138           | -37   | -36.63           | 36.63             |                |
| Nov    | 62.69        | 63             | 75            | -12   | -19.05           | 19.05             |                |
| Dec    | 57.69        | 58             | 79            | -21   | -36.21           | 36.21             |                |
| Jan 87 | 64.07        | 64             | 81            | -17   | -26.56           | 26.56             |                |
| Feb    | 56.29        | 56             | 55            | 1     | 1.79             | 1.79              |                |
| Mar    | 59.67        | 60             | 72            | -12   | -20.00           | 20.00             |                |
| Apr    | 94.71        | 95             | 71            | 24    | 25.26            | 25.26             |                |
| May    | 86.87        | 87             | 72            | 15    | 17.24            | 17.24             |                |

# Nine Month Projections

Sep9lin

| Constant | Coeff   | Un  | Coeff | Nspd | Coeff | Spd | Qtr   |
|----------|---------|-----|-------|------|-------|-----|-------|
| 121.77   | -12.812 | 7.1 | 0.236 | 137  | 0.693 | 31  | 34.61 |
| 121.77   | -12.812 | 7.1 | 0.236 | 65   | 0.693 | 13  | 5.12  |
| 121.77   | -12.812 | 7.1 | 0.236 | 90   | 0.693 | 13  | 5.12  |
| 121.77   | -12.812 | 7   | 0.236 | 108  | 0.693 | 9   | 5.12  |
| 121.77   | -12.812 | 6.9 | 0.236 | 298  | 0.693 | 6   |       |
| 121.77   | -12.812 | 6.8 | 0.236 | 151  | 0.693 | 5   |       |
| 121.77   | -12.812 | 7.2 | 0.236 | 129  | 0.693 | 8   |       |
| 121.77   | -12.812 | 7.2 | 0.236 | 142  | 0.693 | 3   | 2.77  |
| 121.77   | -12.812 | 7.1 | 0.236 | 97   | 0.693 | 5   | 2.77  |
| 121.77   | -12.812 | 7.2 | 0.236 | 88   | 0.693 | 3   | 2.77  |
| 121.77   | -12.812 | 7.1 | 0.236 | 124  | 0.693 | 7   | 34.61 |
| 121.77   | -12.812 | 7   | 0.236 | 100  | 0.693 | 7   | 34.61 |

| Month  | Pred<br>Losses | Rounded | Acc<br>Losses | Error | Percent<br>Error | Absolute<br>Value | Avg %<br>Error |
|--------|----------------|---------|---------------|-------|------------------|-------------------|----------------|
| Jun 86 | 119.23         | 119     | 102           | 17    | 16.67            | 16.67             | 23.8           |
| Jul    | 60.27          | 60      | 82            | -22   | -26.83           | 26.83             |                |
| Aug    | 66.17          | 66      | 124           | -58   | -46.77           | 46.77             |                |
| Sep    | 68.93          | 69      | 105           | -36   | -34.29           | 34.29             |                |
| Oct    | 107.85         | 108     | 138           | -30   | -21.74           | 21.74             |                |
| Nov    | 73.75          | 74      | 75            | -1    | -1.33            | 1.33              |                |
| Dec    | 65.51          | 66      | 79            | -13   | -16.46           | 16.46             |                |
| Jan 87 | 67.88          | 68      | 81            | -13   | -16.05           | 16.05             |                |
| Feb    | 59.93          | 60      | 55            | 5     | 9.09             | 9.09              |                |
| Mar    | 55.14          | 55      | 72            | -17   | -23.61           | 23.61             |                |
| Apr    | 99.53          | 100     | 71            | 29    | 40.85            | 40.85             |                |
| May    | 95.15          | 95      | 72            | 23    | 31.94            | 31.94             |                |

# Ten Month Projections

Sep10lin

| Constant | Coeff | Un  | Coeff | Nspd | Coeff | Spd | Qtr   |
|----------|-------|-----|-------|------|-------|-----|-------|
| 32.74    | -1.07 | 7.3 | 0.144 | 162  | 1.726 | 20  | 41.17 |
| 32.74    | -1.07 | 7.1 | 0.144 | 76   | 1.726 | 11  | 16.2  |
| 32.74    | -1.07 | 7.1 | 0.144 | 99   | 1.726 | 9   | 16.2  |
| 32.74    | -1.07 | 7.1 | 0.144 | 118  | 1.726 | 7   | 16.2  |
| 32.74    | -1.07 | 7   | 0.144 | 315  | 1.726 | 4   |       |
| 32.74    | -1.07 | 6.9 | 0.144 | 158  | 1.726 | 4   |       |
| 32.74    | -1.07 | 6.8 | 0.144 | 136  | 1.726 | 7   |       |
| 32.74    | -1.07 | 7.2 | 0.144 | 205  | 1.726 | 2   | 0.734 |
| 32.74    | -1.07 | 7.2 | 0.144 | 108  | 1.726 | 3   | 0.734 |
| 32.74    | -1.07 | 7.1 | 0.144 | 96   | 1.726 | 2   | 0.734 |
| 32.74    | -1.07 | 7.2 | 0.144 | 134  | 1.726 | 4   | 41.17 |
| 32.74    | -1.07 | 7.1 | 0.144 | 105  | 1.726 | 6   | 41.17 |

| Month  | Pred<br>Losses | Acc<br>Rounded Losses | Percent<br>Error | Absolute<br>Value | Avg %<br>Error |
|--------|----------------|-----------------------|------------------|-------------------|----------------|
| Jun 86 | 123.95         | 124                   | 22               | 21.57             | 29.0           |
| Jul    | 71.27          | 71                    | -11              | 13.41             |                |
| Aug    | 71.13          | 71                    | -53              | 42.74             |                |
| Sep    | 70.42          | 70                    | -35              | 33.33             |                |
| Oct    | 77.51          | 76                    | -60              | 43.48             |                |
| Nov    | 55.01          | 55                    | -20              | 26.67             |                |
| Dec    | 57.13          | 57                    | -22              | 27.85             |                |
| Jan 87 | 58.74          | 59                    | -22              | 27.16             |                |
| Feb    | 46.50          | 47                    | -8               | 14.55             |                |
| Mar    | 43.15          | 43                    | -29              | 40.28             |                |
| Apr    | 92.41          | 92                    | 21               | 29.58             |                |
| May    | 91.79          | 92                    | 20               | 27.78             |                |

# Eleven Month Projections

## Sepilin

| Constant | Coeff   | Un  | Coeff | Nspd | Coeff | Spd | Qtr   |
|----------|---------|-----|-------|------|-------|-----|-------|
| 136.84   | -14.006 | 7.3 | 0.174 | 175  | 0.422 | 12  | 32.88 |
| 136.84   | -14.006 | 7.3 | 0.174 | 83   | 0.422 | 8   | 10.69 |
| 136.84   | -14.006 | 7.1 | 0.174 | 108  | 0.422 | 7   | 10.69 |
| 136.84   | -14.006 | 7.1 | 0.174 | 122  | 0.422 | 6   | 10.69 |
| 136.84   | -14.006 | 7.1 | 0.174 | 336  | 0.422 | 2   |       |
| 136.84   | -14.006 | 7   | 0.174 | 169  | 0.422 | 1   |       |
| 136.84   | -14.006 | 6.9 | 0.174 | 143  | 0.422 | 4   |       |
| 136.84   | -14.006 | 6.8 | 0.174 | 223  | 0.422 | 1   | 5.023 |
| 136.84   | -14.006 | 7.2 | 0.174 | 131  | 0.422 | 3   | 5.023 |
| 136.84   | -14.006 | 7.2 | 0.174 | 110  | 0.422 | 2   | 5.023 |
| 136.84   | -14.006 | 7.1 | 0.174 | 141  | 0.422 | 3   | 32.88 |
| 136.84   | -14.006 | 7.2 | 0.174 | 115  | 0.422 | 3   | 32.88 |

| Month  | Pred<br>Losses | Rounded | Acc<br>Losses | Error | Percent<br>Error | Absolute<br>Value | Avg %<br>Error |
|--------|----------------|---------|---------------|-------|------------------|-------------------|----------------|
| Jun 86 | 102.99         | 103     | 102           | 1     | 0.98             | 0.98              | 21.0           |
| Jul    | 63.10          | 63      | 82            | -19   | -23.17           | 23.17             |                |
| Aug    | 69.83          | 70      | 124           | -54   | -43.55           | 43.55             |                |
| Sep    | 71.85          | 72      | 105           | -33   | -31.43           | 31.43             |                |
| Oct    | 96.71          | 97      | 138           | -41   | -29.71           | 29.71             |                |
| Nov    | 68.63          | 69      | 75            | -6    | -8.00            | 8.00              |                |
| Dec    | 66.77          | 67      | 79            | -12   | -15.19           | 15.19             |                |
| Jan 87 | 85.85          | 86      | 81            | 5     | 6.17             | 6.17              |                |
| Feb    | 65.08          | 65      | 55            | 10    | 18.18            | 18.18             |                |
| Mar    | 61.00          | 61      | 72            | -11   | -15.28           | 15.28             |                |
| Apr    | 96.08          | 96      | 71            | 25    | 35.21            | 35.21             |                |
| May    | 90.15          | 90      | 72            | 18    | 25.00            | 25.00             |                |

# Twelve Month Projections

Sep12lin

| Constant | Coeff  | Un  | Coeff | Nspd | Coeff | Spd | Qtr   |
|----------|--------|-----|-------|------|-------|-----|-------|
| 114.92   | -10.82 | 7.3 | 0.155 | 189  | 0.65  | 8   | 27.86 |
| 114.92   | -10.82 | 7.3 | 0.155 | 94   | 0.65  | 5   | 13.11 |
| 114.92   | -10.82 | 7.3 | 0.155 | 115  | 0.65  | 4   | 13.11 |
| 114.92   | -10.82 | 7.1 | 0.155 | 125  | 0.65  | 11  | 13.11 |
| 114.92   | -10.82 | 7.1 | 0.155 | 349  | 0.65  | 1   |       |
| 114.92   | -10.82 | 7.1 | 0.155 | 177  | 0.65  | 1   |       |
| 114.92   | -10.82 | 7   | 0.155 | 150  | 0.65  | 2   |       |
| 114.92   | -10.82 | 6.9 | 0.155 | 234  | 0.65  | 1   | 4.53  |
| 114.92   | -10.82 | 6.8 | 0.155 | 137  | 0.65  | 2   | 4.53  |
| 114.92   | -10.82 | 7.2 | 0.155 | 126  | 0.65  | 2   | 4.53  |
| 114.92   | -10.82 | 7.2 | 0.155 | 147  | 0.65  | 1   | 27.86 |
| 114.92   | -10.82 | 7.1 | 0.155 | 134  | 0.65  | 2   | 27.86 |

| Month  | Pred<br>Losses | Rounded | Acc<br>Losses | Error | Percent<br>Error | Absolute<br>Value | Avg %<br>Error |
|--------|----------------|---------|---------------|-------|------------------|-------------------|----------------|
| Jun 86 | 98.29          | 98      | 102           | -4    | -3.92            | 3.92              | 20.1           |
| Jul    | 66.86          | 67      | 82            | -15   | -18.29           | 18.29             |                |
| Aug    | 69.47          | 69      | 124           | -55   | -44.35           | 44.35             |                |
| Sep    | 77.73          | 78      | 105           | -27   | -25.71           | 25.71             |                |
| Oct    | 92.84          | 93      | 138           | -45   | -32.61           | 32.61             |                |
| Nov    | 66.18          | 66      | 75            | -9    | -12.00           | 12.00             |                |
| Dec    | 63.73          | 64      | 79            | -15   | -18.99           | 18.99             |                |
| Jan 87 | 81.71          | 82      | 81            | 1     | 1.23             | 1.23              |                |
| Feb    | 68.41          | 68      | 55            | 13    | 23.64            | 23.64             |                |
| Mar    | 62.38          | 62      | 72            | -10   | -13.89           | 13.89             |                |
| Apr    | 88.31          | 88      | 71            | 17    | 23.94            | 23.94             |                |
| May    | 88.03          | 88      | 72            | 16    | 22.22            | 22.22             |                |

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