

AD - A 132 396

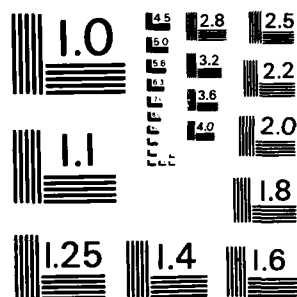
A STUDY OF THE EFFECTIVENESS OF THE ARMY'S NATIONAL  
ADVERTISING EXPENDITURES VOLUME 3 APPENDICES(U) N W  
AYER INC NEW YORK 31 AUG 81 81-3 MDA903-79-D-0001

UNCLASSIFIED

F/G 5/3

NL

1/3



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



# UNITED STATES ARMY RECRUITING COMMAND

2

Study Report 81-3 AD

ADA 132396

## A Study of the Effectiveness of the Army's National Advertising Expenditures

Volume III  
Appendices

**N W AYER INCORPORATED**  
**AUGUST 1981**

Approved for Public Release  
Distribution Unlimited

DTIC  
ELECTED  
SEP 14 1983  
S E

DTIC FILE COPY

Prepared for the  
**United States Army Recruiting Command**  
**Fort Sheridan, Illinois 60037**

83 08 24 041

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

| REPORT DOCUMENTATION PAGE                                                                                                                                                                                                                                                                                                                 |                      | READ INSTRUCTIONS<br>BEFORE COMPLETING FORM                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------------------------------------------------------------|
| 1. REPORT NUMBER                                                                                                                                                                                                                                                                                                                          | 2. GOVT ACCESSION NO | 3. RECIPIENT'S CATALOG NUMBER                                               |
|                                                                                                                                                                                                                                                                                                                                           | 4A-A132 396          |                                                                             |
| 4. TITLE (and Subtitle)<br>A STUDY OF THE EFFECTIVENESS OF THE ARMY'S<br>NATIONAL ADVERTISING EXPENDITURES<br>VOLUME III                                                                                                                                                                                                                  |                      | 5. TYPE OF REPORT & PERIOD COVERED<br>Final Draft<br>27 Sept 79 - 31 Aug 81 |
| 7. AUTHOR(s)<br><br>N W AYER INCORPORATED                                                                                                                                                                                                                                                                                                 |                      | 6. PERFORMING ORG. REPORT NUMBER                                            |
| 9. PERFORMING ORGANIZATION NAME AND ADDRESS<br>N W Ayer Inc.<br>1345 Avenue of the Americas<br>New York, NY 10105                                                                                                                                                                                                                         |                      | 8. CONTRACT OR GRANT NUMBER(s)<br><br>MDA903-79-D-0001                      |
| 11. CONTROLLING OFFICE NAME AND ADDRESS<br><br>United States Army Recruiting Command<br>Ft. Sheridan, IL                                                                                                                                                                                                                                  |                      | 10. PROGRAM ELEMENT PROJECT, TASK<br>AREA & WORK UNIT NUMBERS               |
| 14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)<br><br>N/A                                                                                                                                                                                                                                                    |                      | 12. REPORT DATE<br>31 Aug 81                                                |
|                                                                                                                                                                                                                                                                                                                                           |                      | 13. NUMBER OF PAGES                                                         |
|                                                                                                                                                                                                                                                                                                                                           |                      | 15. SECURITY CLASS. (of this report)<br>UNCLASSIFIED                        |
|                                                                                                                                                                                                                                                                                                                                           |                      | 15a. DECLASSIFICATION/DOWNGRADING<br>SCHEDULE<br>N/A                        |
| 16. DISTRIBUTION STATEMENT (of this Report)<br><br>Approved for public release; distribution unlimited.                                                                                                                                                                                                                                   |                      |                                                                             |
| 17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)<br><br>N/A                                                                                                                                                                                                                                     |                      |                                                                             |
| 18. SUPPLEMENTARY NOTES<br><br>Volume III of three volumes                                                                                                                                                                                                                                                                                |                      |                                                                             |
| 19. KEY WORDS (Continue on reverse side if necessary and identify by block number)<br><br>ADVERTISING, ACCESSIONS, CONTRACTS, ACCESSIONS AS CONTRACTED, ARMY,<br>RECRUITING, EFFECTIVENESS, COST, MODEL, BOX-JENKINS, ECONOMETRIC, ASVAB,<br>EXAMS, CONVERSION, LINKAGE.                                                                  |                      |                                                                             |
| 20. ABSTRACT (Continue on reverse side if necessary and identify by block number)<br><br>ARMY ADVERTISING COST, EFFECTIVENESS MODEL<br><br>The Army's advertising expenditures were shown to be cost effective in a<br>two-stage modeling process. Advertising was related to ASVAB exams, and exams<br>were then related to recruitment. |                      |                                                                             |

The U.S. Army Recruiting Command (USAREC) has asked N W Ayer Incorporated to study the effectiveness of the Army's national recruitment advertising. N W Ayer's Marketing Services Department undertook this task in September, 1979, with guidance from USAREC's Program Analysis and Evaluation Division. In addition, their assistance in acquiring, providing, and checking data and data sources was essential.

Volume II is the Main Report and is intended for the reader who wants to fully understand the details of the project: its inception, methodology, data, results, validation, and economic implications.

At our request our methodology and conclusions have been reviewed by Professor Martin K. Starr of the Graduate School of Business of Columbia University. He judged our statistical procedures sound and the conclusions acceptable on a statistical and analytic basis.

|             |  |  |  |   |  |
|-------------|--|--|--|---|--|
| Account for |  |  |  |   |  |
|             |  |  |  | X |  |
|             |  |  |  |   |  |
|             |  |  |  |   |  |
| F           |  |  |  |   |  |
| I           |  |  |  |   |  |
| A           |  |  |  |   |  |
| Dist        |  |  |  |   |  |
| A           |  |  |  |   |  |



VOLUME III  
APPENDICES

ESSENTIAL ELEMENTS OF ANALYSIS APPENDIX

|              |                                                                                                            |     |
|--------------|------------------------------------------------------------------------------------------------------------|-----|
| Section A.1  | How Does The Recruiting Process Work?.....                                                                 | 1   |
| Section A.2  | How Is The Market Segmented?.....                                                                          | 5   |
| Section A.3  | What Key Factors Are In The Data Base?.....                                                                | 6   |
| Section A.4  | What Factors Are Not In The Data Base?.....                                                                | 9   |
| Section A.5  | What Time Frame Does The Analysis Cover?.....                                                              | 10  |
| Section A.6  | Why And How Was A Two-Stage Procedure Selected?.....                                                       | 11  |
| Section A.7  | What Was The Exam Model-Building Strategy?.....                                                            | 12  |
| Section A.8  | What Were the Key Findings Regarding Category I-IIIA Exams?..                                              | 13  |
| A.8.1        | What Seasonality Was Found For Category I-IIIA Exams?.....                                                 | 13  |
| A.8.2        | Why And How Was Exam Data Adjusted To Remove The Effect<br>Of The GI Bill?.....                            | 15  |
| A.8.3        | How Do The Key Variables Other Than Advertising Impact<br>Exam Variation?.....                             | 18  |
| A.8.4        | What Is The Pre-Advertising Model?.....                                                                    | 26  |
| A.8.5        | What Effects Were Hypothesized For Each Of The Media?.....                                                 | 30  |
| A.8.6        | How Was The Complete Category I-IIIA Exam Model Specified?..                                               | 42  |
| Section A.9  | How Did The Category IIIB-IV Analysis Compare To The<br>Category I-IIIA?.....                              | 44  |
| A.9.1        | What Seasonality Was Found For Category IIIB-IV Exams?.....                                                | 45  |
| A.9.2        | Category IIIB-IV Exam Model Cross Correlations With<br>Non-Advertising Factors.....                        | 46  |
| A.9.3        | Category IIIB-IV Exams Pre-Advertising Model Specification..                                               | 51  |
| A.9.4        | Category IIIB-IV Exam Model Media Analysis - Cross<br>Correlations.....                                    | 52  |
| A.9.5        | Category IIIB-IV Exam Model Final Model Specification.....                                                 | 61  |
| Section A.10 | How Was The Pay Off (Accessions) Related To Exam Variation?..                                              | 62  |
| A.10.1       | What Are The Key Issues Regarding The Linkage Between<br>Exams And Accessions?.....                        | 64  |
| A.10.2       | What Did We Observe In The Time Series Relating Exams<br>And Accessions?.....                              | 65  |
| A.10.3       | What Factors Had A Major Impact On The Conversion Rate?.....                                               | 69  |
| A.10.4       | How Do Variations In Manpower Needs Impact Conversion<br>Rate Variation?.....                              | 73  |
| A.10.5       | Do Other Factors Impact The Conversion Rate?.....                                                          | 81  |
| A.10.6       | How Can The Final Linkage Models Best Be Specified?.....                                                   | 87  |
| Section A.11 | Are The Models Robust?.....                                                                                | 92  |
| A.11.1       | How Well Does The Two Stage Model Specification Track<br>The Actual Data?.....                             | 93  |
| A.11.2       | Are The Exam Models Consistent Over Different Time Spans?...                                               | 102 |
| A.11.3       | Are The Estimated Advertising Coefficients Sensitive To<br>The Other Variables Included In The Model?..... | 105 |
| Section A.12 | Step by Step Procedures For Using The Models.....                                                          | 110 |

## UNTRANSFORMED DATA SERIES APPENDICES

### Data Appendix A. Performance Variables

#### Accessions by Date of Contract

- A.1 High School Degree/Category I-IIIA
- A.2 High School Degree/Category IIIB-IV
- A.3 Non Degree/Category I-IIIA
- A.4 Non-Degree/Category IIIB-IV

#### ASVAB Exams

- A.5 Category I-IIIA
- A.6 Category IIIB-IV

### Data Appendix B. Media Variables

#### Advertising Spending

- B.1 Television
- B.2 Radio
- B.3 Newspaper
- B.4 Outdoor
- B.5 Direct Mail
- B.6 Local Advertising
- B.7 Regular Magazines
- B.8 Special Magazines

#### Media Deflators

- B.9 Spot Television
- B.10 Network Television
- B.11 Spot Radio
- B.12 Network Radio
- B.13 Newspapers
- B.14 Magazines
- B.15 Outdoor

### Data Appendix C. Policy Variables

- C.1 Recruiter Accession Objectives
- C.2 E1 Pay
- C.3 Recruiter Numbers

### Data Appendix D. Environmental Variables

- D.1 Youth (16-19) Unemployment
- D.2 Civilian Minimum Wage

ADJUSTED OR TRANSFORMED DATA SERIES APPENDICES

Data Appendix E. Performance Variables

Accessions by Date of Contract (the December 1976 GI Bill  
determined spike removed from the data)

- E.1 High School Degree/Category I-III A
- E.2 High School Degree/Category IIIB-IV
- E.3 Non Degree/Category I-III A

ASVAB Exams (the December 1976 GI bill Determined spike  
removed from the data)

- E.4 Category I-III A
- E.5 Category IIIB-IV

Data Appendix F. Media Variables

Advertising spending (deflated to constant Dec. 1978 dollars,  
and adjusted to reflect net spending levels throughout)

- F.1 Television
- F.2 Radio
- F.3 Newspaper
- F.4 Outdoor
- F.5 Direct Mail
- F.6 Local Advertising
- F.7 Regular Magazines
- F.8 Special Magazines

Aggregated Advertising Spending (aggregation is over deflated  
net dollars)

- F.9 Total Media at Current period
- F.10 Total Media Sum of Periods T-4 through T-11
- F.11 Television (lagged 1 period) + Local Advertising  
+ Newspaper
- F.12 Total Media - Sum of Current Period Through Period T-5

Data Appendix G. Policy Variables

- G.1 Recruiter Accession Objectives - Twelve Month Centered  
Moving Average
- G.2 Recruiter Accession Objectives - Ratio of Monthly  
Objectives to Moving Average
- G.3 Relative Pay - the Ratio of EI Pay to the Civilian  
Minimum Wage

ESSENTIAL ELEMENTS  
OF ANALYSIS

## Section A.1. HOW DOES THE RECRUITING PROCESS WORK?

It was necessary to begin the model-building procedure by developing an overview of the system under consideration (See figure A.1.1. for a schematic perspective of the system). The objective of developing this process perspective was not to incorporate into it every element of the recruiting system, but to outline those elements which are critical to developing a measurement of the influence of advertising spending levels. With this measurement based on a sound understanding of the process dynamics, the risk of confounding the impact of advertising spending with other system factor changes was considerably lessened.

This overview of the recruiting process specifies that the pool of eligible enlistment candidates receives a continual flow of information that impacts perceptions about the viability of enlistment in the Army. This input comes from both the Recruiting Command with information about Army pay, benefits and training opportunities; and from the general economic environment, with information about alternative employment, educational, and military service opportunities.

The quantity and quality of this information acts to impact both the level of awareness of opportunities offered by the Army and attitudes toward the Army, thus creating an atmosphere that affects responsiveness to contacts made by the recruiter force and inducing people to seek out recruiters on their own.

The ability of the recruiters as salesmen to present Army pay and benefits in a manner competitive with alternative service recruiting efforts results in the number of candidates who make a commitment to begin the enlistment process by going to an Armed Forces Enlistment Entry Station (AFEES) and taking mental and physical exams. Data on the number of candidates completing the examination process each month is available as a measure of performance of the recruiting system.

Once the examination process has been completed, the percentage of signed contracts is heavily dependent on the manpower requirements of the Army, as well as on the effectiveness of the career counseling staff in matching examinee abilities and interests with available MOS slots.

Finally, the time of accession for those who sign contracts is primarily determined by the flexibility of the DEP policy and by school-related seasonality.

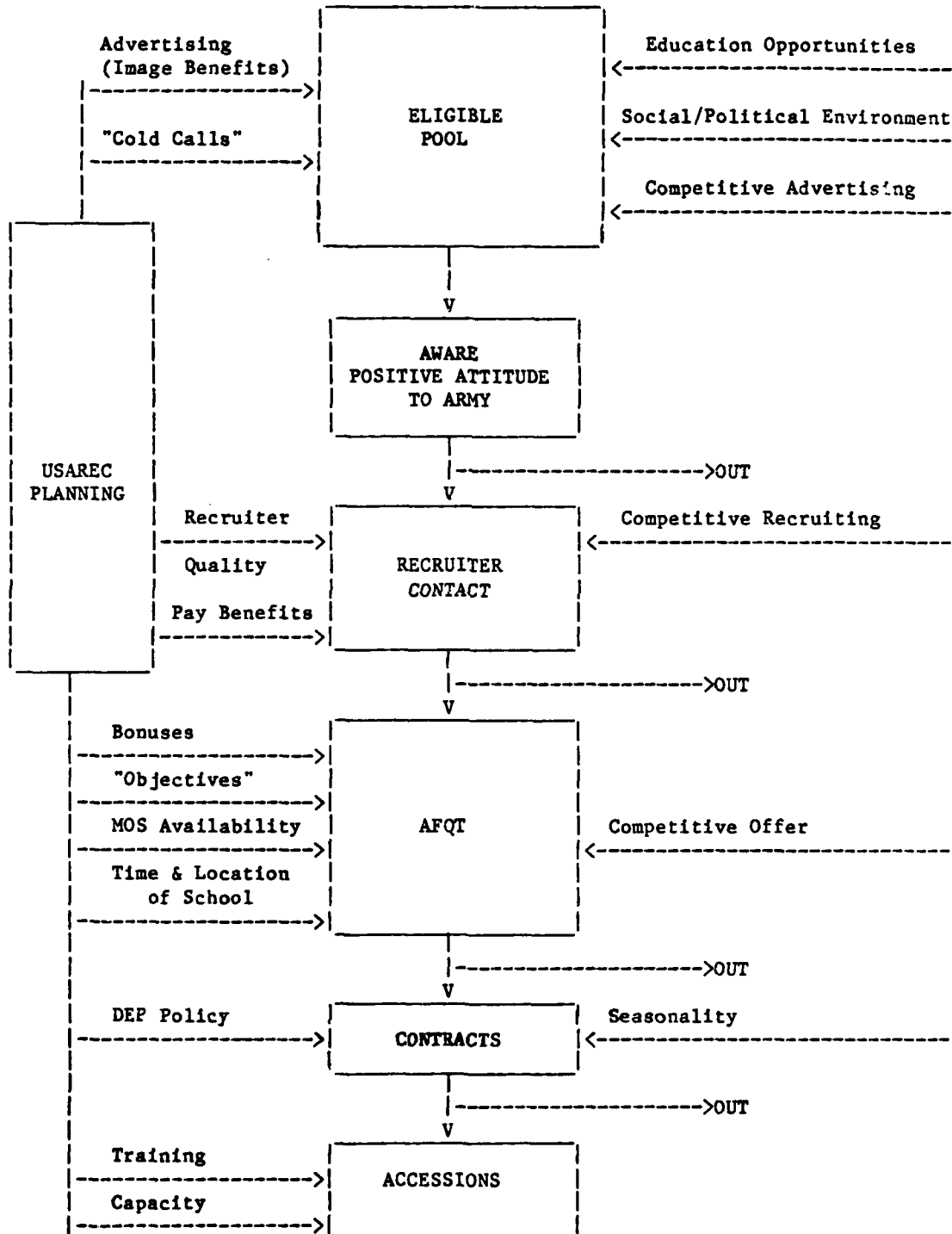


Figure A.1.1. Process Overview

Careful consideration of the process flow makes it clear that the system payoff, the number of accessions achieved each month, is considerably "downstream" from the impact of changes in the level of advertising spending, which is the critical variable under investigation.

Monthly data was not available that reflects changes in awareness levels and attitudes of the target market toward the Army, nor was monthly data available on the number of contacts made with the recruiting system.

However, the number of ASVAB exams completed each month was available, and represents the system performance measure furthest "upstream" in the process for which data was available.

In order to measure the response of the system at the point most sensitive to changes in the level of advertising, exam counts, as well as to track variations in the key payoff measure, accession levels, the process was viewed in two stages:

Stage 1: Relate Exam levels to changes in advertising, other policy variables, and critical non-controllable environmental influences.

Stage 2: Relate Accession levels to changes in Exam levels.

Figure A.1.2 simplifies the process perspective in terms of the two stages.

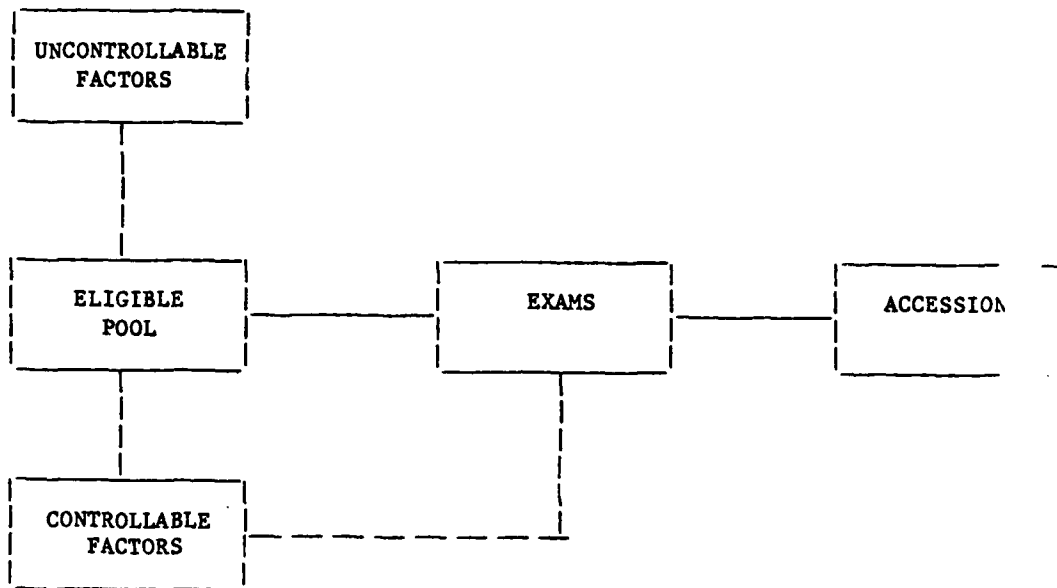


Figure A.1.2. Simplified Process Perspective

## Section A.2. HOW IS THE MARKET SEGMENTED?

Army priorities for the quality of the recruit mix required investigating the differential impact of advertising on key market segments. Segmentation was based on high school degree status and mental category test scores:

- ° High School Degree - Category I-IIIA
- ° High School Degree - Category IIIB-IV
- ° Non-Degree - Category I-IIIA
- ° Non-Degree - Category IIIB-IV

The first segment deserves the highest priority; therefore, this group's differential response to advertising pressure, as compared with that of the other groups, was of particular interest in this analysis.

For the next two groups, some quality is lost with respect to test scores or degree status. The relative priority that these two groups receive would depend on whether the Army's current interest is in degree status or mental category.

The last group was considered to be more constrained by the demands of the Army than by the supply of candidates because accession variation reflects administrative pressures as much as response to marketing efforts; therefore, this group was not subjected to the same degree or detail of analysis.

The appropriate degree status could not be specified in the exam data, since the records reflect the status at the time of examination, not at the time of accession, and therefore underrepresent the number of graduates. With this restriction in mind, the exam data was partitioned by mental test scores into two groups, Category I-IIIA and Category IIIB-IV, and an exam model was built for each.

The two exam segments were used in the first stage of the two-stage process, and each of the three accession segments considered was then related to the appropriate exam group in the second stage.

### Section A.3. WHAT KEY FACTORS ARE IN THE DATA BASE?

The data used in the analyses can be classified into four sets:

- ° Measures of Recruiting Performance
- ° Measures of Advertising Expenditure Activity
- ° USAREC Controllable Policy Variables
- ° Non-controllable Environmental Influences

Each of the variable groupings will be briefly discussed in this section. A more complete discussion of each variable, including a listing is included in the data appendix.

#### Measures of Recruiting Performances.

##### ASVAB 6-7 EXAMINATION COMPLETIONS:

This variable measures the number of exams completed each month in the AFES stations.

##### ACCESSIONS BY CONTRACT DATE:

Accession records were reviewed and each accession was allocated to the month in which the enlistment contract was signed. This is effectively a contract series exclusive of those contracts that do not result in final accession. To our knowledge, this is the first time that recruiting performance has been measured using a criterion so far "upstream" in the process.

#### Measures of Advertising Expenditure Activity.

The advertising data used in the analysis reflects historical monthly expenditures, as reported in N W Ayer media archives, used to purchase advertising space targeted toward the non-prior service market segment.

Three key considerations in specifying the advertising variables are that

- ° individual media components were analyzed to account for differing responses;
- ° The reported dollar expenditures for each medium needed to be properly adjusted by the appropriate media deflator so that all expenditure levels throughout the analysis were reported in constant dollars (December 1978 = 1.00); and
- ° gross expenditures (including agency commissions) were adjusted to net expenditures (exclusive of agency commissions) where necessary.

Table A.3.1 lists the media components into which the total media expenditures are broken.

USAREC-Controllable Policy Variables.

RECRUITER ACCESSION OBJECTIVES:

This variable reflects monthly objectives for male non-prior service accessions as a measure of both long- and short-term "pressure" on the system.

E-1 PAY:

This variable was used in the analysis as a component in the relative pay ratio comparing the level of E-1 pay to the civilian minimum wage.

PRODUCTION RECRUITERS:

This variable represents the number of recruiters and commanders on station each month, and reflects variations in the size of the recruiter force.

Non-Controllable Environmental Influences.

YOUTH UNEMPLOYMENT:

This variable represents the monthly unemployment rate for 16 to 19 years olds.

CIVILIAN MINIMUM WAGE:

This variable represents the monthly minimum wage as legislated by Congress, and is the second component in the relative pay ratio.

NAVY ADVERTISING:

This variable represents the total monthly advertising media expenditures by the U.S. Navy, and is the only competitive advertising data whose accuracy was confirmed.

Table A.3.1. Media Components

- (1) Television (space costs for network and spot television)
- (2) Radio (space costs for network and spot radio)
- (3) Newspaper
- (4) Outdoor (space costs for outdoor billboards)
- (5) Regular Magazines
- (6) Special Magazines (primarily "Source Book" and "On Your Own")
- (7) Local Advertising (primarily newspaper ads placed locally  
by the local recruiting commands)
- (8) Direct Mail

#### Section A.4. WHAT FACTORS ARE NOT IN THE DATA BASE?

Ideally, the impact of variations in factors not included in the model specification will be small and independent of the factors included, so as not to cause a serious bias in the estimation of the model coefficients.

Table A.4.1 lists some of the factors that could impact the performance of the recruiting system but which were not easily quantifiable, and therefore were not included in the data base.

Table A.4.1. Factors Not in the Data Base

- ° MOS Availability
- ° Time & Location of MOS School
- ° Offers From Other Services
- ° Bonuses Offered
- ° Recruiter Quality
- ° Social & Political Events
- ° Creative Changes in Advertising

Section A.5. WHAT TIME FRAME DOES THE ANALYSIS COVER?

The time frame used to develop the analysis was determined by the availability of the examination and accession data. Exam models were built on 54 monthly observations covering the period April, 1976 to September, 1980. Accession models were built on 48 monthly observations covering the period April, 1976 to March, 1980.

#### Section A.6. WHY AND HOW WAS A TWO-STAGE PROCEDURE SELECTED?

The primary objective of the analysis was to measure the impact of changes in advertising spending levels on the recruiting system's performance.

As noted earlier, there is considerable administrative influence on the system between the time that changes in advertising spending impact prospects' interest level in the Army and the time that that impact on the interest level is reflected in the accession levels.

In order to maximize our ability to read the effects of advertising, we chose to describe the system by the two-stage process that was noted in the overview section. The two-stage nature of the process, as well as the need for evaluating accessions on a market segment basis, required the following model-building procedure:

- (1) A model was built for each of the two exam segments, each relating the number of ASVAB exams completed each month to controllable and uncontrollable factors.
- (2) A second model was developed for each of three accession segments, each using the number of completed exams as input, and relating the number of accessions (by contract date) to the number of completed exams as well as to other key policy variables.

#### Section A.7. WHAT WAS THE EXAM MODEL-BUILDING STRATEGY?

The first step in the two-stage process was to build an exam model relating advertising changes to variations in exam levels for each of the two exam groups: mental categories I-III A and IIIB-IV. The strategy used to develop the exam models can be outlined in seven basic steps:

1. Determination of those factors whose variation should affect the level of exams.
2. Examination, using the Box Jenkins "pre whitened" cross-correlations technique<sup>1</sup>, of the dynamic pattern between exams and each of the non-advertising variables to determine whether the variable under consideration has a significant immediate or delayed effect. Advertising variables were not considered at this time, in order to reduce the variability in exams before trying to measure the effects of the individual advertising media.
3. Assumption that each non-advertising variable would have an immediate effect. In some cases, the variable was dropped from further consideration after analyzing the cross-correlations. In other cases, a delayed effect was added to the current-effect hypothesis.
4. Use of multiple regression to verify that each factor had significant marginal effect on exam variation. A multivariate model was developed to best explain the portion of exam variation determined by the covariate factors. This model is referred to as the "pre-advertising model."
5. Development of a time series of residuals from the pre-advertising model to represent that part of the exam variation that is determined by advertising and unidentifiable factors that affect recruiting.
6. Use of the Box Jenkins technique to identify the dynamic pattern between changes in advertising spending levels by individual media and variation in the residual series.
7. Estimation of the parameters of a model including both non-advertising and advertising variables.

The specifics of implementing the strategy for building the Category I-III A model is discussed in Section A.8, and for building the Category IIIB-IV model in Section A.9. This detail includes discussion of data pattern analysis, seasonality, special data adjustments, comments on the cross-correlations, and results of multiple regression runs.

---

<sup>1</sup> The analysis of cross correlations is described in detail by George E.P. Box and Gwilym M. Jenkins in Time Series Analysis, published by Holden Day (San Francisco, 1976).

#### Section A.8. WHAT WERE THE KEY FINDINGS OF EXAMINING THE CATEGORY I-III A EXAMS?

This discussion starts with the inspection of data patterns, continues with the testing of model specification structures, and concludes with the description of a final model. In the process, all key findings are supported with detailed analyses.

##### Section A.8.1 What Seasonality Was Found For Category I-III A Exams?

Regular seasonal variation in the exam data reflects both seasonality in the environmental factors affecting the availability of candidates for enlistment and seasonal patterns in the manpower processing patterns of the Army.

In order to identify these seasonal patterns a standard technique was used: the ratio of each month's exam level to a twelve-month moving average was computed (Table A.8.1.1).

As seen in the Table, January was consistently higher while both the April-May and September-October periods were consistently lower than average. We therefore hypothesized that the use of dummy variable indicators - one for January, another for April and May, and a third for September and October - would be appropriate.

With the seasonal pattern thus identified, we looked at the data for other systematic patterns, and identified a GI Bill effect which is discussed in the next section.

Table A.8.1.1. Ratio of CAT I-III A Exams to a Twelve-Month  
Moving Average For Every Month of Data

|     | <u>1976</u> | <u>1977</u> | <u>1978</u> | <u>1979</u> | <u>1980</u> |
|-----|-------------|-------------|-------------|-------------|-------------|
| JAN |             | 1.04        | 1.14        | 1.25        | 1.24        |
| FEB |             | 1.04        | 1.08        | 1.05        | 1.22        |
| MAR |             | 1.10        | 1.11        | 1.09        | 1.01        |
| APR |             | .91         | .85         | .90         |             |
| MAY |             | .81         | .73         | .89         |             |
| JUN |             | 1.01        | 1.03        | .93         |             |
| JUL |             | .94         | .93         | 1.09        |             |
| AUG |             | 1.01        | 1.08        | 1.04        |             |
| SEP |             | .85         | .90         | .79         |             |
| OCT | .90         | .90         | .91         | .85         |             |
| NOV | 1.20        | 1.12        | 1.02        | .91         |             |
| DEC | 1.11        | 1.06        | .95         | .81         |             |

Section A.8.2 Why And How Was Exam Data Adjusted To Remove Effect Of GI Bill Termination?

A plot of the monthly Exam series clearly shows a drop beginning in January 1977 (See figure A.8.2.1). This change in the process level coincides with the termination of the GI Bill of Rights as of the end of 1976, as well as with an overall lowering of resources applied to the recruiting process.

In addition to the drop in the level, the number of exams processed in December 1976 was extraordinarily high. It was reasonable to assume that this represented a last minute system "loading" to take advantage of the GI Bill; therefore, this period was treated as an "outlier," and the number was replaced by the pre-1977 process mean. The reduction in the exam rate was captured and modeled with a 1-0 dummy variable, which signalled when the GI Bill was in effect. We felt it necessary to take the effect of this process change out of the data in order to effectively evaluate the correlational pattern of exams with the other variables. The data was adjusted by subtracting from the exam series the mean computed for the data prior to January 1977 and the mean computed after January 1977.

The resulting residual series was used as the performance measure in investigating the relationship of recruiting with the other factors. This series is seen in Figure A.8.2.2, and is called REXA.

With the regular patterns in the data identified in terms of seasonality and GI Bill Termination, we could go on to an examination of the impact of the non-advertising variables.

Value of Process Mean

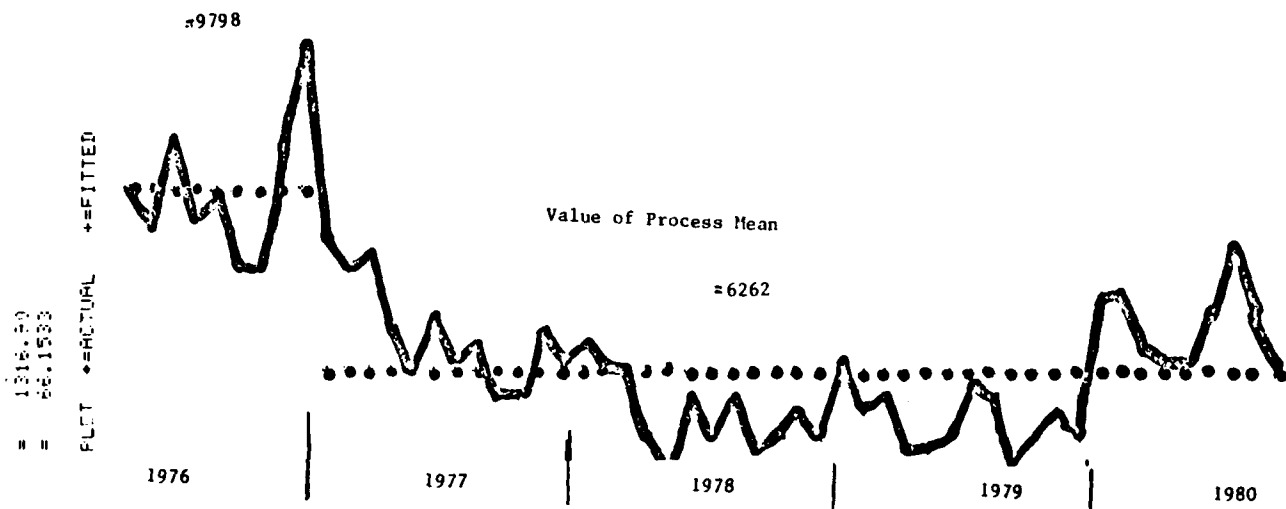


Figure A.8.2.1. Effect of GI Bill on Category I-III Exams

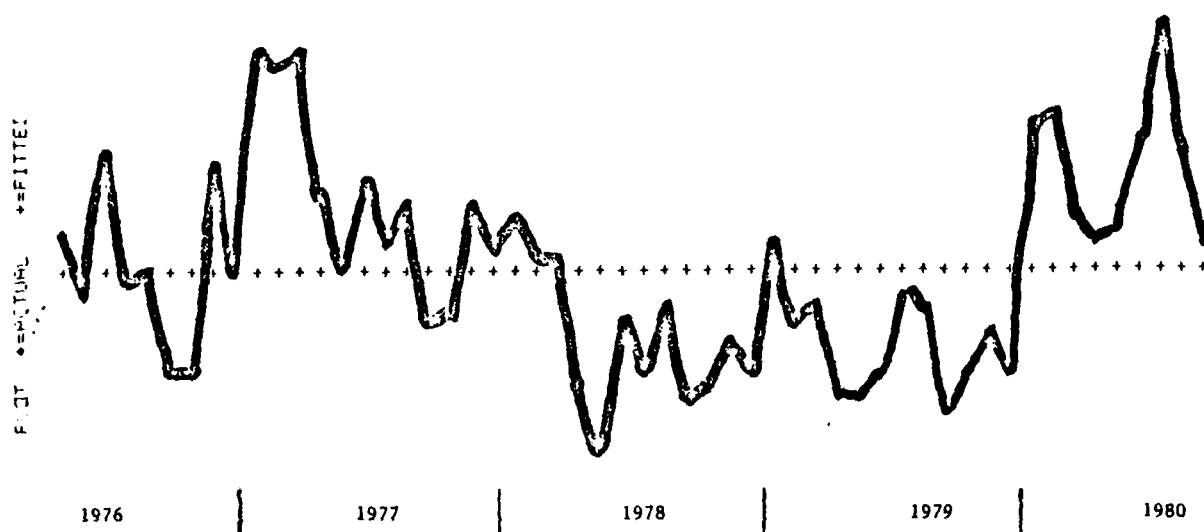


Figure A.8.2.2. Category I-III A Exam Residuals (GI Bill termination effect out)

Section A.8.3. How Do The Key Variables Other Than Advertising Impact  
Exam Variation?

The basic relationship between exam variation and each of the non-advertising factors expected to be key determinants of the process was examined using cross-correlation analysis.

We used the Box Jenkins method of "pre-whitening" the data to remove systematic variations before computing the cross correlations.

Evaluation of the Cross-Correlations

The analysis of the pattern in the cross-correlations was designed to provide insight into the delay structure between changes in the key factors and exam variation (adjusted for GI Bill termination). The "pre-whitened" cross-correlations between the adjusted exam series (called REXA) and each of the factors under consideration were computed for the current period and for lags of up to one year.

The following guidelines were applied in using the patterns seen in the cross-correlations to determine the structure of the variables to be included in the model:

- ° Current effects were always assumed to be appropriate and would be tested in the regression model even if they did not show up in the cross-correlations.
- ° Effects at those lags where the cross-correlations had signs that are opposite to the way the process would reasonably be expected to operate were not considered.
- ° Effects at lags where significant cross-correlations appeared to be the result of systematic variation due to a factor other than the variable under investigation, such as joint seasonality, were not considered.

The patterns and key observations for each of the variables is discussed in turn. The actual cross-correlations that were evaluated follow the discussion in tables A.8.3.1 through A.8.3.5, and the graphs of the impulse response weights are included in the tables. These weights are a simple transformation of the cross-correlations, and outline the distributed impact, at each lag, caused by a "spike" in the value of the variable being examined.

#### YOUTH UNEMPLOYMENT:

There was a significant cross-correlation at the one month lag. This suggests that increased unemployment has some effect on enlistment (See Figure A.8.3.1). An average of the current and previous period unemployment rate was hypothesized to capture the effect.

#### RECRUITING OBJECTIVES:

The cross-correlations between the residual exam series and recruiting objectives show a positive effect for the current period and for all lags, with particularly strong effects at lags 2, 7, and 10 (See Figure A.8.3.2).

There is a strong delay structure built into the relation between these two series since the objectives are for accessions, which lag behind the exam completion rate due to the Delayed Entry Program. In addition, both series have seasonal fluctuations, and the differences in seasonal peaks induce an apparent lag structure. Therefore, a delay structure was not deemed appropriate and only the current effects were used.

#### RELATIVE PAY (El Pay/minimum wage):

The cross-correlation between the adjusted exam series and the relative pay ratio showed positive responses for the current period and for lags of 3 and 8 periods (See Figure A.8.3.3).

Again, there is seasonality in the two series. El pay is raised every October at the beginning of the fiscal year, and the minimum wage rate is increased three months later in January. This would seem to account for the apparent delay structure, so only the current effect was considered. Although the current effect is not larger than two standard deviations, it was hypothesized given the strong theoretical connection between the demand for a job and the pay for the job.

#### PRODUCTION RECRUITERS:

The cross-correlations between the number of production recruiters and the adjusted exam series show positive response for the current period and for the first three lags (See Figure A.8.3.4).

Although none of the correlations were larger than two standard deviations, an immediate effect was hypothesized, since discussions with recruiters indicate that recruiters try to schedule the prospect to take the exam within days of first contact.

**NAVY ADVERTISING:**

The cross correlations between monthly Navy advertising expenditures and the adjusted exam series were negative at all lags, but none were as large as one standard deviation (See Figure A.8.3.5).

This suggests directional but rather weak evidence that increases in Navy advertising expenditure levels result in a depressing effect on the number of people who are stimulated to pursue Army enlistment by taking the ASVAB exams. Since the evidence was weak, and also since the Navy advertising expenditure data was only available through 1978, this variable was dropped from further consideration.

**1000**

53

1



1

1000

## CROSS CORRELATIONS

SERIES 1 - PREWHITENED RECD  
 SERIES 2 - PREWHITENED REWA

MEAN OF SERIES 1 =  $-.12565E+00$   
 ST. DEV. OF SERIES 1 =  $.18748E+01$   
 MEAN OF SERIES 2 =  $-.90674E-02$   
 ST. DEV. OF SERIES 2 =  $.81278E+00$

| NUMBER OF LAGS<br>ON SERIES 1 | CROSS<br>CORRELATION | NUMBER OF LAGS<br>ON SERIES 2 | CROSS<br>CORRELATION |
|-------------------------------|----------------------|-------------------------------|----------------------|
| 0                             | .326                 | 0                             | .326                 |
| 1                             | .231                 | 1                             | -.073                |
| 2                             | -.004                | 2                             | .091                 |
| 3                             | .286                 | 3                             | .016                 |
| 4                             | .163                 | 4                             | -.086                |
| 5                             | .185                 | 5                             | -.152                |
| 6                             | .132                 | 6                             | -.064                |
| 7                             | .352                 | 7                             | -.194                |
| 8                             | .217                 | 8                             | -.102                |
| 9                             | .220                 | 9                             | -.041                |
| 10                            | .341                 | 10                            | -.073                |
| 11                            | .229                 | 11                            | -.051                |
| 12                            | .229                 | 12                            | -.177                |

APPROXIMATE STANDARD ERROR FOR CROSS CORRELATIONS IS .136

ESTIMATED IMPULSE RESPONSE WEIGHTS V(K)

| VALUES | -.191 | 0.                   | .191  |
|--------|-------|----------------------|-------|
|        | ***** | *****                | ***** |
| .141   | 0     | XXXXXXXXXXXXXXXXXXXX |       |
| .100   | 1     | XXXXXXXXXXXX         |       |
| -.002  | 2     | X                    |       |
| .124   | 3     | XXXXXXXXXXXXXXXXXXXX |       |
| .071   | 4     | XXXXXXXXXX           |       |
| .080   | 5     | XXXXXXXXXXXX         |       |
| .057   | 6     | XXXXXXXXXX           |       |
| .153   | 7     | XXXXXXXXXXXXXXXXXXXX |       |
| .094   | 8     | XXXXXXXXXXXX         |       |
| .095   | 9     | XXXXXXXXXXXX         |       |
| .148   | 10    | XXXXXXXXXXXXXXXXXXXX |       |
| .099   | 11    | XXXXXXXXXXXX         |       |
| .099   | 12    | XXXXXXXXXXXX         |       |

AUTOBJ TENTATIVELY SUGGESTS A TRANSFER MODEL OF THE FORM

$R = 1$ ,  $S = 0$  AND DELAY = 0

Figure A.8.3.2. Cross-Correlations  
 CAT I-III Exams (Adjusted) vs. Recruiter Objectives

CROSS CORRELATIONS

REF ID: A1 - PREWHITENED RE1  
REF ID: A2 - PREWHITENED REKA

```
MEAN OF SERIES 1      = -.37562E-02
ST. DEV. OF SERIES 1  = .17855E-01
MEAN OF SERIES 2      = -.89751E-02
ST. DEV. OF SERIES 2  = .68145E+00
```

| NUMBER OF LAGS<br>ON SERIES 1 | CROSS<br>CORRELATION | NUMBER OF LAGS<br>ON SERIES 2 | CROSS<br>CORRELATION |
|-------------------------------|----------------------|-------------------------------|----------------------|
| 0                             | .180                 | 0                             | .180                 |
| 1                             | .078                 | 1                             | -.076                |
| 2                             | .053                 | 2                             | .040                 |
| 3                             | .193                 | 3                             | .043                 |
| 4                             | .020                 | 4                             | .158                 |
| 5                             | -.260                | 5                             | -.065                |
| 6                             | -.046                | 6                             | -.081                |
| 7                             | -.085                | 7                             | -.025                |
| 8                             | .139                 | 8                             | .031                 |
| 9                             | .060                 | 9                             | .066                 |
| 10                            | -.050                | 10                            | .004                 |
| 11                            | -.061                | 11                            | .022                 |
| 12                            | -.295                | 12                            | -.013                |

APPROXIMATE STANDARD ERROR FOR CROSS CORRELATIONS IS .136

## ESTIMATED IMPULSE RESPONSE WEIGHTS V(K)

```

VALUES      -14.082      0.      14.082
             .+++++.+++++.+++++.+++++.
6.659       0             xxxxxxxxxxxx
2.992       1             xxxxxx
2.032       2             xxxx
7.371       3             xxxxxxxxxxxx
.748        4             xx
-9.936      5             xxxxxxxxxxxx
-1.768      6             xxxxx
-3.250      7             xxxxxx
5.317       8             xxxxxxxxxx
2.281       9             xxxxx
-1.907      10            xxxxx
-2.318      11            xxxxx
-11.265     12            xxxxxxxxxxxx

```

AUTOBU TENTATIVELY SUGGESTS A TRANSFER MODEL OF THE FORM  
 $R = 0$ ,  $S = 0$  AND  $DELAY = 0$

- Figure A.8.3.3. Cross-Correlations  
CAT I-III A Exams (Adjusted) vs. Relative Pay



## CROSS CORRELATIONS

SERIES 1 - PREWHITENED TND  
 SERIES 2 - PREWHITENED PEAR

MEAN OF SERIES 1 =  $-1.35990E-02$   
 ST. DEV. OF SERIES 1 =  $.30140E+00$   
 MEAN OF SERIES 2 =  $.38539E-01$   
 ST. DEV. OF SERIES 2 =  $.10872E+01$

| NUMBER OF LAGS<br>ON SERIES 1 | CROSS<br>CORRELATION | NUMBER OF LAGS<br>ON SERIES 2 | CROSS<br>CORRELATION |
|-------------------------------|----------------------|-------------------------------|----------------------|
| 0                             | -.020                | 0                             | -.020                |
| 1                             | -.072                | 1                             | -.073                |
| 2                             | -.117                | 2                             | .122                 |
| 3                             | -.109                | 3                             | .111                 |
| 4                             | -.078                | 4                             | .079                 |
| 5                             | -.065                | 5                             | -.056                |
| 6                             | -.147                | 6                             | -.106                |

APPROXIMATE STANDARD ERROR FOR CROSS CORRELATIONS IS .133

ESTIMATED IMPULSE RESPONSE WEIGHTS WAP

|        |                           |              |      |
|--------|---------------------------|--------------|------|
| VALUES | -.665                     | 0.           | .665 |
|        | .*****.*****.*****.*****. |              |      |
| -.003  | 0                         | XXXX         |      |
| -.259  | 1                         | XXXXXXXXXX   |      |
| -.481  | 2                         | XXXXXXXXXXXX |      |
| -.393  | 3                         | XXXXXXXXXXXX |      |
| -.330  | 4                         | XXXXXXXXXX   |      |
| -.236  | 5                         | XXXXXXXXXX   |      |
| -.532  | 6                         | XXXXXXXXXXXX |      |

AUTOBJ TENTATIVELY SUGGESTS A TRANSFER MODEL OF THE FORM  
 $P = 0, I = 0$  AND DELAY = 0

Figure A.8.3.5. Cross-Correlations  
 CAT I-III A Exams (Adjusted) Vs. Navy Advertising

#### Section A.8.4. What Is The Pre-Advertising Model?

The patterns identified in the cross-correlation analysis were used to determine which of the variables under consideration should be included as key co-variates to advertising in the final model specifications.

With the key variables and the delay structure impacting exam variation identified, we developed a model specification called the Pre-Advertising model.

This model structures the relationship between exam variation and the key factors, with the exception of advertising. The parameters can be estimated using multiple regression.

With the pre-exam model identified, we can estimate the variation in exams for each month determined by the levels of the non-advertising variables. Subtracting these estimated values from the actual exam data leaves a time series whose variation should be determined by advertising variation and the net impact of all unidentified factors. Ideally, the impact of the unidentified variables will be small and this residual series can be used to effectively examine the impact of varying advertising spending levels.

The preceding correlation analyses suggest that the following factors should be included in the pre-advertising model:

- ° GI Bill termination (December 1976) - 1-0 dummy variable
- ° Youth Unemployment - average of current and one period lag
- ° Recruiting objectives - current period effect
- ° Relative pay - current period effect
- ° Production recruiters - current period effect
- ° Seasonality - 1-0 dummy variables
  - January - positive increment
  - April, May - negative increment
  - September, October - negative increment
- ° Auto-Regressive structure

Using multiple regression in order to jointly estimate the coefficients of the factors, we identified a model specification with computed "t" statistics greater than 2.0 for all variables with the exception of the April-May seasonal specification. This seasonal effect was apparently confounded with other factors and reflected redundant information; therefore, it was dropped from the specification list. The coefficients were estimated again under the reduced specification.

All of the estimated coefficients had computed "t" statistics greater than 2.0, and the resulting linear model was considered the appropriate pre-advertising model. The computed Durbin Watson statistic of 1.9 suggests no indication of a problem with auto-correlation in the residuals; therefore, an auto-regressive structure was not used.

The model is presented in Figure A.8.4.1.

This model specification explains the monthly variations in exams very well. The high percentage of explained variance (92%) and the lack of auto-correlation are evidence that the variables identified are key to describing the process.

The residuals of this model are seen in Figure A.8.4.2. These residuals are called RESX. They represent a measure of exam-taking actively adjusted for the key non-advertising factors. As such, the residuals serve as the criteria of recruiting success in the next section. These residuals account for a small proportion of exam-taking since the pre-advertising model explains 92% of the variation in exams. In fact, the residuals may be too small to completely reflect the variation in advertising. This is possible since some advertising effects may have been captured in the pre-advertising model by non-advertising variables, which would occur if there were a correlation between advertising and the non-advertising variables.

| <u>VARIABLE</u>      | <u>COEFFICIENT</u> | <u>"t"</u> |
|----------------------|--------------------|------------|
| Constant             | -16,860            | -6.6       |
| GI Bill Dummy        | 2,702              | 8.8        |
| Unemployment (0-1)   | 402                | 8.1        |
| Recruiter Objectives | .070               | 3.5        |
| Relative Pay         | 7,535              | 4.3        |
| Recruiters           | 1.79               | 4.8        |
| January              | 1,233              | 4.0        |
| September-October    | -732               | -3.2       |
| Durbin Watson        | 1.9                |            |
| Multiple R Squared   | .92                |            |

Figure A.8.4.1. The Pre-Advertising Model for I-III A Exams

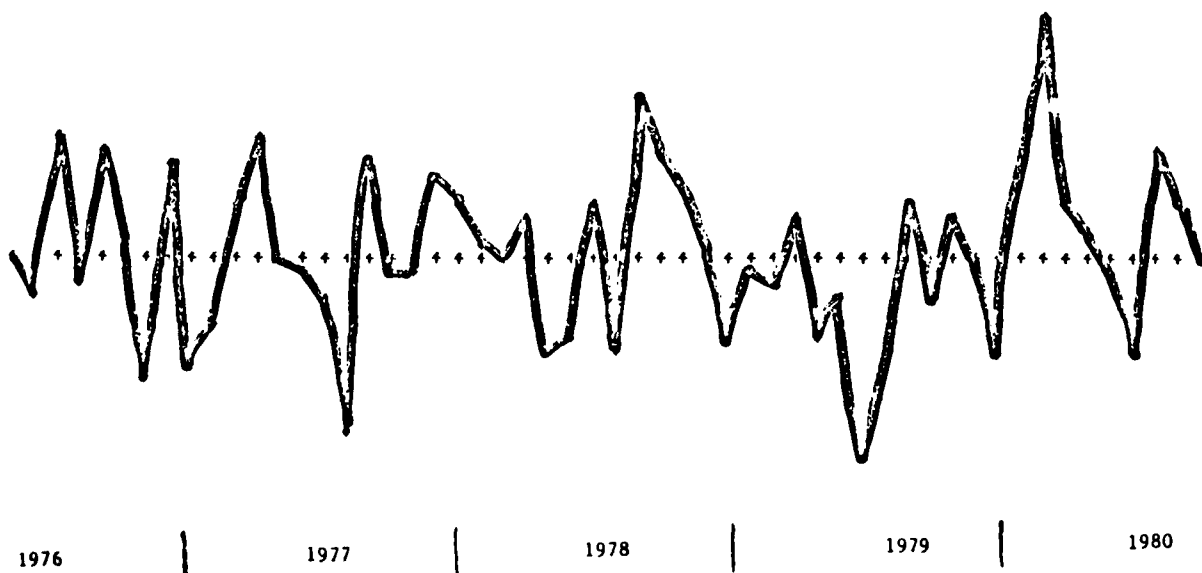


Figure A.8.4.2. Category I-III Exam Residuals  
(From Pre-Advertising Model)

Section A.8.5. What Effects Were Hypothesized For Each Of The Media?

Once the effects of the non-advertising variables were removed from exam variation, we addressed the analysis of advertising. Cross-correlations were used to identify the immediate and delayed effects of the advertising media. As in the analysis of the non-advertising variables, cross-correlations were computed between the residual series and each of the individual media variables for the current period, as well as for lags up to 12 periods (See Figure A.8.5.1).

The results of the individual cross-correlations (seen in Figures A.8.5.2 through A.8.5.9) are not clear cut. It would appear from the patterns that came out of the cross-correlation analysis that we attempted to achieve too high a level of resolution to identify specific response patterns for each medium.

The cross-correlation analysis provides an indication of the length of the response delays.

Figure A.8.5.1 provides a summary of the delay structures by indicating for each media component the lags at which the largest cross-correlations occurred. Two key characteristics emerge:

- ° All of the media, with the exception of television, show delays in the response at medium to long lags (4 to 12 months)
- ° Three media - TV, newspapers, and local advertising - show immediate (current period) or nearly immediate (1 period lag) response patterns.

The results of these analyses suggested that we concentrate on media aggregates, rather than trying to model the effects of individual media. We therefore examined cross-correlation for a total aggregate (see figure A.8.5.9).

The results of this total media aggregation are clearer. In this cross-correlation we see some evidence of an immediate effect up to one month after exposure, and evidence of a delayed effect of between 3 and 11 months.

In neither case do the cross-correlations for the aggregate media exceed two standard deviations. This is due to the intercorrelation among the independent variables (see Figure A.8.5.8). Aggregate advertising has a correlation of .17 with the GI Bill indicator and unemployment, a correlation of .13 with the January indicator, and a correlation of .43 with the September-October indicator. These correlations are nearly as great or greater than the correlation between advertising XMED and exams or exam residuals.

|                   | <u>LAG</u> | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|-------------------|------------|---|---|---|---|---|---|---|---|---|---|----|----|----|
| <u>MEDIUM</u>     |            |   |   |   |   |   |   |   |   |   |   |    |    |    |
| NEWSPAPERS        |            | X |   |   |   |   |   |   |   |   | X |    |    |    |
| RADIO             |            |   |   |   |   | X |   |   |   |   |   | X  |    |    |
| OUTDOOR           |            |   |   |   | X |   |   | X |   |   |   |    |    | X  |
| REGULAR MAGAZINES |            |   |   |   | X | X |   |   |   |   |   |    |    |    |
| SPECIAL MAGAZINES |            |   |   |   |   |   |   | X |   | X |   |    |    | X  |
| DIRECT MAIL       |            |   |   |   |   | X |   |   |   |   |   |    | X  |    |
| LOCAL             |            | X |   |   |   | X |   |   |   |   | X |    |    |    |
| TELEVISION        |            |   | X |   |   |   |   |   |   |   |   |    |    |    |

Figure A.8.5.1. Category I-III A Exams Pre-Advertising Residuals  
(Advertising Impacts are Strong at Indicated Lags)

# ADVERTISING PRESSURE VARIABLES:

The pattern observed in the cross-correlations across the individual and aggregate media can be summarized as follows:

- Some mid- and long-term delayed responses for all of the media (with the exception of TV).
- Some immediate (current period or one period delay) responses for three of the media (TV, newspapers, and local advertising).

These patterns suggested the following specification of advertising as two aggregate "pressure" variables:

- (1) Total Media Aggregate with long-term delay: a moving sum of all media lagged four to eleven periods. The advertising pressure affecting current period exam levels is the result of the spending inventory built up from 11 months ago through four months ago
- (2) Immediate Response: the sum of current period spending for newspapers and local advertising plus the most previous period spending for television.

The total media aggregate identified with the long-term delay structure can be viewed from two perspectives:

- The level of exam activity in any given month is directly related to the level of advertising inventory reflecting total advertising spending for an eight month period going back 11 months through four months ago.
- If there is an increase in advertising pressure in a specific month, the resulting impact on processed exams will not be seen for four months, and then the increased activity will continue at the same level for another nine months.

Both perspectives are an accurate interpretation of the distributed lag structure, but the first way of viewing the system requires less concern with the pattern of the lag weights, and easily accommodates the equal weight specification.

The two advertising variables, one capturing the immediate response of exam levels to changes in advertising spending, and one capturing the delayed can now be combined with the non-advertising variable to specify a complete model. This model will be discussed in the next section.

## CROSS CORRELATIONS

SERIES 1 - PREWHITENED DMS  
 SERIES 2 - PREWHITENED RESX

MEAN OF SERIES 1 =  $-.22029E-01$   
 ST. DEV. OF SERIES 1 =  $.20266E+00$   
 MEAN OF SERIES 2 =  $-.52319E-03$   
 ST. DEV. OF SERIES 2 =  $.51517E+00$

| NUMBER OF LAGS<br>ON SERIES 1 | CROSS<br>CORRELATION | NUMBER OF LAGS<br>ON SERIES 2 | CROSS<br>CORRELATION |
|-------------------------------|----------------------|-------------------------------|----------------------|
| 0                             | .156                 | 0                             | .156                 |
| 1                             | -.134                | 1                             | -.222                |
| 2                             | -.147                | 2                             | .111                 |
| 3                             | .142                 | 3                             | .059                 |
| 4                             | -.012                | 4                             | -.063                |
| 5                             | -.017                | 5                             | .147                 |
| 6                             | -.173                | 6                             | -.096                |
| 7                             | .057                 | 7                             | .111                 |
| 8                             | -.144                | 8                             | .063                 |
| 9                             | .240                 | 9                             | .103                 |
| 10                            | .101                 | 10                            | -.111                |
| 11                            | -.095                | 11                            | -.093                |
| 12                            | .201                 | 12                            | -.010                |

APPROXIMATE STANDARD ERROR FOR CROSS CORRELATIONS IS .136

ESTIMATED IMPULSE RESPONSE WEIGHTS W(K)

| VALUES |    | - .763                    | 0.                   | .763 |
|--------|----|---------------------------|----------------------|------|
|        |    | .+++++.+++++.+++++.+++++. |                      |      |
| .397   | 0  |                           | XXXXXXXXXX           |      |
| -.339  | 1  |                           | XXXXXXXXXX           |      |
| -.374  | 2  |                           | XXXXXXXXXX           |      |
| .361   | 3  |                           | XXXXXXXXXX           |      |
| -.032  | 4  |                           | XX                   |      |
| -.044  | 5  |                           | XX                   |      |
| -.441  | 6  | XXXXXXXXXXXX              |                      |      |
| .146   | 7  |                           | XXXXXX               |      |
| -.366  | 8  | XXXXXXXXXXXX              |                      |      |
| .611   | 9  |                           | XXXXXXXXXXXXXXXXXXXX |      |
| .256   | 10 |                           | XXXXXXXXXX           |      |
| -.241  | 11 | XXXXXXX                   |                      |      |
| .511   | 12 |                           | XXXXXXXXXXXXXXXXXXXX |      |

AUTOBJ TENTATIVELY SUGGESTS A TRANSFER MODEL OF THE FORM  
 $R = 0, S = 0$  AND DELAY = 0

Figure A.8.5.2. Cross-Correlations  
 Category I-III A Exams (Residuals from Pre-Advertising)  
 vs. Newspaper Advertising

## CROSS CORRELATIONS

SERIES 1 - PREWHITENED DFB  
 SERIES 2 - PREWHITENED PECK

MEAN OF SERIES 1 = .19607E+02  
 ST. DEV. OF SERIES 1 = .14357E+03  
 MEAN OF SERIES 2 = -.67557E-04  
 ST. DEV. OF SERIES 2 = .62733E+00

| NUMBER OF LAGS<br>ON SERIES 1 | CROSS<br>CORRELATION | NUMBER OF LAGS<br>ON SERIES 2 | CROSS<br>CORRELATION |
|-------------------------------|----------------------|-------------------------------|----------------------|
| 0                             | -.088                | 0                             | -.088                |
| 1                             | .007                 | 1                             | .106                 |
| 2                             | -.018                | 2                             | .087                 |
| 3                             | -.010                | 3                             | -.213                |
| 4                             | .090                 | 4                             | .067                 |
| 5                             | .018                 | 5                             | -.069                |
| 6                             | -.092                | 6                             | -.005                |
| 7                             | -.075                | 7                             | .209                 |
| 8                             | .043                 | 8                             | -.014                |
| 9                             | -.021                | 9                             | -.097                |
| 10                            | .147                 | 10                            | .126                 |
| 11                            | .053                 | 11                            | -.040                |
| 12                            | -.083                | 12                            | -.083                |

APPROXIMATE STANDARD ERROR FOR CROSS CORRELATIONS IS .136

## ESTIMATED IMPULSE RESPONSE WEIGHTS V(K)

| VALUES |    | -.001      | 0.                 | .001  |
|--------|----|------------|--------------------|-------|
|        |    | +++++      | +++++              | +++++ |
| -.000  | 0  | XXXXXXXXXX |                    |       |
| .000   | 1  |            | XX                 |       |
| -.000  | 2  |            | XXX                |       |
| -.000  | 3  |            | XX                 |       |
| .000   | 4  |            | XXXXXXXXXX         |       |
| .000   | 5  |            | XXX                |       |
| -.000  | 6  | XXXXXXXXXX |                    |       |
| -.000  | 7  | XXXXXXXXXX |                    |       |
| .000   | 8  |            | XXXXXX             |       |
| -.000  | 9  |            | XXX                |       |
| .001   | 10 |            | XXXXXXXXXXXXXXXXXX |       |
| .000   | 11 |            | XXXXXXX            |       |
| -.000  | 12 | XXXXXXXXXX |                    |       |

AUTOBJ TENTATIVELY SUGGESTS A TRANSFER MODEL OF THE FORM  
 $R = 0, S = 0$  AND DELAY = 0

Figure A.8.5.3. Cross-Correlations  
 Category I-III A Exams (Residuals from Pre-Advertising)  
 vs. Radio Advertising

## 1

1.

**C**

1

1

1

{

1

—

## CROSS CORRELATIONS:

SERIES 1 - PREWHITENED DPG2  
 SERIES 2 - PREWHITENED PECK

MEAN OF SERIES 1 =  $-6.0136E-01$   
 ST. DEV. OF SERIES 1 =  $.16578E+00$   
 MEAN OF SERIES 2 =  $.53090E-02$   
 ST. DEV. OF SERIES 2 =  $.49841E+00$

| NUMBER OF LAGS<br>ON SERIES 1 | CROSS<br>CORRELATION | NUMBER OF LAGS<br>ON SERIES 2 | CROSS<br>CORRELATION |
|-------------------------------|----------------------|-------------------------------|----------------------|
| 0                             | .009                 | 0                             | .009                 |
| 1                             | .030                 | 1                             | -.122                |
| 2                             | -.119                | 2                             | -.097                |
| 3                             | .283                 | 3                             | -.153                |
| 4                             | .142                 | 4                             | -.374                |
| 5                             | .099                 | 5                             | -.271                |
| 6                             | .010                 | 6                             | .023                 |
| 7                             | -.034                | 7                             | -.002                |
| 8                             | .108                 | 8                             | .092                 |
| 9                             | .099                 | 9                             | .157                 |
| 10                            | -.030                | 10                            | -.041                |
| 11                            | -.140                | 11                            | -.047                |
| 12                            | -.040                | 12                            | .035                 |

APPROXIMATE STANDARD ERROR FOR CROSS CORRELATIONS IS .136

## ESTIMATED IMPULSE RESPONSE WEIGHTS V(K)

| VALUES | -1.062 | 0.                   | 1.062 |
|--------|--------|----------------------|-------|
|        | +++++  | +++++                | +++++ |
| .038   | 0      | XX                   |       |
| .039   | 1      | XXX                  |       |
| -.158  | 2      | XXXXXXXX             |       |
| .350   | 3      | XXXXXXXXXXXXXXXXXXXX |       |
| .426   | 4      | XXXXXXXXXXXX         |       |
| .298   | 5      | XXXXXXXX             |       |
| .059   | 6      | XX                   |       |
| -.103  | 7      | XXX                  |       |
| .325   | 8      | XXXXXXXX             |       |
| .298   | 9      | XXXXXXXX             |       |
| -.030  | 10     | XXX                  |       |
| -.421  | 11     | XXXXXXXXXXXX         |       |
| -.122  | 12     | XXX                  |       |

AUTOBJ TENTATIVELY SUGGESTS A TRANSFER MODEL OF THE FORM  
 $P = 0, S = 0$  AND DELAY = 0

Figure A.8.5.5. Cross-Correlations  
 Category I-III A Exams (Residuals from Pre-Advertising)  
 vs. Reg. Magazine Advertising

## CROSS CORRELATIONS

SERIES 1 - PREWHITENED DSP2  
 SERIES 2 - PREWHITENED RESX

MEAN OF SERIES 1 =  $-.30371E-01$   
 ST. DEV. OF SERIES 1 =  $.42372E+00$   
 MEAN OF SERIES 2 =  $.88334E-02$   
 ST. DEV. OF SERIES 2 =  $.50217E+00$

| NUMBER OF LAGS<br>ON SERIES 1 | CROSS<br>CORRELATION | NUMBER OF LAGS<br>ON SERIES 2 | CROSS<br>CORRELATION |
|-------------------------------|----------------------|-------------------------------|----------------------|
| 0                             | .094                 | 0                             | .094                 |
| 1                             | -.047                | 1                             | -.114                |
| 2                             | .099                 | 2                             | -.082                |
| 3                             | -.056                | 3                             | -.096                |
| 4                             | -.124                | 4                             | -.145                |
| 5                             | .111                 | 5                             | .067                 |
| 6                             | .255                 | 6                             | -.013                |
| 7                             | .049                 | 7                             | .090                 |
| 8                             | .278                 | 8                             | -.077                |
| 9                             | -.036                | 9                             | -.092                |
| 10                            | .037                 | 10                            | -.008                |
| 11                            | .238                 | 11                            | .179                 |
| 12                            | .056                 | 12                            | .041                 |

APPROXIMATE STANDARD ERROR FOR CROSS CORRELATIONS IS .136

ESTIMATED IMPULSE RESPONSE WEIGHTS V(K)

| VALUES |    | -.412 | 0.               | .412  |
|--------|----|-------|------------------|-------|
|        |    | ***** |                  | ***** |
| .112   | 0  |       | XXXXXX           |       |
| -.055  | 1  |       | XXXX             |       |
| .118   | 2  |       | XXXXXXXX         |       |
| -.066  | 3  |       | XXXX             |       |
| -.147  | 4  |       | XXXXXXXX         |       |
| .132   | 5  |       | XXXXXXXX         |       |
| .302   | 6  |       | XXXXXXXXXXXXXXXX |       |
| .058   | 7  |       | XXXX             |       |
| .329   | 8  |       | XXXXXXXXXXXXXXXX |       |
| -.042  | 9  |       | XXX              |       |
| .044   | 10 |       | XXX              |       |
| .292   | 11 |       | XXXXXXXXXXXXXXXX |       |
| .067   | 12 |       | XXXX             |       |

AUTOBJ TENTATIVELY SUGGESTS A TRANSFER MODEL OF THE FORM  
 $P = 0, S = 0$  AND DELAY = 0

Figure A.8.5.6. Cross-Correlations  
 Category I-IIIA Exams (Residuals from Pre-Advertising)  
 vs. Special Magazine Advertising

## CROSS CORRELATIONS

SERIES 1 - PREWHITENED DIMA  
 SERIES 2 - PREWHITENED PEIN

MEAN OF SERIES 1 =  $-.23466E-01$   
 ST. DEV. OF SERIES 1 =  $.21759E+00$   
 MEAN OF SERIES 2 =  $-.45980E-03$   
 ST. DEV. OF SERIES 2 =  $.53227E+00$

| NUMBER OF LAGS<br>ON SERIES 1 | CROSS<br>CORRELATION | NUMBER OF LAGS<br>ON SERIES 2 | CROSS<br>CORRELATION |
|-------------------------------|----------------------|-------------------------------|----------------------|
| 0                             | -.026                | 0                             | -.026                |
| 1                             | .020                 | 1                             | .218                 |
| 2                             | -.072                | 2                             | .101                 |
| 3                             | -.331                | 3                             | -.206                |
| 4                             | .387                 | 4                             | -.186                |
| 5                             | .061                 | 5                             | .217                 |
| 6                             | -.021                | 6                             | -.195                |
| 7                             | -.016                | 7                             | .306                 |
| 8                             | -.249                | 8                             | .122                 |
| 9                             | -.212                | 9                             | -.289                |
| 10                            | .089                 | 10                            | .190                 |
| 11                            | .164                 | 11                            | -.043                |
| 12                            | -.035                | 12                            | .007                 |

APPROXIMATE STANDARD ERROR FOR CROSS CORRELATIONS IS .136

## ESTIMATED IMPULSE RESPONSE WEIGHTS V(K)

| VALUES | -1.183                    | 0.                 | 1.183 |
|--------|---------------------------|--------------------|-------|
|        | .+++++.+++++.+++++.+++++. |                    |       |
| -.064  | 0                         | XX                 |       |
| .048   | 1                         | XX                 |       |
| -.175  | 2                         | XXXX               |       |
| -.809  | 3                         | XXXXXXXXXXXXXXXXXX |       |
| .947   | 4                         | XXXXXXXXXXXXXXXXXX |       |
| .149   | 5                         | XXXX               |       |
| -.052  | 6                         | XX                 |       |
| -.040  | 7                         | XX                 |       |
| -.608  | 8                         | XXXXXXXXXXXX       |       |
| -.518  | 9                         | XXXXXXXXXXXX       |       |
| .218   | 10                        | XXXXX              |       |
| .400   | 11                        | XXXXXXXX           |       |
| -.086  | 12                        | XX                 |       |

AUTOBJ TENTATIVELY SUGGESTS A TRANSFER MODEL OF THE FORM  
 $R = 0, S = 1$  AND DELAY = 3

Figure A.8.5.7. Cross-Correlations  
 Category I-III A Exams (Residuals from Pre-Advertising)  
 vs. Direct Mail Advertising

SERIES 1 - PREWHITENED LCD  
 SERIES 2 - PREWHITENED RECM

MEAN OF SERIES 1 = .32703E+01  
 ST. DEV. OF SERIES 1 = .37899E+02  
 MEAN OF SERIES 2 = .45505E-02  
 ST. DEV. OF SERIES 2 = .53713E+00

| NUMBER OF LAGS<br>ON SERIES 1 | CROSS<br>CORRELATION | NUMBER OF LAGS<br>ON SERIES 2 | CROSS<br>CORRELATION |
|-------------------------------|----------------------|-------------------------------|----------------------|
| 0                             | .204                 | 0                             | .204                 |
| 1                             | .069                 | 1                             | -.137                |
| 2                             | -.181                | 2                             | .158                 |
| 3                             | -.137                | 3                             | -.103                |
| 4                             | .254                 | 4                             | -.331                |
| 5                             | .007                 | 5                             | .024                 |
| 6                             | .007                 | 6                             | .105                 |
| 7                             | .003                 | 7                             | .085                 |
| 8                             | -.143                | 8                             | -.029                |
| 9                             | .167                 | 9                             | .091                 |
| 10                            | .033                 | 10                            | -.047                |
| 11                            | .008                 | 11                            | .112                 |
| 12                            | -.144                | 12                            | .033                 |

APPROXIMATE STANDARD ERROR FOR CROSS CORRELATIONS IS .136

ESTIMATED IMPULSE RESPONSE WEIGHTS V(K)

| VALUES |    | -.005         | 0.            | .005  |
|--------|----|---------------|---------------|-------|
|        |    | +++++         | +++++         | +++++ |
| .003   | 0  |               | XXXXXXXXXXXXX |       |
| .001   | 1  |               | XXXXX         |       |
| -.003  | 2  | XXXXXXXXXXXXX |               |       |
| -.002  | 3  | XXXXXXXXXXXXX |               |       |
| .004   | 4  |               | XXXXXXXXXXXXX |       |
| .000   | 5  |               | X             |       |
| .000   | 6  |               | X             |       |
| .000   | 7  |               | X             |       |
| -.002  | 8  | XXXXXXXXXXXXX |               |       |
| .002   | 9  |               | XXXXXXXXXXXXX |       |
| .000   | 10 |               | XXX           |       |
| .000   | 11 |               | XX            |       |
| -.002  | 12 | XXXXXXXXXXXXX |               |       |

AUTOBJ TENTATIVELY SUGGESTS A TRANSFER MODEL OF THE FORM  
 $R = 0, S = 0$  AND DELAY = 0

Figure A.8.5.8. Cross-Correlations  
 Category I-IIIA Exams (Residuals from Pre-Advertising)  
 vs. Local Advertising

## CROSS CORRELATIONS

SERIES 1 - PREWHITENED DTWE  
 SERIES 2 - PREWHITENED FECH

MEAN OF SERIES 1 = .32450E-01  
 ST. DEV. OF SERIES 1 = .27226E+00  
 MEAN OF SERIES 2 = .42081E-01  
 ST. DEV. OF SERIES 2 = .79578E+00

| NUMBER OF LAGS<br>ON SERIES 1 | CROSS<br>CORRELATION | NUMBER OF LAGS<br>ON SERIES 2 | CROSS<br>CORRELATION |
|-------------------------------|----------------------|-------------------------------|----------------------|
| 0                             | .099                 | 0                             | .099                 |
| 1                             | .387                 | 1                             | .076                 |
| 2                             | -.021                | 2                             | -.198                |
| 3                             | -.038                | 3                             | .127                 |
| 4                             | .066                 | 4                             | -.013                |
| 5                             | -.052                | 5                             | -.111                |
| 6                             | .141                 | 6                             | .052                 |
| 7                             | -.074                | 7                             | -.051                |
| 8                             | .093                 | 8                             | .099                 |
| 9                             | -.232                | 9                             | .102                 |
| 10                            | .023                 | 10                            | -.045                |
| 11                            | -.129                | 11                            | -.068                |
| 12                            | -.141                | 12                            | -.244                |

APPROXIMATE STANDARD ERROR FOR CROSS CORRELATIONS IS .136

ESTIMATED IMPULSE RESPONSE WEIGHTS V(K)

| VALUES | -1.415                           | 0.                   | 1.415 |
|--------|----------------------------------|----------------------|-------|
|        | +++++++,+++++++,+++++++,+++++++, |                      |       |
| .291   | 0                                | XXXXX                |       |
| 1.132  | 1                                | XXXXXXXXXXXXXXXXXXXX |       |
| -.060  | 2                                | XX                   |       |
| -.110  | 3                                | XXX                  |       |
| .193   | 4                                | XXXX                 |       |
| -.151  | 5                                | XXX                  |       |
| .413   | 6                                | XXXXXXXX             |       |
| -.216  | 7                                | XXXX                 |       |
| .271   | 8                                | XXXXX                |       |
| -.679  | 9                                | XXXXXXXXXXXX         |       |
| .068   | 10                               | XX                   |       |
| -.378  | 11                               | XXXXXX               |       |
| -.411  | 12                               | XXXXXX               |       |

AUTOBJ TENTATIVELY SUGGESTS A TRANSFER MODEL OF THE FORM  
 $R = 0$ ,  $S = 0$  AND DELAY = 1

Figure A.8.5.9. Cross-Correlations  
 Category I-III A Exams (Residuals from Pre-Advertising)  
 vs. TV Advertising

## CROSS CORRELATION:

41

SERIES 1 - PREWHITENED XMED  
 SERIES 2 - PREWHITENED PECK

MEAN OF SERIES 1 =  $-4.7036E-01$   
 ST. DEV. OF SERIES 1 =  $.77945E+00$   
 MEAN OF SERIES 2 =  $-1.16798E-02$   
 ST. DEV. OF SERIES 2 =  $.49142E+00$

| NUMBER OF LAGS<br>ON SERIES 1 | CROSS<br>CORRELATION | NUMBER OF LAGS<br>ON SERIES 2 | CROSS<br>CORRELATION |
|-------------------------------|----------------------|-------------------------------|----------------------|
| 0                             | .157                 | 0                             | .157                 |
| 1                             | .135                 | 1                             | .179                 |
| 2                             | -.078                | 2                             | .125                 |
| 3                             | .001                 | 3                             | -.125                |
| 4                             | .071                 | 4                             | -.233                |
| 5                             | .070                 | 5                             | -.055                |
| 6                             | .211                 | 6                             | -.082                |
| 7                             | -.117                | 7                             | .164                 |
| 8                             | .068                 | 8                             | .057                 |
| 9                             | -.092                | 9                             | -.136                |
| 10                            | .067                 | 10                            | -.043                |
| 11                            | .107                 | 11                            | .006                 |
| 12                            | .032                 | 12                            | -.004                |

APPROXIMATE STANDARD ERROR FOR CROSS CORRELATIONS IS .136

ESTIMATED IMPULSE RESPONSE WEIGHTS V(K)

| VALUES |    |                   |
|--------|----|-------------------|
|        |    | -.166 0. .166     |
|        |    | *****             |
| .099   | 0  | XXXXXXXXXXXXX     |
| .085   | 1  | XXXXXXXXXXXXX     |
| -.049  | 2  | XXXXXXXX          |
| .000   | 3  | X                 |
| .045   | 4  | XXXXXX            |
| .044   | 5  | XXXXXX            |
| .133   | 6  | XXXXXXXXXXXXXXXXX |
| -.074  | 7  | XXXXXXXXXXXXX     |
| .043   | 8  | XXXXXX            |
| -.058  | 9  | XXXXXXXX          |
| .042   | 10 | XXXXXX            |
| .068   | 11 | XXXXXXXXXXXXX     |
| .020   | 12 | XXX               |

AUTOBJ TENTATIVELY SUGGESTS A TRANSFER MODEL OF THE FORM  
 $R = 0, S = 0$  AND DELAY = 0

## AUTOCORRELATION FUNCTION

Figure A.8.5.10. Cross-Correlations  
 Category I-III A Exams (Residuals from Pre-Advertising)  
 vs. Total Media

Section A.8.6. How was the complete Category I-IIIA Exam model specified?

After completion of the elements of model specification, identification of the key environmental and policy co-variables and development of appropriate aggregations of the media components, we were able to structure a linear model relating exam variation to key system variables, including advertising. Multiple regression was used to estimate the parameters of a complete model specification. The resulting model specification is presented in Figure A.8.6.1.

The inclusion of advertising as a variable in the model specification did not result in any major changes in the coefficients of the non-advertising variables. In fact, only the recruiter objective variable changed in magnitude by an amount greater than 10%. This suggests that the effects of advertising are not confounded with changes in the other factors and therefore the estimated coefficients provide a good measure of the impact of changes in advertising spending levels on the number of potential recruits coming into the examination process.

The estimated impact of advertising on exam variation can be interpreted as follows:

An incremental ten thousand dollars (1978 dollars) in advertising expenditures in a given month will bring additional Category I-IIIA prospects through the examination process at the rates of

- One prospect a month for each of eight months beginning in the fourth month after the incremental expenditure, due to the long-term aggregate.
- Five additional prospects within one month of the incremental expenditure, due to the immediate response aggregate.

This estimated response model clearly demonstrates that while the flow of potential recruits into the examination process was seriously impacted by the termination of the GI Bill in 1976, and while factors within the system varied in response to changes in environmental factors and administrative policies, we could still measure a systematic response to changes in the level of advertising.

A similar analysis was done to examine the Category IIIB-IV exams, and will be discussed in the next section.

| <u>Variable</u>        | <u>Coefficient</u> | <u>t statistic</u> |
|------------------------|--------------------|--------------------|
| . Constant             | -13841             | -4.4               |
| . GI Bill              | 2948               | 8.9                |
| . Unemployment (0-1)   | 366                | 7.1                |
| . Recruiter Objectives | .070               | 3.2                |
| . Relative Pay         | 6832               | 3.4                |
| . Recruiters           | 1.05               | 2.4                |
| . January              | 1289               | 4.5                |
| . September-October    | -695               | -3.3               |
| . \$Adv (0 or 1)       | .485               | 2.2                |
| . \$Adv (4-11)         | .10                | 2.5                |

Durbin Watson - 1.9

R<sup>2</sup> .93

Figure A.8.6.1.

CAT I-III A Exams - Final Model

Section A.9. HOW DID THE CATEGORY IIIB-IV ANALYSIS COMPARE TO THE CATEGORY I-IIIA?

The Category IIIB-IV exam series was analyzed in the same manner as the I-IIIA series, with the following results:

- ° The same pre-advertising variable specification was identified (the September - October seasonal impact was marginally significant, but was included to provide for consistent structure).
- ° A single advertising pressure variable was identified that reflected a much shorter delay structure. The variable was a moving sum of all media for the current period through a five period lag.

The resulting model is presented in figure A.9.5.1.

The method for establishing seasonal factors, the procedure for identifying a pre-advertising model, and the analysis of the individual media was exactly the same as in developing the Category I-IIIA model, so the resulting tables and figures can be presented directly.

Table A.9.1.1 - seasonality development

Figures A.9.2.1-A.9.2.5 - non-advertising variable cross-correlations

Figure A.9.3.1 - pre-advertising model

Figures A.9.4.1-A.9.4.9 - cross-correlation of media variables

Figure A.9.5.1 - final model specification

There are two key differences in the CAT IIIB-IV exam model as compared to the I-IIIA model:

- (1) The exam variation for Category IIIB-IV was much more sensitive to variation in the non-advertising factors (compare the two final models, Figure A.8.6.1 to Figure A.9.5.1). The IIIB-IV coefficients are larger for each variable.
- (2) The impact of advertising showed no long-term delay, and could be specified with a variable that indicated an even distribution of the impact of changes in advertising spending from the current month through the fifth month after the change.

Section A.9.1. What Seasonality Was Found For Category IIIB-IV Exams?

Table A.9.1.1. Ratio of IIIB-IV Exams to a twelve month Moving Average for every month of Data

|     | <u>CATEGORY IIIB-IV EXAMS</u> |             |             |             |             | <u>RATIO TO MOVING AVERAGE</u> |  |  |  |  |
|-----|-------------------------------|-------------|-------------|-------------|-------------|--------------------------------|--|--|--|--|
|     | <u>1976</u>                   | <u>1977</u> | <u>1978</u> | <u>1979</u> | <u>1980</u> |                                |  |  |  |  |
| JAN |                               | 1.19        | 1.21        | 1.24        | 1.23        |                                |  |  |  |  |
| FEB |                               | .98         | 1.08        | .94         | 1.15        |                                |  |  |  |  |
| MAR |                               | 1.06        | 1.00        | 1.01        | .91         |                                |  |  |  |  |
| APR |                               | .93         | .79         | .88         |             |                                |  |  |  |  |
| MAY |                               | .88         | .76         | .89         |             |                                |  |  |  |  |
| JUN |                               | 1.09        | 1.01        | 1.01        |             |                                |  |  |  |  |
| JUL |                               | .92         | .91         | 1.11        |             |                                |  |  |  |  |
| AUG |                               | .86         | 1.08        | 1.12        |             |                                |  |  |  |  |
| SEP |                               | .81         | .94         | .90         |             |                                |  |  |  |  |
| OCT | .99                           | .87         | .92         | .97         |             |                                |  |  |  |  |
| NOV | 1.17                          | 1.06        | 1.03        | .96         |             |                                |  |  |  |  |
| DEC | 1.18                          | 1.04        | .95         | .75         |             |                                |  |  |  |  |

Section A.9.2. Category IIIB-IV Exam Model Cross-Correlations with Non-advertising Factors.

MEAN OF SERIES 1 =  $-2.3981E-01$   
 ST. DEV. OF SERIES 1 =  $.11129E+01$   
 MEAN OF SERIES 2 =  $-6.9739E-01$   
 ST. DEV. OF SERIES 2 =  $.19028E+01$

| NUMBER OF LAGS<br>ON SERIES 1 | CROSS<br>CORRELATION | NUMBER OF LAGS<br>ON SERIES 2 | CROSS<br>CORRELATION |
|-------------------------------|----------------------|-------------------------------|----------------------|
| 0                             | .042                 | 0                             | .042                 |
| 1                             | .413                 | 1                             | -.051                |
| 2                             | -.127                | 2                             | -.041                |
| 3                             | -.190                | 3                             | .122                 |
| 4                             | -.126                | 4                             | .363                 |
| 5                             | .199                 | 5                             | .090                 |
| 6                             | .157                 | 6                             | -.210                |
| 7                             | -.265                | 7                             | .078                 |
| 8                             | .073                 | 8                             | -.005                |
| 9                             | -.106                | 9                             | -.045                |
| 10                            | -.006                | 10                            | .175                 |
| 11                            | -.101                | 11                            | -.149                |
| 12                            | -.099                | 12                            | .141                 |

APPROXIMATE STANDARD ERROR FOR CROSS CORRELATIONS IS .136

ESTIMATED IMPULSE RESPONSE WEIGHTS V(K)

| VALUES |    | -.882        | 0.                   | .882  |
|--------|----|--------------|----------------------|-------|
|        |    | +++++        | +++++                | +++++ |
| .071   | 0  |              | XXX                  |       |
| .705   | 1  |              | XXXXXXXXXXXXXXXXXXXX |       |
| -.218  | 2  |              | XXXXXX               |       |
| -.325  | 3  |              | XXXXXXXX             |       |
| -.216  | 4  |              | XXXXXX               |       |
| .341   | 5  |              | XXXXXXXXXX           |       |
| .268   | 6  |              | XXXXXXXX             |       |
| -.453  | 7  | XXXXXXXXXXXX |                      |       |
| .133   | 8  |              | XXXX                 |       |
| -.181  | 9  |              | XXXXXX               |       |
| -.011  | 10 |              | X                    |       |
| -.173  | 11 |              | XXXXXX               |       |
| -.169  | 12 |              | XXXXXX               |       |

AUTOBJ TENTATIVELY SUGGESTS A TRANSFER MODEL OF THE FORM  
 $P = 1, S = 0$  AND DELAY = 1

Figure A.9.2.1. Cross Correlations  
 Cat. IIIB-IV Exams (Adjusted) vs. Youth Unemployment

## CROSS CORRELATIONS

SERIES 1 - PREWHITENED RECD  
 SERIES 2 - PREWHITENED FENB

MEAN OF SERIES 1 =  $-.12565E+00$   
 ST. DEV. OF SERIES 1 =  $.18748E+01$   
 MEAN OF SERIES 2 =  $.11984E-01$   
 ST. DEV. OF SERIES 2 =  $.21530E+01$

| NUMBER OF LAGS<br>ON SERIES 1 | CROSS<br>CORRELATION | NUMBER OF LAGS<br>ON SERIES 2 | CROSS<br>CORRELATION |
|-------------------------------|----------------------|-------------------------------|----------------------|
| 0                             | .469                 | 0                             | .469                 |
| 1                             | .275                 | 1                             | .209                 |
| 2                             | .276                 | 2                             | .194                 |
| 3                             | .393                 | 3                             | .025                 |
| 4                             | .267                 | 4                             | .038                 |
| 5                             | .233                 | 5                             | -.068                |
| 6                             | .167                 | 6                             | -.030                |
| 7                             | .401                 | 7                             | -.055                |
| 8                             | .091                 | 8                             | -.019                |
| 9                             | .238                 | 9                             | -.041                |
| 10                            | .256                 | 10                            | -.037                |
| 11                            | .074                 | 11                            | -.024                |
| 12                            | .200                 | 12                            | -.215                |

APPROXIMATE STANDARD ERROR FOR CROSS CORRELATIONS IS .136

ESTIMATED IMPULSE RESPONSE WEIGHTS V(K)

| VALUES |    | -.673    | 0.                   | .673     |
|--------|----|----------|----------------------|----------|
|        |    | +++++++. | +++++++.             | +++++++. |
| .538   | 0  |          | XXXXXXXXXXXXXXXXXXXX |          |
| .316   | 1  |          | XXXXXXXXXXXX         |          |
| .317   | 2  |          | XXXXXXXXXXXX         |          |
| .451   | 3  |          | XXXXXXXXXXXXXXXXXXXX |          |
| .307   | 4  |          | XXXXXXXXXXXX         |          |
| .268   | 5  |          | XXXXXXXXXXXX         |          |
| .191   | 6  |          | XXXXXXX              |          |
| .460   | 7  |          | XXXXXXXXXXXXXXXXXXXX |          |
| .104   | 8  |          | XXXX                 |          |
| .273   | 9  |          | XXXXXXXXXXXX         |          |
| .294   | 10 |          | XXXXXXXXXXXX         |          |
| .085   | 11 |          | XXXX                 |          |
| .230   | 12 |          | XXXXXXXXXXXX         |          |

AUTOBJ TENTATIVELY SUGGESTS A TRANSFER MODEL OF THE FORM  
 $R = 1$ ,  $S = 0$  AND DELAY = 0

Figure A.9.2.2. Cross Correlations  
 Cat. IIIB-IV Exams (Adjusted) vs. Recruiter Objectives

```
MEAN OF SERIES 1      = -.37562E+02
ST. DEV. OF SERIES 1  = .17855E+01
MEAN OF SERIES 2      = -.22780E+01
ST. DEV. OF SERIES 2  = .18072E+01
```

APPROXIMATE STANDARD ERROR FOR CROSS CORRELATIONS IS .138

```

VALUES      -28.216                      0.                      28.216
            .+++++.+++++.+++++.+++++.
13.733      0                               XXXXXXXXXXXX
-7.948      1                             XXXXXXXX
 3.453      2                             XXX
 8.422      3                             XXXXXXXX
-4.515      4                             XXXX
-22.572     5      XXXXXXXXXXXXXXXXXXXX
-12.403     6                             XXXXXXXXXXXX
-12.095     7                             XXXXXXXXXXXX
15.156      8                             XXXXXXXXXXXXX
 7.800      9                             XXXXXXXX
-9.900     10                             XXXXXXXX
-6.931     11                             XXXXXXXX
-20.329     12      XXXXXXXXXXXXXXXXXXXX

```

AUTOBJ TENTATIVELY SUGGESTS A TRANSFER MODEL OF THE FORM  
 $R = 0$ ,  $S = 0$  AND DELAY = 0

Figure A.9.2.3. Cross Correlations  
Cat. IIIB-IV Exams (Adjusted) vs. Relative Pay



## CROSS CORRELATIONS

SERIES 1 - PREWHITENED TND  
 SERIES 2 - PREWHITENED PEKB

MEAN OF SERIES 1 =  $-.99990E-02$   
 ST. DEV. OF SERIES 1 =  $.30140E+00$   
 MEAN OF SERIES 2 =  $.62634E+00$   
 ST. DEV. OF SERIES 2 =  $.26440E+01$

| NUMBER OF LAGS<br>ON SERIES 1 | CROSS<br>CORRELATION | NUMBER OF LAGS<br>ON SERIES 2 | CROSS<br>CORRELATION |
|-------------------------------|----------------------|-------------------------------|----------------------|
| 0                             | -.050                | 0                             | -.050                |
| 1                             | -.151                | 1                             | -.052                |
| 2                             | -.019                | 2                             | .119                 |
| 3                             | -.191                | 3                             | .206                 |
| 4                             | -.133                | 4                             | .253                 |
| 5                             | -.089                | 5                             | .065                 |
| 6                             | -.160                | 6                             | -.134                |

APPROXIMATE STANDARD ERROR FOR CROSS CORRELATIONS IS .183

ESTIMATED IMPULSE RESPONSE WEIGHTS V(K)

| VALUES | -2.099                   | 0.            | 2.099 |
|--------|--------------------------|---------------|-------|
|        | .+++++.+++++.+++++.++++. |               |       |
| -.441  | 0                        | XXXXX         |       |
| -1.321 | 1                        | XXXXXXXXXXXXX |       |
| -.167  | 2                        | XXX           |       |
| -1.679 | 3                        | XXXXXXXXXXXXX |       |
| -1.163 | 4                        | XXXXXXXXXXXXX |       |
| -.780  | 5                        | XXXXXXXXX     |       |
| -1.405 | 6                        | XXXXXXXXXXXXX |       |

AUTOBJ TENTATIVELY SUGGESTS A TRANSFER MODEL OF THE FORM  
 $R = 0$ ,  $S = 0$  AND DELAY = 0

## AUTOCORRELATION FUNCTION

Figure A.9.2.5. Cross Correlations  
 Cat. IIIB-IV Exams (Adjusted) vs. Navy Advertising

Section A.9.3. Category IIIB-IV Exams Pre-advertising Model Specifications.

| <u>VARIABLE</u>     | <u>COEFFICIENT</u> | <u>"t"</u> |
|---------------------|--------------------|------------|
| Constant            | -40,107            | -3.5       |
| GI Bill             | 5,770              | -4.6       |
| Unemployment (0-1)  | 715                | 4.5        |
| Recruiter Objective | 0.250              | 4.3        |
| Relative Pay        | 17,561             | 2.4        |
| Recruiters          | 443                | 2.8        |
| January             | 3,377              | 4.9        |
| September - October | -1,503             | 2.7        |
| Durbin Watson       | 2.0                |            |
| R <sup>2</sup>      | .89                |            |

Figure A.9.3.1. Mental Category IIIB-IV Exam Model. (Pre-Advertising)  
(Cochrane Orcutt Algorithm used)

## 11



1

—

100

—

```
MEAN OF SERIES 1      =  .19807E+02
ST. DEV. OF SERIES 1  =  .14357E+03
MEAN OF SERIES 2      =  -.12933E-01
ST. DEV. OF SERIES 2  =  .14992E+01
```

| NUMBER OF LAGS<br>ON SERIES 1 | CROSS<br>CORRELATION | NUMBER OF LAGS<br>ON SERIES 2 | CROSS<br>CORRELATION |
|-------------------------------|----------------------|-------------------------------|----------------------|
| 0                             | -.034                | 0                             | -.034                |
| 1                             | .013                 | 1                             | .154                 |
| 2                             | -.002                | 2                             | .041                 |
| 3                             | -.170                | 3                             | -.115                |
| 4                             | .136                 | 4                             | .123                 |
| 5                             | .218                 | 5                             | -.046                |
| 6                             | -.121                | 6                             | -.100                |
| 7                             | -.163                | 7                             | .227                 |
| 8                             | -.128                | 8                             | -.110                |
| 9                             | -.078                | 9                             | -.068                |
| 10                            | .095                 | 10                            | .202                 |
| 11                            | .138                 | 11                            | -.064                |
| 12                            | -.154                | 12                            | -.094                |

ESTIMATED IMPULSE RESPONSE WEIGHTS  $\hat{y}(k)$ 

```
VALUES      - .003      0.      .003
      .+++++.+++++.+++++.+++++.
- .000      0                      XXX
.000      1                      XX
-.000      2                      X
-.002      3      XXXXXXXXXXXXXXX
.001      4                      XXXXXXXXXXXXX
.002      5                      XXXXXXXXXXXXXXXXXXXX
-.001      6      XXXXXXXXXXXXX
-.002      7      XXXXXXXXXXXXXXX
-.001      8      XXXXXXXXXXXXX
-.001      9      XXXXXXXX
.001      10                     XXXXXXXXX
.001      11                     XXXXXXXXXXXXX
-.002      12      XXXXXXXXXXXXXXX
```

AUTOBU TENTATIVELY SUGGESTS A TRANSFER MODEL OF THE FORM  
R = 0, S = 0 AND DELAY = 0

**Figure A.9.4.2. Cross Correlations  
Cat. IIIB-IV Exams (Residuals from Pre-Advertising)  
vs. Radio Advertising**

```
MEAN OF SERIES 1      =  -.30537E+01
ST. DEV. OF SERIES 1  =  .12957E+00
MEAN OF SERIES 2      =  -.14665E+00
ST. DEV. OF SERIES 2  =  .14139E+01
```

| NUMBER OF LAGS<br>ON SERIES 1 | CROSS<br>CORRELATION | NUMBER OF LAGS<br>ON SERIES 2 | CROSS<br>CORRELATION |
|-------------------------------|----------------------|-------------------------------|----------------------|
| 0                             | .209                 | 0                             | .209                 |
| 1                             | -.074                | 1                             | .044                 |
| 2                             | -.134                | 2                             | -.058                |
| 3                             | -.055                | 3                             | -.010                |
| 4                             | -.203                | 4                             | .019                 |
| 5                             | -.054                | 5                             | .002                 |
| 6                             | .171                 | 6                             | -.029                |
| 7                             | -.030                | 7                             | -.001                |
| 8                             | -.088                | 8                             | .025                 |
| 9                             | .035                 | 9                             | .005                 |
| 10                            | -.155                | 10                            | .020                 |
| 11                            | -.089                | 11                            | .014                 |
| 12                            | .124                 | 12                            | -.027                |

APPROXIMATE STANDARD ERROR FOR CROSS CORRELATIONS IS .136

ESTIMATED IMPULSE RESPONSE WEIGHTS W(K)

```
VALUES      -2.853      0.      2.853
      .+++++.+++++.+++++.+++++.
2.282  0      XXXXXXXXXXXXXXXXXXXX
-.803  1      XXXXXXXX
-1.462  2      XXXXXXXXXXXXXXXX
-.599  3      XXXXXX
-2.220  4      XXXXXXXXXXXXXXXXXXXX
-.588  5      XXXXXX
1.869  6      XXXXXXXXXXXXXXXXXXXX
-.325  7      XXXX
-.962  8      XXXXXXXXXX
.385  9      XXXX
-1.691 10     XXXXXXXXXXXXXXXX
-.975 11     XXXXXXXXXX
1.352 12     XXXXXXXXXXXXXXXX
```

AUTOBJ TENTATIVELY SUGGESTS A TRANSFER MODEL OF THE FORM  
R = 0 , S = 0 AND DELAY = 0

**Figure A.9.4.3. Cross Correlations**  
**Cat. IIIB-IV Exams (Residuals from Pre-Advertising)**  
**vs. Outdoor Advertising**

## CROSS CORRELATIONS

SERIES 1 - PREWHITENED DPG2  
 SERIES 2 - PREWHITENED REG2

MEAN OF SERIES 1 =  $-.60136E-01$   
 ST. DEV. OF SERIES 1 =  $.16578E+00$   
 MEAN OF SERIES 2 =  $-.85815E-01$   
 ST. DEV. OF SERIES 2 =  $.16359E+01$

| NUMBER OF LAGS<br>ON SERIES 1 | CROSS<br>CORRELATION | NUMBER OF LAGS<br>ON SERIES 2 | CROSS<br>CORRELATION |
|-------------------------------|----------------------|-------------------------------|----------------------|
| 0                             | .339                 | 0                             | .339                 |
| 1                             | .272                 | 1                             | .261                 |
| 2                             | .080                 | 2                             | .256                 |
| 3                             | .377                 | 3                             | .157                 |
| 4                             | .247                 | 4                             | -.170                |
| 5                             | .105                 | 5                             | -.117                |
| 6                             | .026                 | 6                             | -.023                |
| 7                             | -.035                | 7                             | -.010                |
| 8                             | .018                 | 8                             | -.061                |
| 9                             | .030                 | 9                             | -.075                |
| 10                            | -.212                | 10                            | -.148                |
| 11                            | -.213                | 11                            | -.088                |
| 12                            | -.087                | 12                            | -.005                |

APPROXIMATE STANDARD ERROR FOR CROSS CORRELATIONS IS .136

ESTIMATED IMPULSE RESPONSE WEIGHTS V(K)

| VALUES | -4.653 | 0.                   | 4.653 |
|--------|--------|----------------------|-------|
|        | +++++  | +++++                | +++++ |
| 3.344  | 0      | XXXXXXXXXXXXXXXXXXXX |       |
| 2.684  | 1      | XXXXXXXXXXXXXXXXXXXX |       |
| .790   | 2      | XXXX                 |       |
| 3.722  | 3      | XXXXXXXXXXXXXXXXXXXX |       |
| 2.439  | 4      | XXXXXXXXXXXXXXXXXXXX |       |
| 1.041  | 5      | XXXXX                |       |
| .252   | 6      | XX                   |       |
| -.343  | 7      | XX                   |       |
| .175   | 8      | XX                   |       |
| .298   | 9      | XX                   |       |
| -2.091 | 10     | XXXXXXXXXXXX         |       |
| -2.106 | 11     | XXXXXXXXXXXX         |       |
| -.858  | 12     | XXXXX                |       |

AUTOBJ TENTATIVELY SUGGESTS A TRANSFER MODEL OF THE FORM  
 $R = 1, S = 0$  AND DELAY = 0

Figure A.9.4.4. Cross Correlations  
 Cat. IIIB-IV Exams (Residuals from Pre-Advertising)  
 vs. Reg. Magazine Advertising

## CROSS CORRELATIONS

SERIES 1 - PREWHITENED DIPS  
 SERIES 2 - PREWHITENED FECS

MEAN OF SERIES 1 =  $-3.0371E-01$   
 ST. DEV. OF SERIES 1 =  $.42372E+00$   
 MEAN OF SERIES 2 =  $-7.5371E-01$   
 ST. DEV. OF SERIES 2 =  $.16823E+01$

| NUMBER OF LAGS<br>ON SERIES 1 | CROSS<br>CORRELATION | NUMBER OF LAGS<br>ON SERIES 2 | CROSS<br>CORRELATION |
|-------------------------------|----------------------|-------------------------------|----------------------|
| 0                             | -.008                | 0                             | -.008                |
| 1                             | .048                 | 1                             | -.220                |
| 2                             | .076                 | 2                             | -.072                |
| 3                             | .000                 | 3                             | .037                 |
| 4                             | -.012                | 4                             | .015                 |
| 5                             | .032                 | 5                             | .086                 |
| 6                             | .135                 | 6                             | .098                 |
| 7                             | -.108                | 7                             | .132                 |
| 8                             | .035                 | 8                             | .103                 |
| 9                             | -.049                | 9                             | .123                 |
| 10                            | .038                 | 10                            | .142                 |
| 11                            | .103                 | 11                            | .203                 |
| 12                            | -.113                | 12                            | .134                 |

APPROXIMATE STANDARD ERROR FOR CROSS CORRELATIONS IS .136

ESTIMATED IMPULSE RESPONSE WEIGHTS V(K)

| VALUES |    | -.669                | 0.                   | .669  |
|--------|----|----------------------|----------------------|-------|
|        |    | +++++                | +++++                | +++++ |
| -.033  | 0  |                      | XX                   |       |
| .190   | 1  |                      | XXXXXXX              |       |
| .302   | 2  |                      | XXXXXXXXXX           |       |
| .001   | 3  |                      | X                    |       |
| -.047  | 4  |                      | XX                   |       |
| .128   | 5  |                      | XXXXX                |       |
| .535   | 6  |                      | XXXXXXXXXXXXXXXXXXXX |       |
| -.429  | 7  | XXXXXXXXXXXXXXXXXXXX |                      |       |
| .139   | 8  |                      | XXXXX                |       |
| -.194  | 9  |                      | XXXXXXX              |       |
| .150   | 10 |                      | XXXXX                |       |
| .411   | 11 |                      | XXXXXXXXXXXXXXXXXXXX |       |
| -.449  | 12 | XXXXXXXXXXXXXXXXXXXX |                      |       |

AUTOBJ TENTATIVELY SUGGESTS A TRANSFER MODEL OF THE FORM  
 $F = 0, S = 0$  AND DELAY = 0

Figure A.9.4.5. Cross Correlations  
 Cat. IIIB-IV Exams (Residuals from Pre-Advertising)  
 vs. Special Magazine Advertising



## CROSS CORRELATIONS

SERIES 1 - PREWHITENED LCD  
 SERIES 2 - PREWHITENED PEIZ

MEAN OF SERIES 1 = .32703E+01  
 ST. DEV. OF SERIES 1 = .37699E+02  
 MEAN OF SERIES 2 = -.15028E+00  
 ST. DEV. OF SERIES 2 = .14467E+01

| NUMBER OF LAGS<br>ON SERIES 1 | CROSS<br>CORRELATION | NUMBER OF LAGS<br>ON SERIES 2 | CROSS<br>CORRELATION |
|-------------------------------|----------------------|-------------------------------|----------------------|
| 0                             | .035                 | 0                             | .035                 |
| 1                             | .087                 | 1                             | .024                 |
| 2                             | -.069                | 2                             | .265                 |
| 3                             | .018                 | 3                             | -.113                |
| 4                             | .297                 | 4                             | -.166                |
| 5                             | .047                 | 5                             | -.095                |
| 6                             | .171                 | 6                             | .114                 |
| 7                             | -.090                | 7                             | .066                 |
| 8                             | -.207                | 8                             | -.198                |
| 9                             | .271                 | 9                             | .066                 |
| 10                            | .089                 | 10                            | .059                 |
| 11                            | -.103                | 11                            | .023                 |
| 12                            | -.193                | 12                            | .036                 |

APPROXIMATE STANDARD ERROR FOR CROSS CORRELATIONS IS .136

## ESTIMATED IMPULSE RESPONSE WEIGHTS V(K)

| VALUES |    | -.014 | 0.                   | .014  |
|--------|----|-------|----------------------|-------|
|        |    | +++++ | +++++                | +++++ |
| .001   | 0  |       | XXX                  |       |
| .003   | 1  |       | XXXXXX               |       |
| -.003  | 2  |       | XXXXXX               |       |
| .001   | 3  |       | XX                   |       |
| .011   | 4  |       | XXXXXXXXXXXXXXXXXXXX |       |
| .002   | 5  |       | XXXX                 |       |
| .007   | 6  |       | XXXXXXXXXXXX         |       |
| -.003  | 7  |       | XXXXXX               |       |
| -.008  | 8  |       | XXXXXXXXXXXX         |       |
| .010   | 9  |       | XXXXXXXXXXXXXXXXXXXX |       |
| .003   | 10 |       | XXXXXX               |       |
| -.004  | 11 |       | XXXXXX               |       |
| -.007  | 12 |       | XXXXXXXXXXXX         |       |

AUTOBJ TENTATIVELY SUGGESTS A TRANSFER MODEL OF THE FORM  
 R = 0, S = 0 AND DELAY = 0

Figure A.9.4.7. Cross Correlations  
 Cat. IIIB-IV Exams (Residuals from Pre-Advertising)  
 vs. Local Advertising



## CROSS CORRELATIONS

SERIES 1 - PREWHITENED NMED  
 SERIES 2 - PREWHITENED PECO

MEAN OF SERIES 1 =  $-.47036E-01$   
 ST. DEV. OF SERIES 1 =  $.77945E+00$   
 MEAN OF SERIES 2 =  $-.15315E+00$   
 ST. DEV. OF SERIES 2 =  $.14274E+01$

| NUMBER OF LAGS<br>ON SERIES 1 | CROSS<br>CORRELATION | NUMBER OF LAGS<br>ON SERIES 2 | CROSS<br>CORRELATION |
|-------------------------------|----------------------|-------------------------------|----------------------|
| 0                             | .089                 | 0                             | .089                 |
| 1                             | .316                 | 1                             | .046                 |
| 2                             | .094                 | 2                             | .204                 |
| 3                             | .063                 | 3                             | .096                 |
| 4                             | .101                 | 4                             | .012                 |
| 5                             | .045                 | 5                             | .112                 |
| 6                             | .114                 | 6                             | -.113                |
| 7                             | -.099                | 7                             | .247                 |
| 8                             | -.038                | 8                             | .091                 |
| 9                             | -.058                | 9                             | -.063                |
| 10                            | -.027                | 10                            | .158                 |
| 11                            | -.046                | 11                            | .160                 |
| 12                            | -.119                | 12                            | .015                 |

APPROXIMATE STANDARD ERROR FOR CROSS CORRELATIONS IS .136

ESTIMATED IMPULSE RESPONSE WEIGHTS V(K)

| VALUES | -.723 | 0.                | .723  |
|--------|-------|-------------------|-------|
|        | +++++ | +++++             | +++++ |
| .163   | 0     | XXXXX             |       |
| .578   | 1     | XXXXXXXXXXXXXXXXX |       |
| .172   | 2     | XXXXXX            |       |
| .114   | 3     | XXXX              |       |
| .185   | 4     | XXXXXX            |       |
| .083   | 5     | XXX               |       |
| .208   | 6     | XXXXXXXX          |       |
| -.182  | 7     | XXXXXX            |       |
| -.069  | 8     | XXX               |       |
| -.106  | 9     | XXXX              |       |
| -.049  | 10    | XX                |       |
| -.083  | 11    | XXX               |       |
| -.218  | 12    | XXXXXXX           |       |

AUTOBJ TENTATIVELY SUGGESTS A TRANSFER MODEL OF THE FORM  
 $R = 1, S = 0$  AND DELAY = 1

Figure A.9.4.9. Cross Correlations  
 Cat. IIIB-IV Exams (Residuals from Pre-Advertising)  
 vs. Total Media

Section A.9.5. Category IIIB-IV Exam Model: Final Model Specification

| <u>Variable</u>        | <u>Coefficient</u> | <u>t statistic</u> |
|------------------------|--------------------|--------------------|
| . Constant             | -35,781            | -5.6               |
| . GI Bill              | 5713               | 7.8                |
| . Unemployment (0-1)   | 543                | 4.1                |
| . Recruiter Objectives | .247               | 5.2                |
| . Relative Pay         | 13846              | 3.3                |
| . Recruiters           | 3.8                | 4.0                |
| . January              | 3435               | 4.7                |
| . September-October    | -781               | -1.5               |
| . \$ Adv (0-5)         | .465               | 4.9                |

Durbin Watson - 1.6

$R^2$  .90

Figure A.9.5.1. Cat IIIB-IV Exams - Final Model  
Final Model Specification

#### Section A.10. HOW WAS THE KEY PAYOFF (ACCESSIONS) RELATED TO EXAM VARIATION?

The exam models describe the response of the recruiting system to changes in advertising spending at that measurable point in the system most sensitive to the impact of advertising changes the level of ASVAB examination completions. The next step was to relate exam levels to the key pay off variable, completed accessions.

The accession process was considered for each of three degree status and test score market segments.

Since there were only two exam models (one for each test score group), we had to link each of the specific degree groups to the appropriate exam process. Figure A.10.1 outlines the structure of the linkage process.

In developing the linkage models, we had to ascertain whether the percentage of degree and non-degree accessions from each exam group is essentially fixed through time, or whether the percentage of accessions varies with changes in other factors. Since there was no available theory regarding this process, we had to identify the key issues in the linkage process, and then establish a procedure for evaluating those issues and incorporating the evaluations into a formal model of the process.

The key issues and the procedure for evaluation are discussed in the next section.

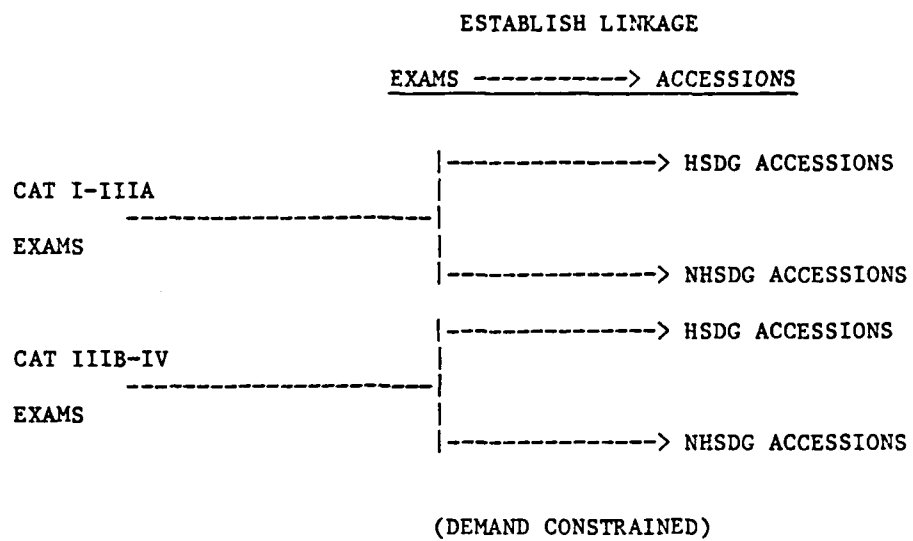


Figure A.10.1. Accessions Linkage Structure

Section A.10.1. What are the Key Issues Regarding the Linkage Between Exams and Accessions?

There were two key issues to investigate in specifying the accession linkage model:

- ° diminishing returns for accessions to exams, which required a non-linear model specification.
- ° whether variation in other system variables impacts the percentage of examined prospects who eventually enlist.

An effective way to consider the variation in the returns of accessions to exams is to examine the ratio of the two series: Accessions/Exams. This ratio will be called the conversion rate, and is defined for each market segment using the appropriate exam series.

The process that led to final linkage model specifications can best be described by the following steps:

- ° Examination of the patterns in the data relating to the key issues,
- ° Development of observations about the nature of the process based on the data, and
- ° Incorporation of those observations into a specific model structure.

The first step was to look at the time series of exams and accessions and to note the systematic patterns, and is described in the next section.

Section A.10.2. What did we Observe in the Time Series Relating Exams and Accessions?

Examination of the patterns relating monthly variation in exam levels to monthly variation in accession levels (see Figures A.10.2.1 - A.10.2.3) revealed the following relationships between market segments under consideration. In these plots both series were transformed to a percent change from the mean value so that differences in scale would not obscure the patterns in plotting both on the same graph.

- HSDG/Category I-III A - the pattern of accession variation follows closely the pattern of exam variation both in terms of long-term trend and month-to-month variation, providing evidence that changes in accession levels are closely tied to changes in exam levels (See figure A.10.2.1).
- HSDG/Category IIIB-IV - The pattern of accession variation has the same shape as the pattern of exam variation in terms of month-to-month variation, but there is a clear pattern of varying returns with respect to the long-term trend (See figure A.10.2.2). The level of exams dropped sharply from the 1976 level through 1977 to a low period in 1978 and rose through 1979 and 1980. In contrast, while the accession level dropped a little through 1977 period, it is more difficult to detect an associated increase through 1979 and 1980. These patterns suggest that accessions show a pattern of diminishing returns to increases in the level of exams.
- NON-HSDG/Category I-III A - The patterns in exam and accession variation are similar in month-to-month variation. The pattern in the longer term trend variation was not easily determined through inspection of the time series plots (See figure A.10.2.3).

This analysis clearly suggested that the level of accessions is largely determined by the number of candidates examined each month; however, the changing returns indicated that a multiplicative model would be appropriate.

With the basic pattern determined, we next looked at the relationship between accession levels and the conversion rate and other factors.

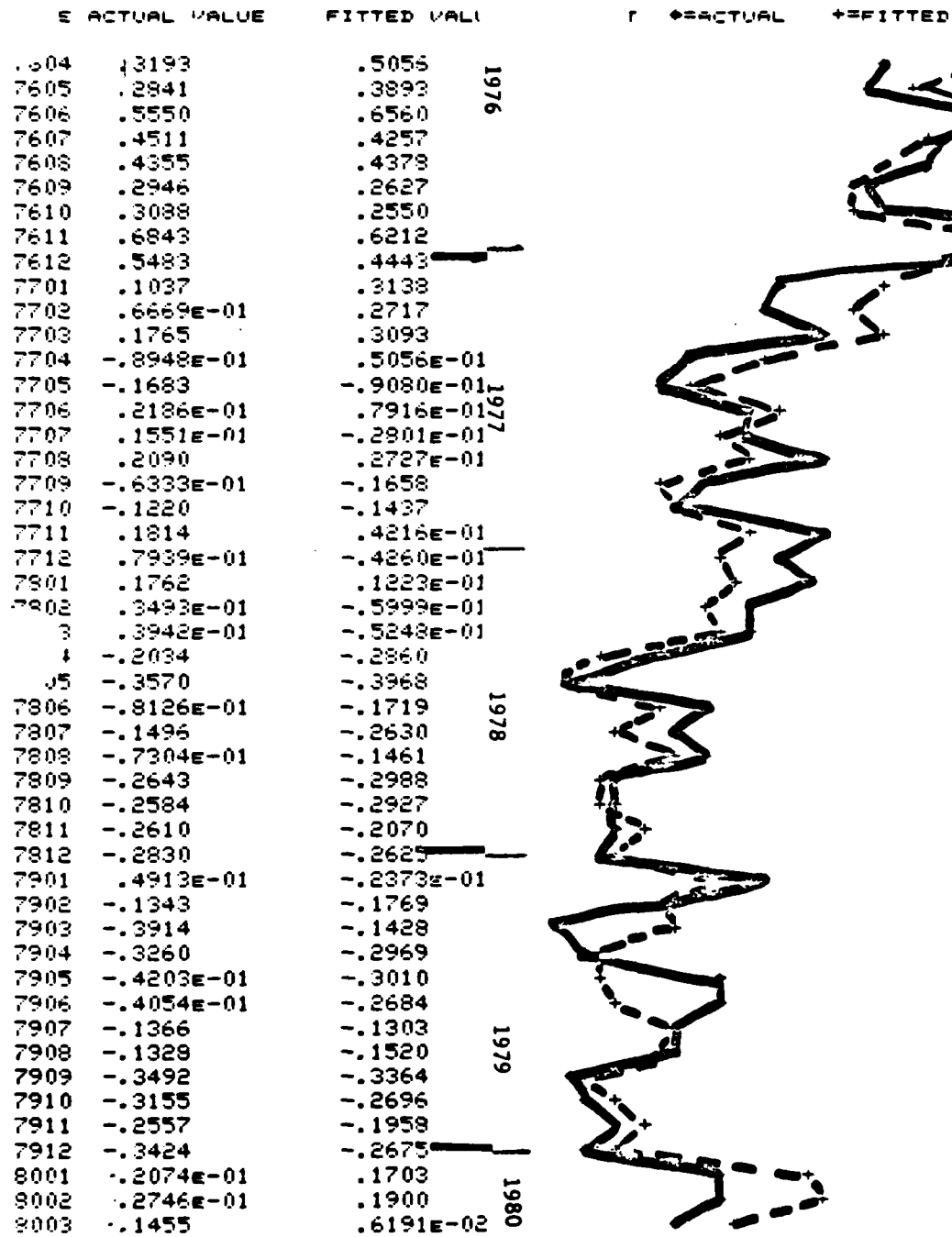


Figure A.10.2.1. HSDG/CAT I-III A  
 (% Deviation from Mean)  
 — Accessions  
 --- Exams

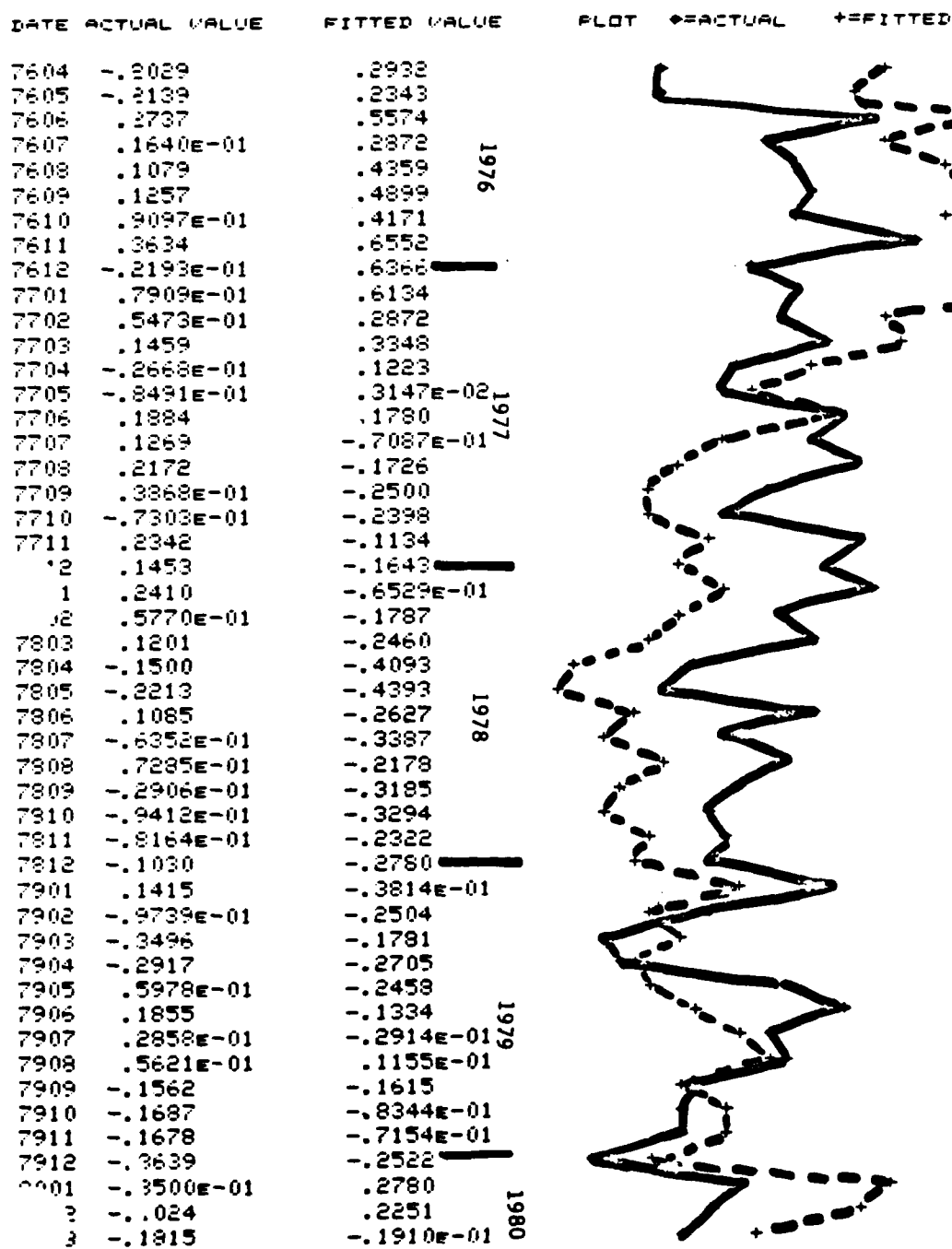


Figure A.10.2.2. HSDG/CAT IIIB-IV  
(% Deviation from Mean)

— Accessions  
--- Exams

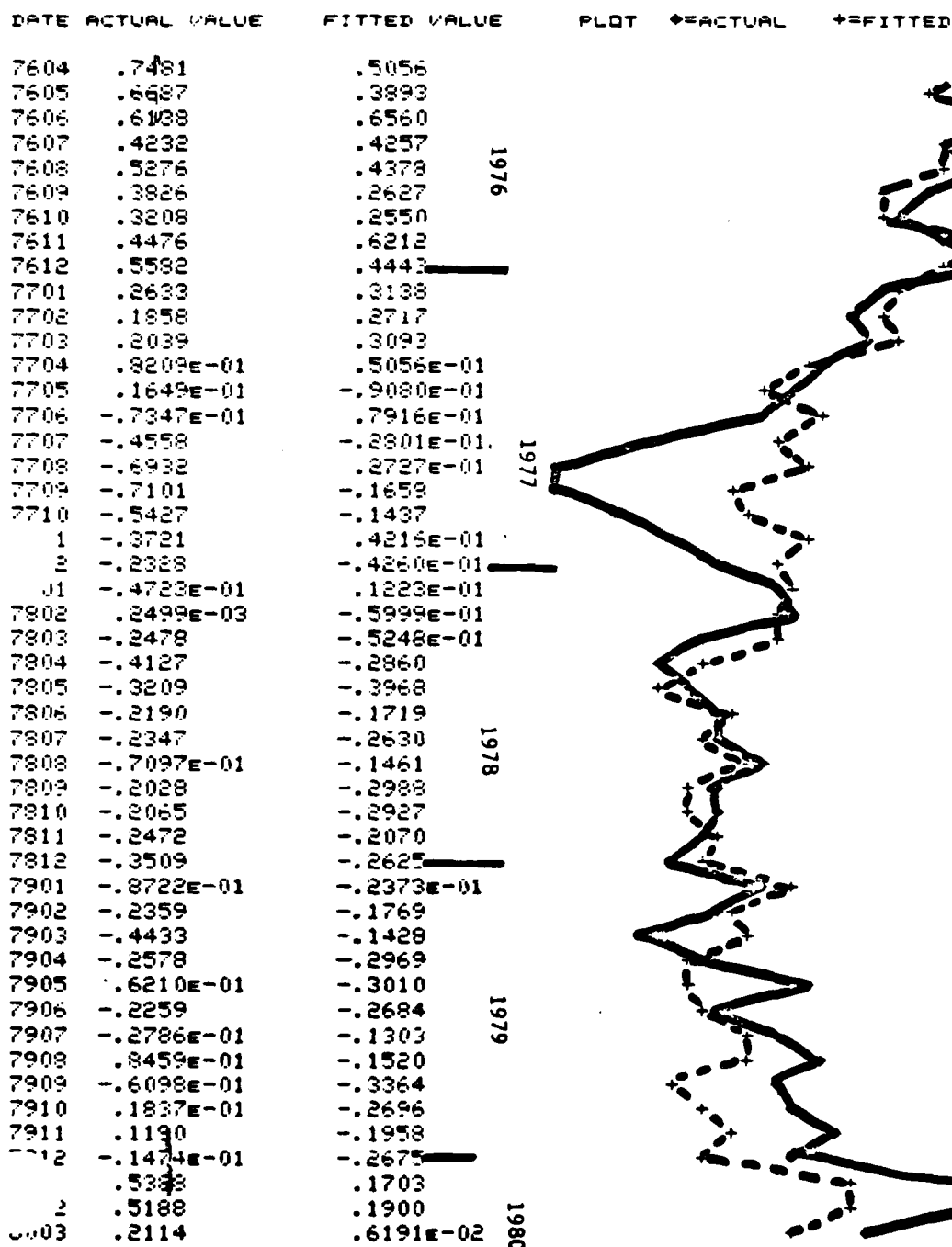


Figure A.10.2.3. Non-HSDG/CAT I-III A  
(% Deviation from Mean)

— Accessions  
--- Exams

### Section A.10.3. What Factors had a Major Impact on the Conversion Rate?

In the preceding section, we observed a pattern that suggested that accessions varied in the same direction as exams; however, in order to determine if accessions varied at the same rate as exams or whether there was a pattern of differing rates, we looked at the ratio of accessions to exams to see if there was any systematic pattern in the varying rates. We called this ratio the conversion rate.

For all three market segments, the conversion rates varied inversely with the level of exams (See figures A.10.5.1 - A.10.5.3.), and was particularly strong for the HSDG/Category IIIB-IV segment. This inverse relationship suggested that either the capacity of the system to absorb increased exams was not as flexible as the capacity to generate the exams, or that conflicting administrative policies were often at work that led to increases in the number people pulled into the examining system beyond the accession needs for these groups. This variation in the conversion rate pinpoints the differences in exam and accession dynamics, and highlights the need for the two-stage description of the system. The varying conversion rates led to the conclusion that an elasticity form of model relating the percentage change in accessions to the percentage change in exams would be appropriate and that we would expect elasticities between zero and one. With the basic form of the model clearly in mind, we looked to see what factors impacted variation in the conversion rate. Of primary concern was the variation in manpower needs, which is examined in the next section.

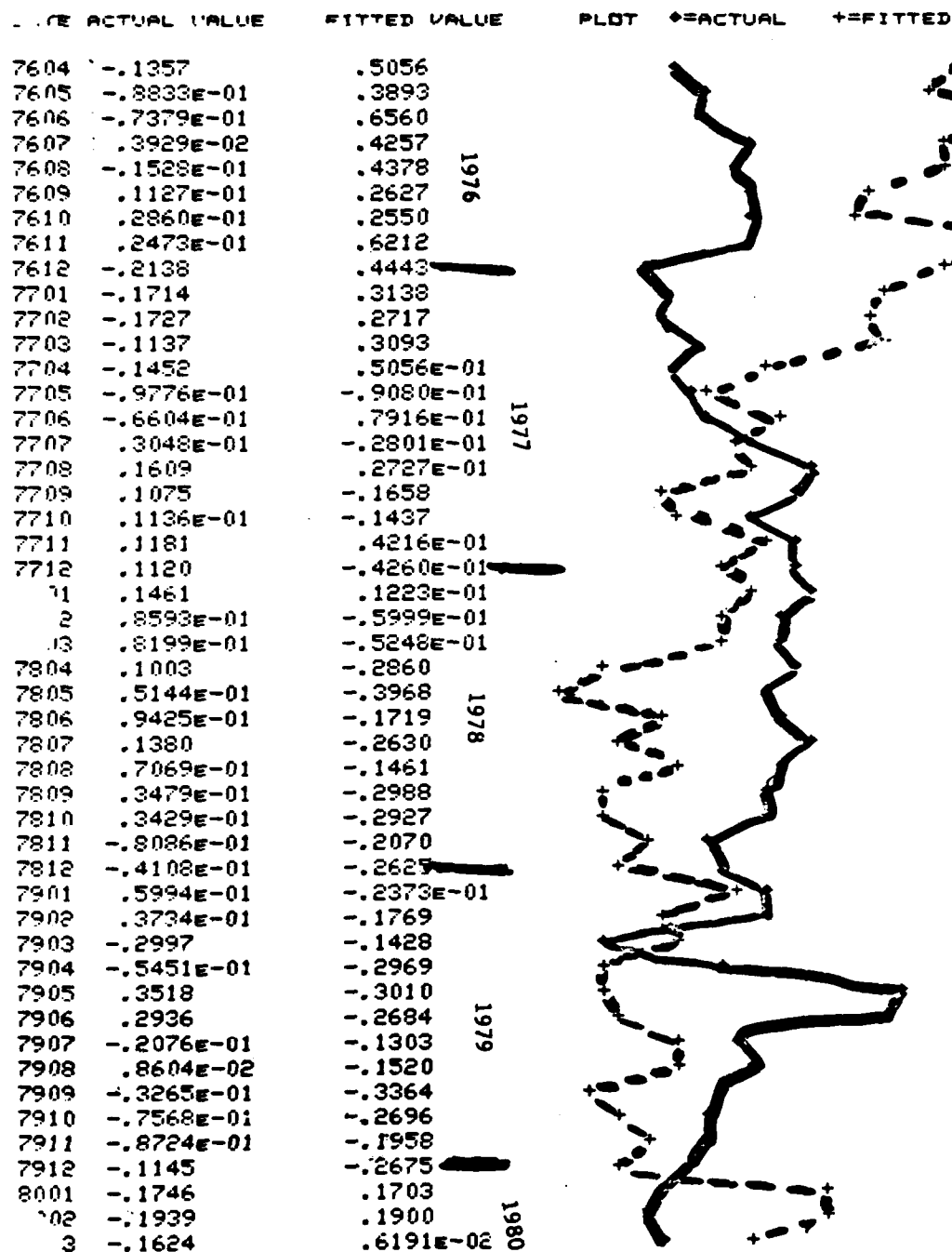


Figure A.10.3.1. HSDG/CAT I-III A  
 (% Deviation from Mean)  
 — Conversion Rate  
 --- Exams

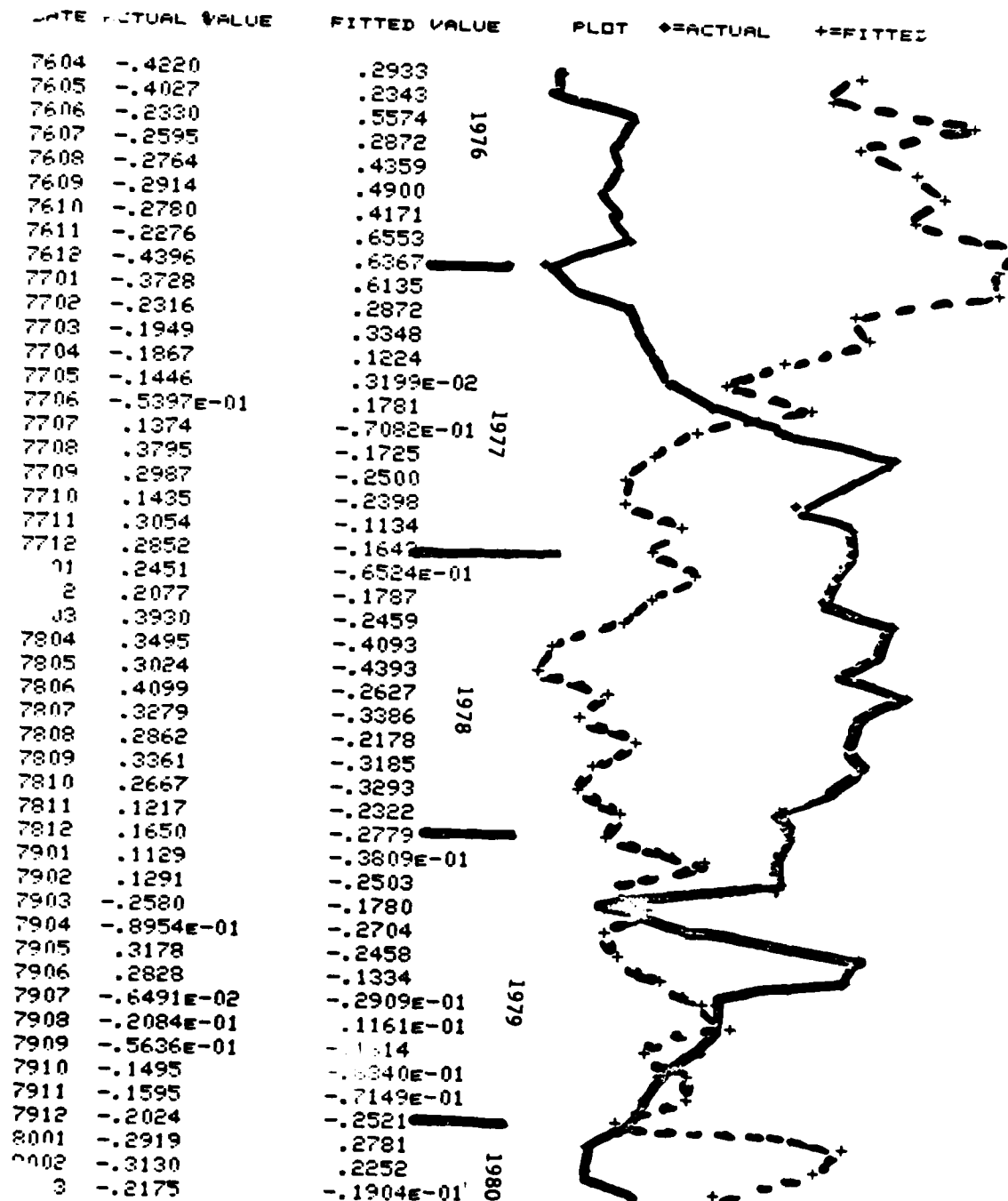


Figure A.10.3.2. HSDG/CAT IIIB-IV  
(% Deviation from Mean)  
— Conversion Rate  
--- Exams

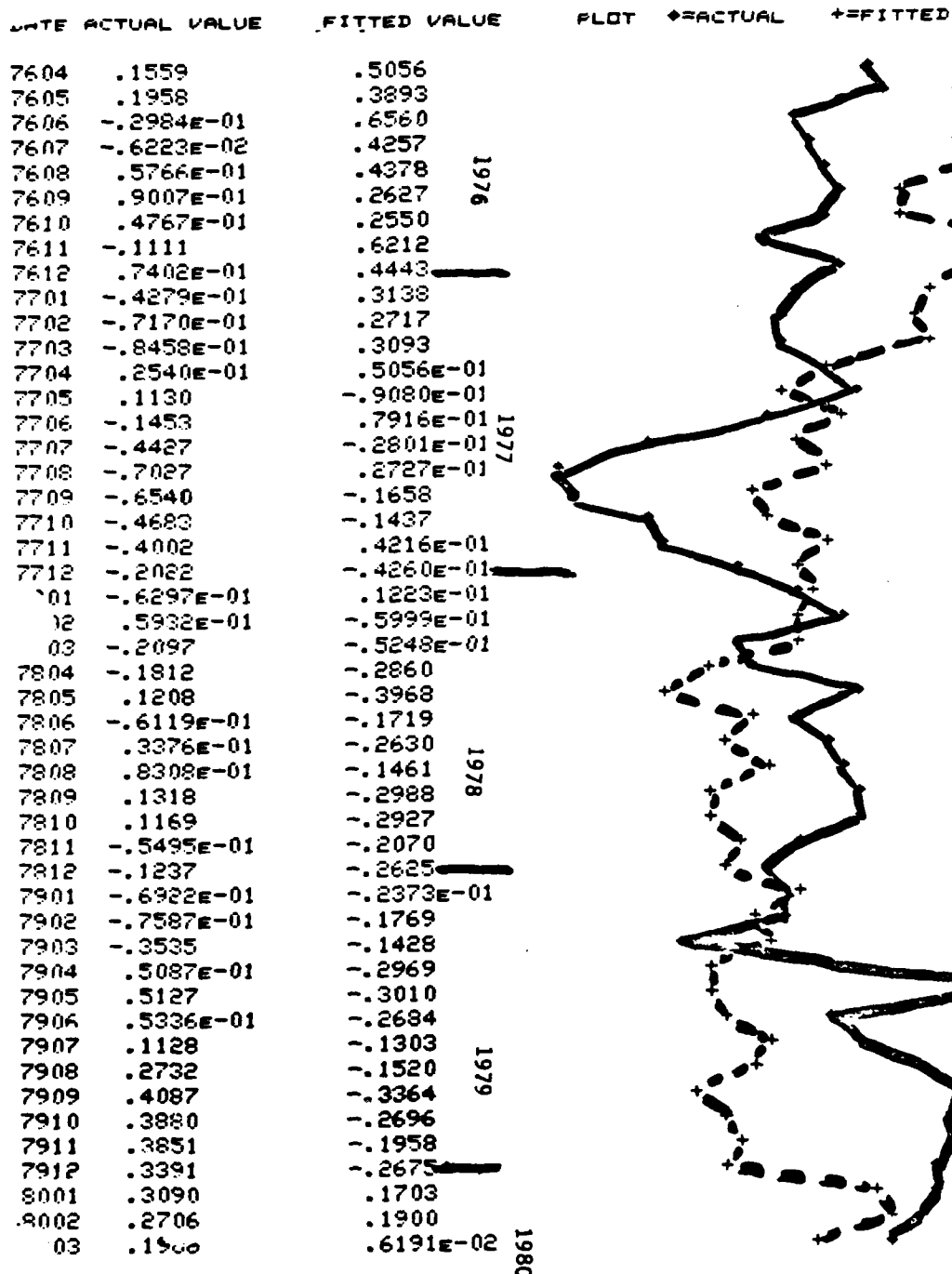


Figure A.10.3.3.  
Non-HSDG/CAT I-III A  
(% Deviation from Mean)  
—— Conversion Rate  
--- Exams

Section A.10.4. How do Variations in Manpower Needs Impact Conversion Rate Variation?

It was reasonable to expect that variation in the level of manpower needs would be a key determinant of the variation in the conversion rate.

The recruiter objective variable measuring monthly accession objectives, which was the only available quantitative measure of manpower needs, was transformed to express objectives in the following manner:

- (1) long-term objectives - twelve month moving average of objectives, which reflects the overall mission level.
- (2) short-term objectives - the ratio of monthly objectives to the smoothed series, which captures variation in the monthly emphases in the annual mission.

The impact of varying objectives on the returns of accessions to exams was investigated by comparing both the long- and short-term objective series with each conversion rate series (accessions/exams).

See Figures A.10.4.1 - A.10.4.3 for a comparison to long-term objectives, and Figures A.10.4.4 - A.10.4.6 for a comparison to short-term objectives.

Three key observations resulted from this examination:

- The conversion rate varies inversely with the level of long-term objectives for both of the high school degree status market segments, CAT I-IIIA and CAT IIIB-IV (See Figures A.10.4.1 and A.10.4.2).
- The conversion rate varies directly (but weakly) with the level of short-term objectives for both of the high school degree market segments (See Figures A.10.4.4 and A.10.4.5).
- The conversion rate varies independently of the level of both the long- and short-term objectives for the Non-Degree/Category I-IIIA segment (See Figures A.10.4.3 and A.10.4.6).

Pressure brings people into the exam process at a faster rate than they are converted to accessions. It was clear from these observations that "pressure" on the recruiting system (long-term objectives reflecting annual mission levels) had differing impacts on the number of prospects brought into the process through the examination stage and on the number of those prospects who eventually enlist into the Army.

This pattern suggested that during periods of higher pressure, relative priorities for accessions shifted from these segments to the less supply-constrained segment, thereby surfacing as a lowering of the conversion ratio.

These observations indicated that since the two objective specifications had impacts in differing directions, that both should be included in the model specifications.

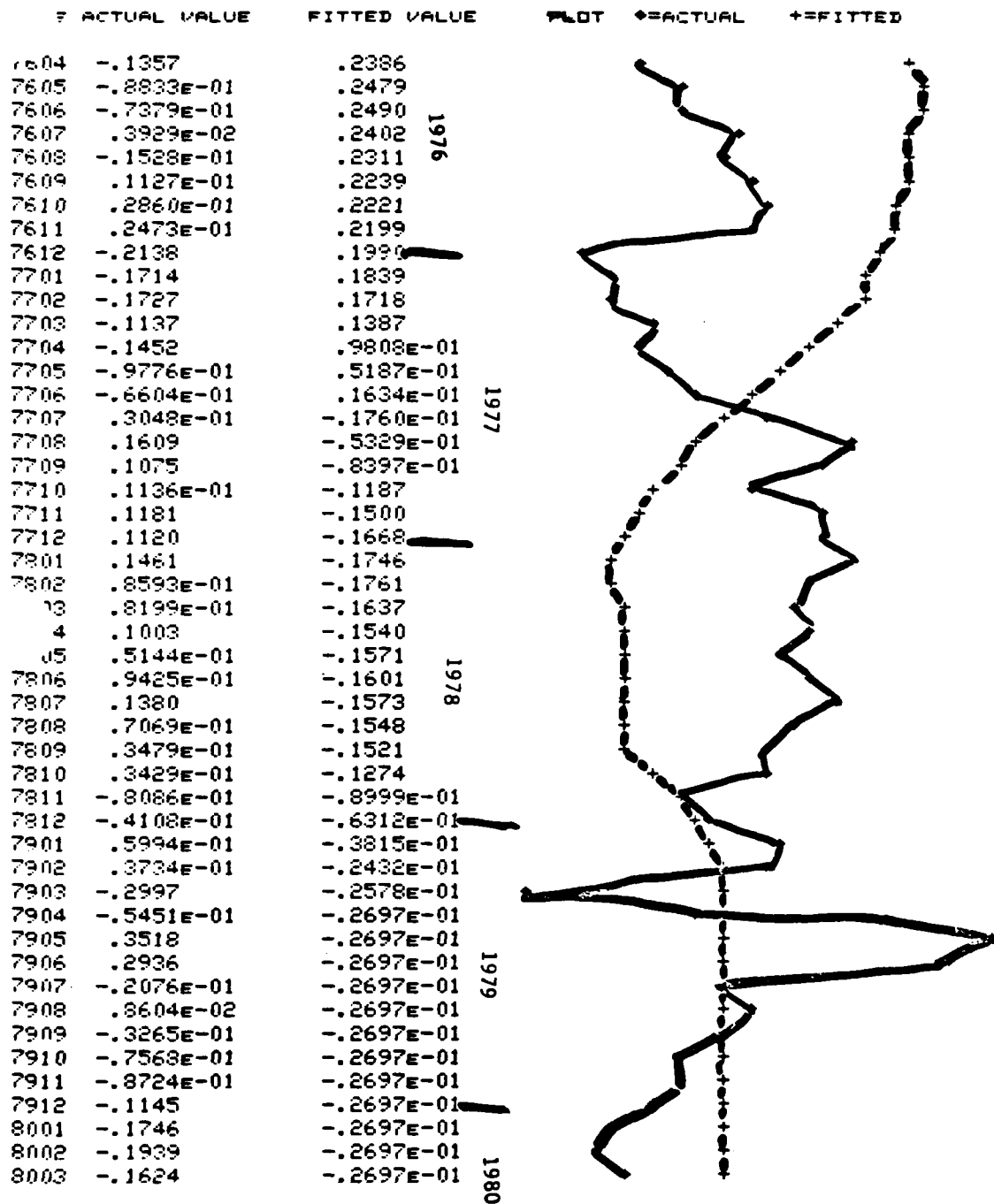


Figure A.10.4.1. HSDG/CAT I-III A  
(% Deviation from Mean)

— Conversion Rate  
--- Long Term Objectives

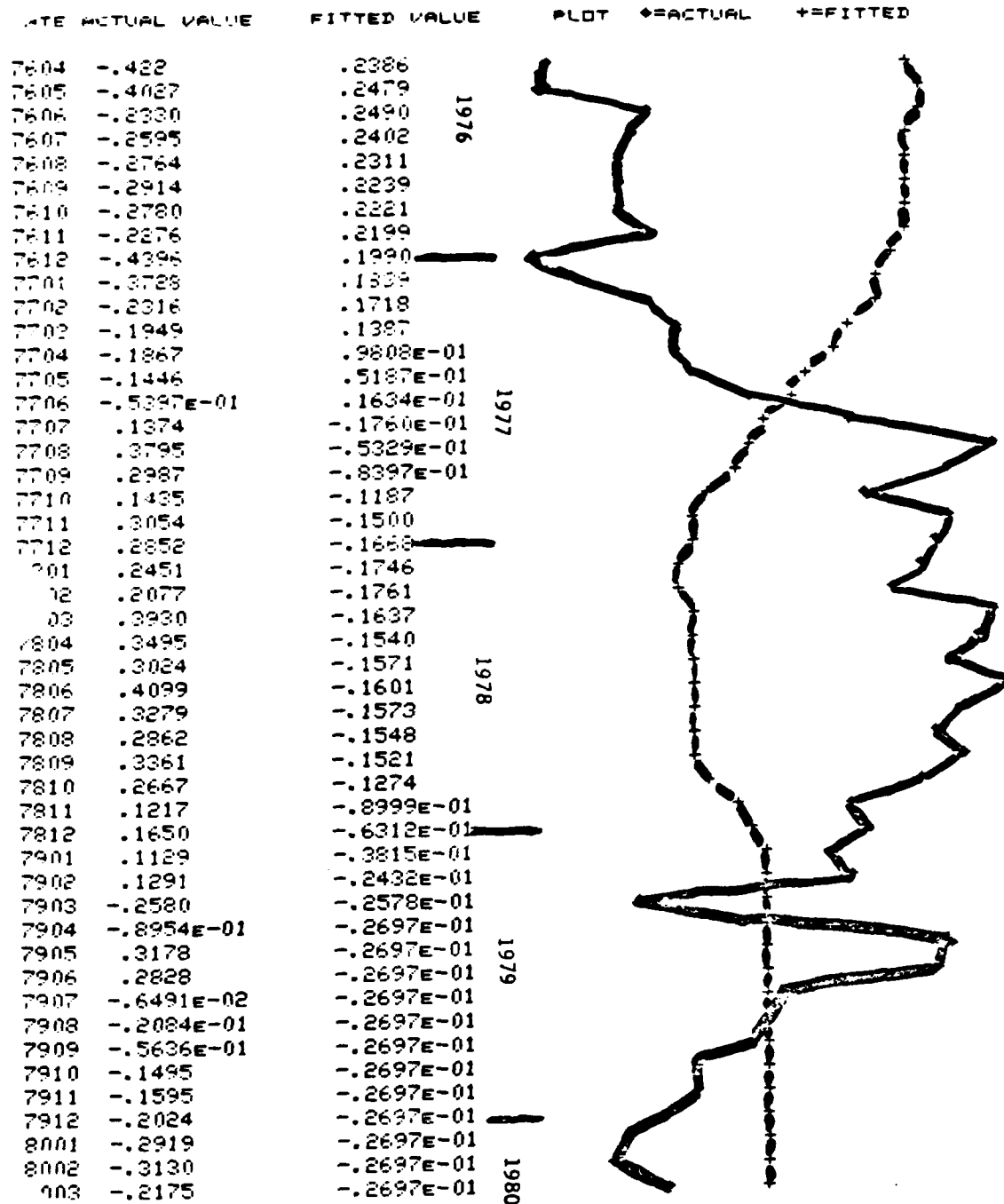


Figure A.10.4.2. HSDG/CAT IIIB-IV  
 (% Deviation from Mean)  
 — Conversion Rate  
 --- Long Term Objectives

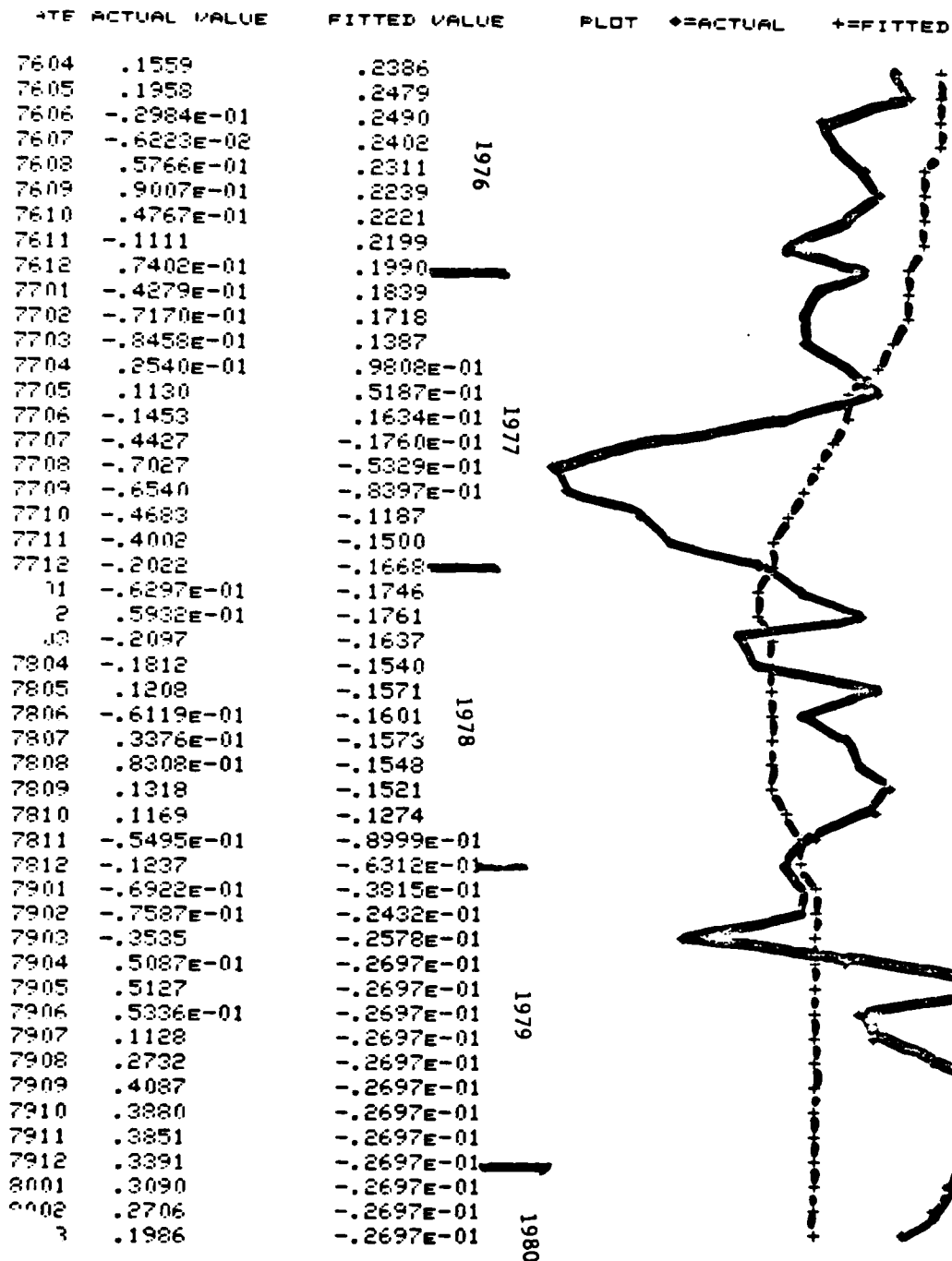


Figure A.10.4.3. Non-HSDG/CAT I-III A  
(% Deviation from Mean)

— Conversion Rate  
--- Long Term Objectives

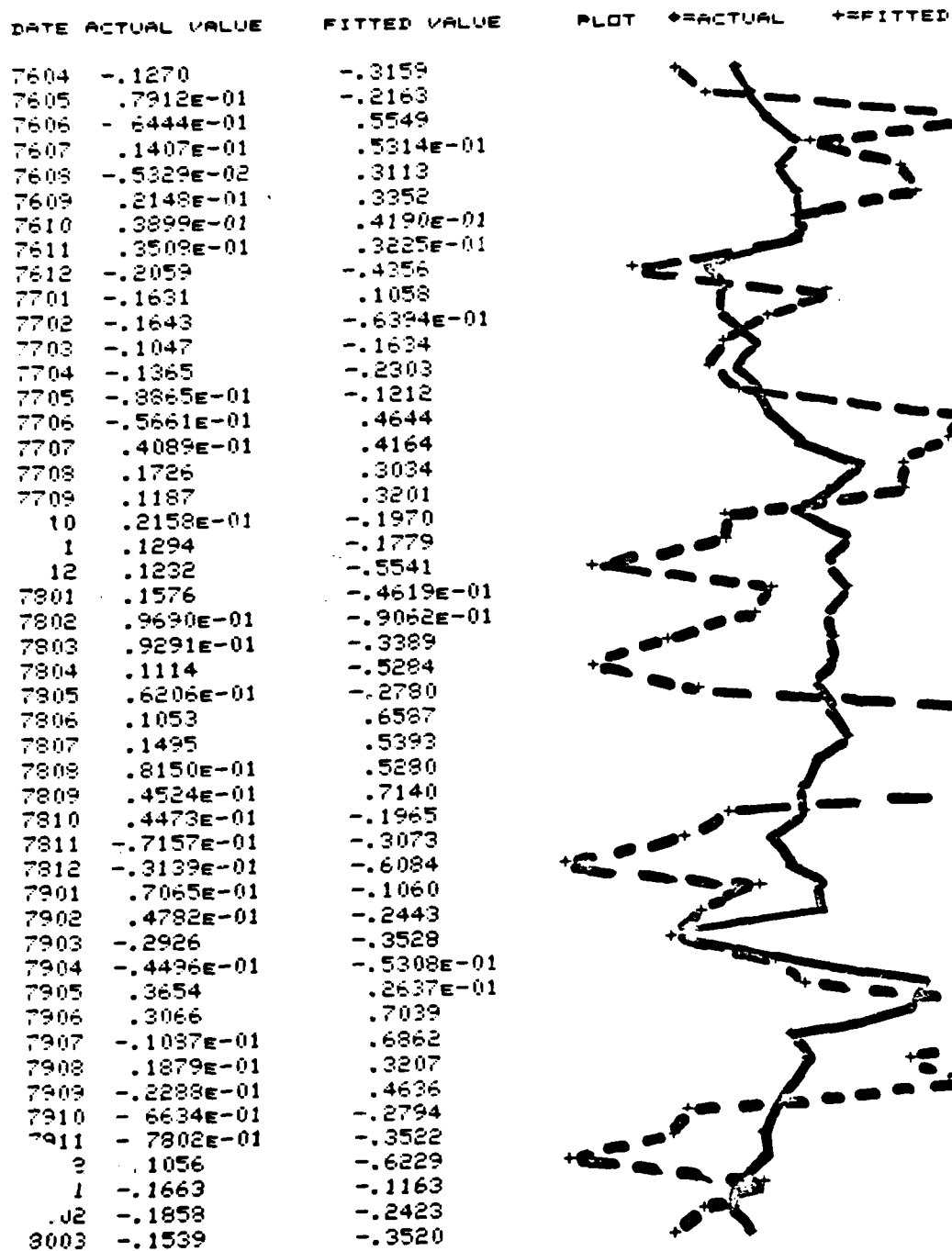


Figure A.10.4.4. HSDG/CAT I-III A  
 (% Deviation from Mean)  
 — Conversion Rate  
 --- Short Term Objectives

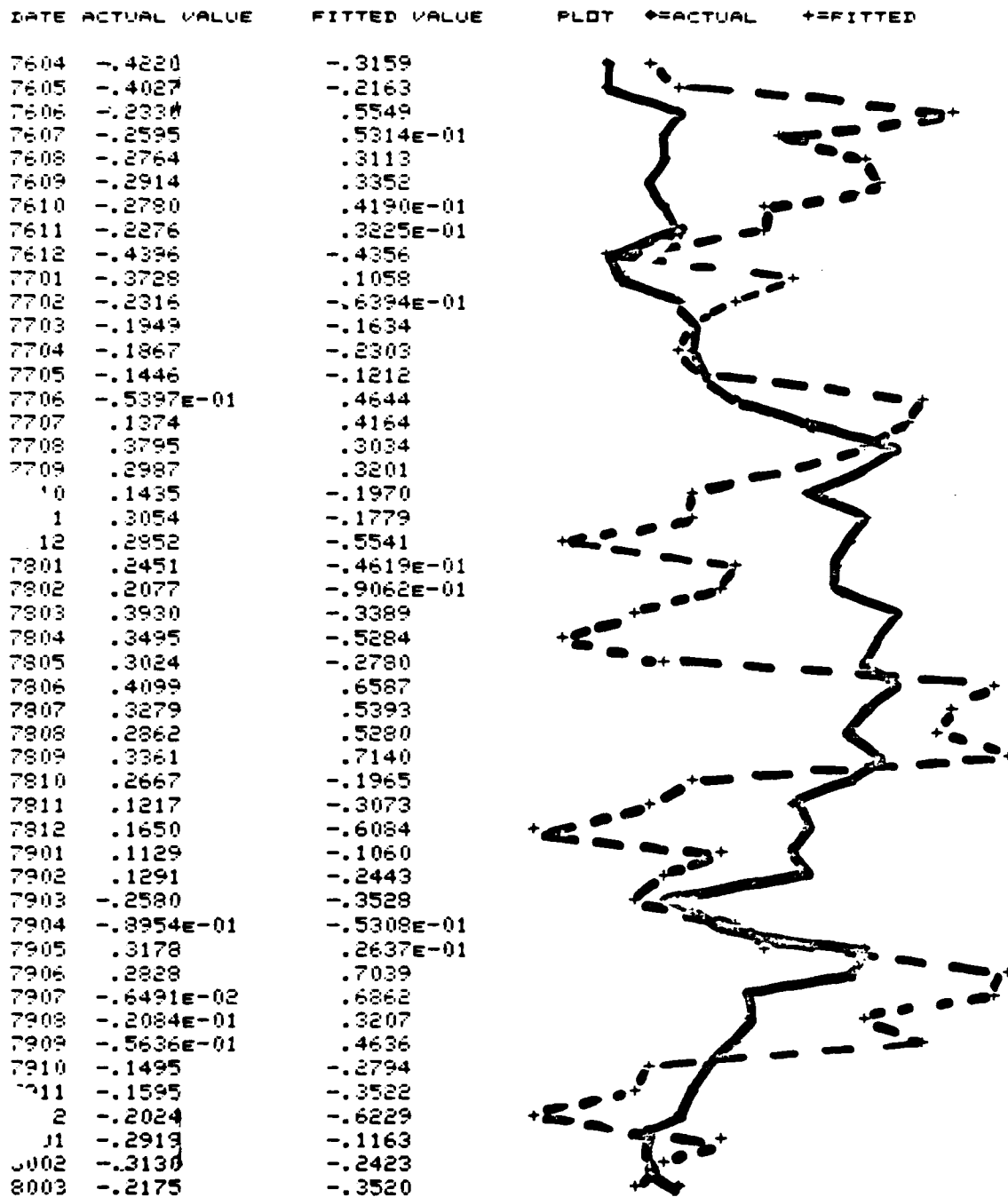


Figure A.10.4.5. HSDG/CAT IIIB-IV  
(% Deviation from Mean)

— Conversion Rate  
--- Short Term Objectives

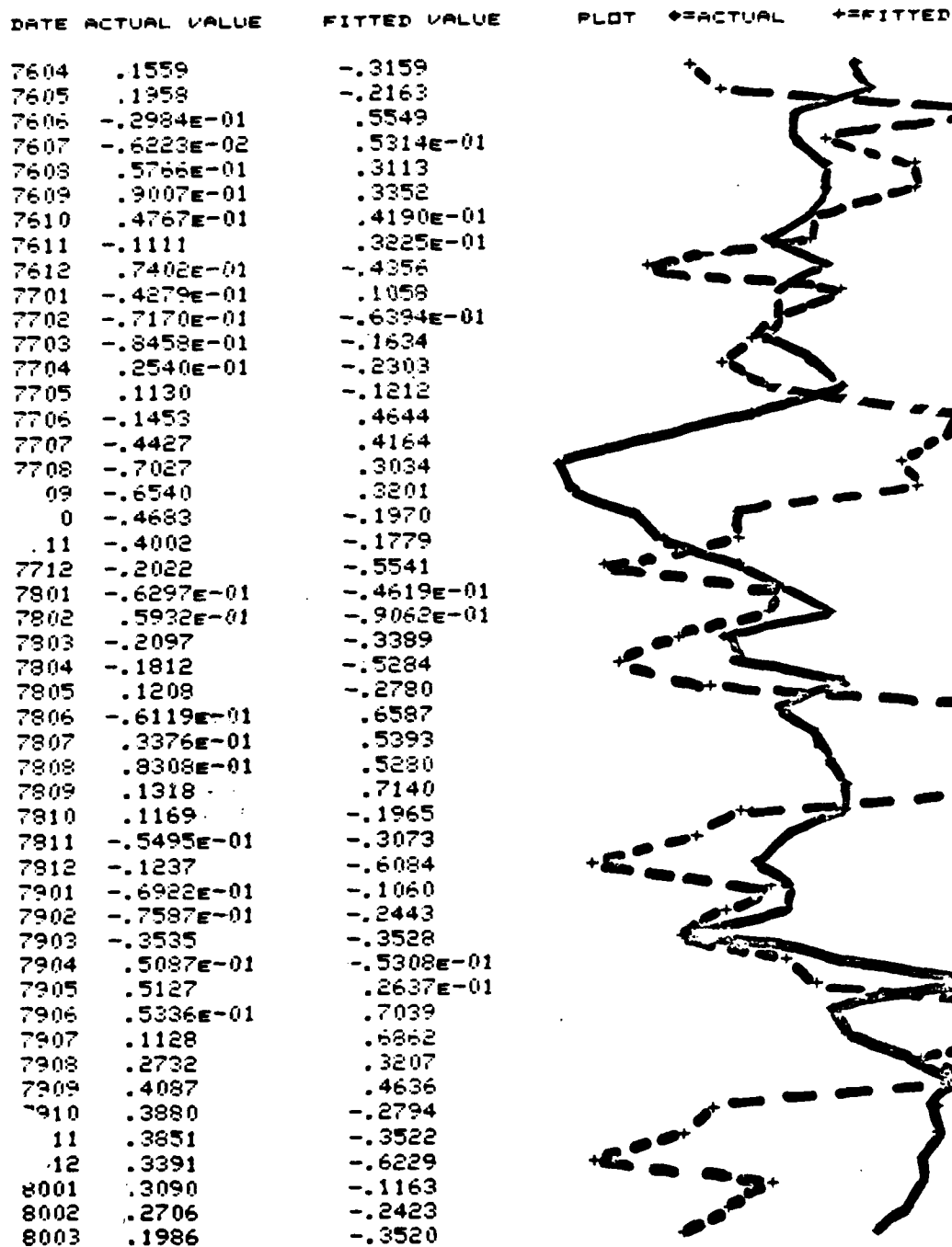


Figure A.10.4.6. NHSDG/CAT I-III A  
(% Deviation from Mean)

— Conversion Rate  
--- Short Term Objectives

#### Section A.10.5. Do Other Factors Impact the Conversion Rate?

The level of exams and manpower needs have been identified as the key determinants of the conversion rate. The remaining question requiring investigation was whether changes in other factors impacted the types of individuals drawn into the examination process, and therefore had an effect on the conversion rate.

We would expect that the impact on accession and conversion rate variation due to changes in the environmental and policy variables (other than objectives) would be reflected through exam variation in the first stage of the process. We would not expect that variation in these variables would impact the mix of candidates as well as the level of exams to a degree that would require their inclusion in the second stage of the process. The structure of this hypothesis is outlined in Figure A.10.5.1.

The hypothesis that no additional variables impacted accessions independently of their impact on exams was tested in the following manner: for each accession series a multiple regression model was specified to include

- level of exams
- objectives
  - short term
  - long term
- unemployment
- production recruiters
- GI bill
- Seasonal Dummies
  - Jan.
  - Sept. - Oct.
- Relative pay
- Advertising variables

Because of the complexity of the model specification, the hypothesis of variable intervention in the determination of accessions was rejected unless there was strong evidence to the contrary (t-statistics over 3.0). The estimated regression equations for each of the three accession market segments are presented in Figures A.10.5.2 - A.10.5.4.

Even though the GI Bill variable did not meet the strict criterion of t greater than 30, we had strong graphic evidence of an impact on the conversion rate on the Category I-III A group because of the sharp drop in the conversion rate immediately after termination (See Figure A.10.4.1).

This factor was included and its significance verified in the final model estimation (See figure A.10.6.1).

There was a depression in the conversion rate for the HSDG/Category I-IIIA group after termination of the GI Bill.

No other factors are key determinants of the accession rate for the other two groups.

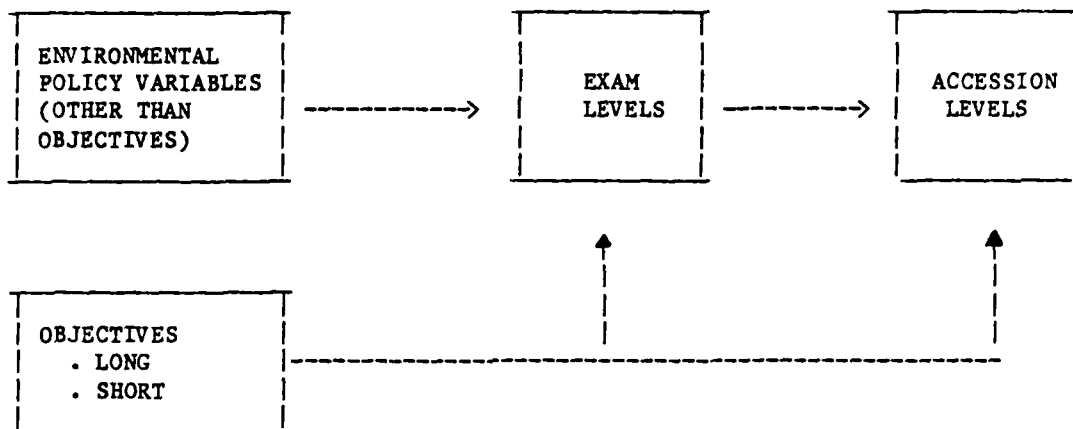


Figure A.10.5.1. Direction of Impacts of Impacts in Two-Stage Process

REGRESSION 1

Dependent variable: HSDG/CAT I-IIIA Accessions (logarithm)

| <u>Right-hand<br/>Variable (logarithm)</u> | <u>Estimated<br/>Coefficient</u> | <u>T-<br/>Statistic</u> |
|--------------------------------------------|----------------------------------|-------------------------|
| CONSTANT                                   | 3.54                             | .937                    |
| EXAMS CAT I-IIIA                           | .602                             | 3.28                    |
| LONG TERM OBJECTIVES                       | -.735                            | -3.51                   |
| SHORT TERM OBJECTIVES                      | .151                             | 3.01                    |
| UNEMPLOYMENT                               | .221                             | .810                    |
| RELATIVE PAY                               | .965                             | 2.46                    |
| RECRUITERS                                 | .808                             | 1.57                    |
| GI BILL                                    | .292                             | 2.40                    |
| JAN                                        | .0814                            | 1.30                    |
| SEPOCT                                     | -.0934                           | -2.09                   |
| \$ ADV 4-11                                | -.139                            | -.899                   |
| \$ ADV 0-1                                 | -.0312                           | -.878                   |

R-SQUARED = .9016  
 DURBIN-WATSON STATISTIC = 1.7337

Figure A.10.5.2  
 HSDG/CAT I-IIIA Accessions

REGRESSION 2

## COCHRANE-ORCUTT ITERATIVE TECHNIQUE

DEPENDENT VARIABLE: NON-HSDG/CATEGORY I-IIIA ACCESSIONS (logarithm)

FINAL VALUE OF RHO - .570884

| <u>RIGHT-HAND<br/>VARIABLE (logarithm)</u> | <u>ESTIMATED<br/>COEFFICIENT</u> | <u>T-<br/>STATISTIC</u> |
|--------------------------------------------|----------------------------------|-------------------------|
| CONSTANT                                   | -24.1                            | -1.75                   |
| EXAMS CAT I-IIIA                           | .796                             | 2.31                    |
| LONG TERM OBJECTIVES                       | 1.24                             | 1.71                    |
| SHORT TERM OBJECTIVES                      | -.0518                           | -.457                   |
| UNEMPLOYMENT                               | -.320                            | -.614                   |
| RELATIVE PAY                               | -1.24                            | -1.11                   |
| RECRUITERS                                 | 2.60                             | 1.62                    |
| GI BILL                                    | .0552                            | .188                    |
| JAN                                        | -.0116                           | -.101                   |
| SEPOCT                                     | .0863                            | .813                    |
| \$ ADV 4-11                                | -.946                            | -2.13                   |
| \$ ADV 0-1                                 | .0717                            | 1.08                    |

R-SQUARED - .82  
 DURBIN-WATSON STATISTIC - 1.6

Figure A.10.5.3  
 Non-ASDG/CAT I-IIIA Accessions

REGRESSION 3

COCHRANE-ORCUTT ITERATIVE TECHNIQUE

DEPENDENT VARIABLE: HSDG/CATEGORY IIIB-IV (logarithm)

FINAL VALUE OF RHO = .261070

| <u>RIGHT-HAND<br/>VARIABLE</u> | <u>ESTIMATED<br/>COEFFICIENT</u> | <u>T-<br/>STATISTIC</u> |
|--------------------------------|----------------------------------|-------------------------|
| CONSTANT                       | 14.9                             | 2.38                    |
| EXAMS CAT IIIB-IV              | .481                             | 2.61                    |
| LONG TERM OBJECTIVES           | -1.03                            | -3.15                   |
| SHORT TERM OBJECTIVES          | .234                             | 4.20                    |
| UNEMPLOYMENT                   | .123                             | .479                    |
| RELATIVE PAY                   | 1.16                             | 2.64                    |
| RECRUITERS                     | -.111                            | -.150                   |
| GI BILL                        | .0138                            | .121                    |
| JAN                            | .0243                            | .349                    |
| SEPOCT                         | -.0882                           | -1.80                   |
| \$ ADV 0-5                     | -.0969                           | -.652                   |

R-SQUARED = .71  
 DURBIN-WATSON STATISTIC = 1.9

Figure A.10.5.4.  
 HSDG/CAT IIIB-IV Accessions

#### Section A.10.6. How Can the Final Linkage Models Best be Specified?

The key observations regarding the linkage between exam levels and accession levels (diminishing returns of accessions to exams importance of objectives in the conversion rate determination, and adjustment for the GI Bill) led to the following considerations in developing linkage models for each of the market segments.

The key independent variables used to specify accession variation are exam levels, short- and long-term objectives, and an adjustment for the GI Bill termination.

- . The estimated models were linear in the logarithms of the dependent variable, accessions, and in the independent variables, in order to specify the multiplicative models required.
- . The estimated coefficients from the log-log models were interpreted as elasticities.
- . There was strong indication of auto-correlation in the residual series when ordinary least squares were used, so the Cochrane-Orcutt<sup>1</sup> algorithm, which adjusts the estimates based on the assumption of a first order auto-correlation in the residuals, was used to estimate the equation parameters.

These considerations were made specifying a linkage model for each of the market segments being analyzed. Multiple regression was used to estimate the coefficients of the log-log model. The indication of auto-correlation in the data required that the Cochrane-Orcutt technique be used to estimate the parameters of the regression equation.

The estimated linkage models presented in Figures A.10.6.1 - A.10.6.3 specify that a session rates are determined by exam levels and objective levels for the two high school degree segments, and by exam levels only for the Non-degree/Category I-III A segment. In addition, for the HSDG/Category I-III A segment, the GI Bill termination had to be considered.

The estimated exam elasticities, .86 for the HSDG/Category I-III A Group and .61 for each of the other two groups, indicate the fractional return in accessions for a percentage increase in exams: a 10% increase in exams results in accessions for the most desirable group and in a 6% increase in accessions for each of the other two groups. This indicates that diminishing returns are less of an issue for the first segment than for the other two segments.

The estimated elasticities for long term objectives, .71 for the HSDG/Category I-III A segment and .97 for the High School degree/Category IIIB-IV segment, reflect the observed pattern of shifting priorities during times of increased pressure. During periods when pressure is up, the relative emphasis will shift to the easier to access non-degree and low mental score segment, even though

---

<sup>1</sup>COCHRANE, D. and G.H. ORCUTT, "Application of Least Squares Regressions to Relationships Containing Autocorrelated Error Terms," Journal of the American Statistical Association #44 (1949), pp.32-61.

more potential candidates in the other segments are brought as far into the system as examination.

In general, we have seen that while increased advertising brings more people into the system (see exam model discussion), the rate at which the additional prospects are converted to accessions is dependent on other policy factors.

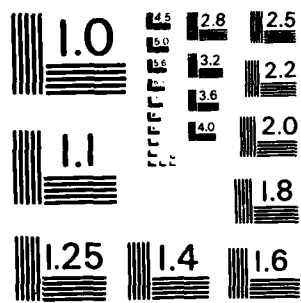
| <u>VARIABLE</u>                  | <u>COEFFICIENT</u> | <u>"t" STATISTIC</u> |
|----------------------------------|--------------------|----------------------|
| Constant                         | 6.97               | 3.4                  |
| Log (CAT 1-3A Exams)             | .86                | 8.7                  |
| Log (Long Term Objectives)       | -.71               | -2.9                 |
| Log (Short Term Objectives)      | .078               | 1.97                 |
| GI Bill Dummy                    | .27                | 3.5                  |
| Adjusted Correlation Coefficient | .35                | 2.6                  |
| R <sup>2</sup>                   | .88                |                      |

Figure A.10.6.1. HSDG/CAT I-III A Accessions - Logarithms

UNCLASSIFIED

F/G 5/3

NL



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

| <u>VARIABLE</u>              | <u>COEFFICIENT</u> | <u>"t" STATISTIC</u> |
|------------------------------|--------------------|----------------------|
| Constant                     | 11.4               | 4.8                  |
| Log (Cat 3B-4 Exams)         | .61                | 4.7                  |
| Log (Long Term Objectives)   | -.97               | 2.9                  |
| Log (Short Term Objectives)  | .17                | 3.3                  |
| Auto Correlation Coefficient | .47                | 3.7                  |
| R <sup>2</sup>               | .62                |                      |

Figure A.10.6.2. HSDG/CAT IIIB-IV Accessions - Logarithms

| <u>VARIABLE</u>              | <u>COEFFICIENT</u> | <u>"t" STATISTIC</u> |
|------------------------------|--------------------|----------------------|
| Constant                     | 1.9                | 1.1                  |
| Log (Cat 1-3A Exams)         | .61                | 3.2                  |
| Auto Correlation Coefficient | .81                | 9.5                  |
| R <sup>2</sup>               | .77                |                      |

Figure A.10.6.3. NHSDG/CAT I-III A Accessions - Logarithms

#### Section A.11. ARE THE MODELS ROBUST?

It was important to implement a systematic procedure for evaluating the validity and robustness of the models. This check provides comfort that the models as specified provide an accurate description of the recruiting process, and that the conclusions reached reflect a high degree of analytical precision.

The validity check consisted of two steps:

- (1) a review of the goodness of fit of the models
- (2) a review of the structural sensitivity of the fitted exam models to
  - excluding variables
  - re-estimating the model structure over a split-half time frame

The results show that the developed models track the actual accession data well, and are robust with respect to the tests used.

A more detailed discussion of the validity and robustness checks follows.

Section A.11.1. How Well Does the Two-stage Model Specification Track the Actual Data?

The monthly accession series, fitted using the model, were compared to actual accessions over the analysis time frame. The fitted accessions from the two-stage model for each target group were calculated as follows:

- . Step 1 - Exams are calculated using advertising, other controllable and non-controllable environmental factors in the exam models.
- . Step 2 - Accessions for each segment are determined using the calculated exams (appropriate mental category) in the linkage models.

The goodness of fit evaluated how well the model structure tracked the monthly recruiting performance data.

The fit was examined for:

- . Each of two exam models
- . Accession models for each of the three key market segments based on the two stage procedure
- . Aggregates of the accession market segments

For the aggregate accession series, the component segments were added for both the actual and fitted series, and the correlation between the fitted and actual aggregates computed.

The squared correlations for the various fits (See Table A.11.1.1) range between 64% and 93%, which indicates a high degree of accuracy in explaining the series variations.

Graphs of the actual and fitted series are presented in figures A.11.1.1-A.11.1.7. These graphs clearly demonstrate that the process as described by the models closely track both long-term trends as well as month-to-month variation.

Table A.11.1.1. GOODNESS OF FIT

| <u>EXAM MODELS</u>                           | <u>R<sup>2</sup></u> |
|----------------------------------------------|----------------------|
| I-III A EXAMS                                | .93                  |
| IIIB-IV EXAMS                                | .90                  |
| <u>ACCESSION MODELS (2 STAGE)</u>            |                      |
| High School Degree/Category I-III A          | .88                  |
| High School Degree/Category IIIB IV          | .64                  |
| Non Degree/Category I-III A                  | .72                  |
| <u>AGGREGATE ACCESSION MODELS (2 STAGES)</u> |                      |
| All Market Segments Combined                 | .86                  |
| Total High School Degree                     | .86                  |

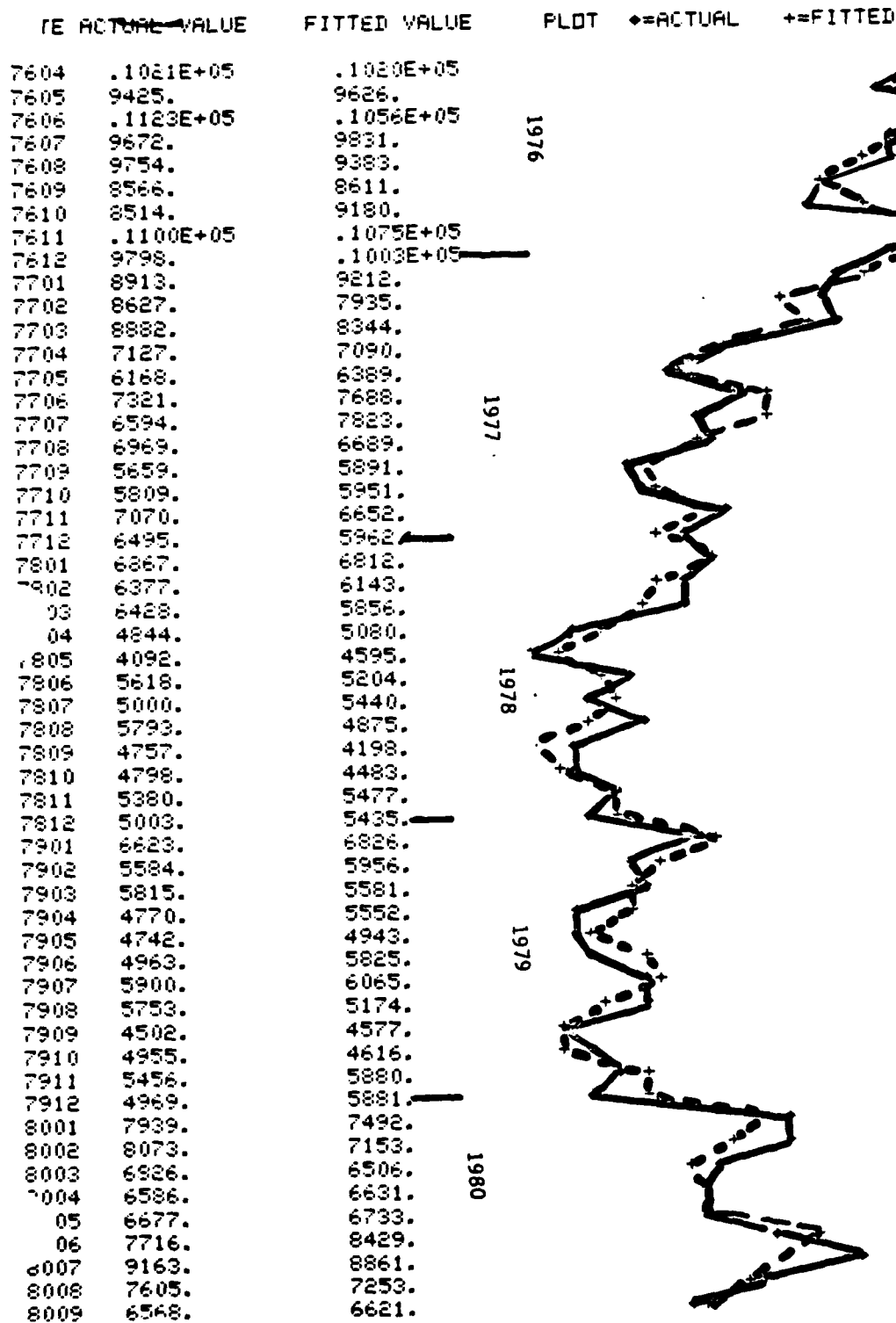


Figure A.11.1.1. Category I-III A

— Exams  
 --- Model Fit

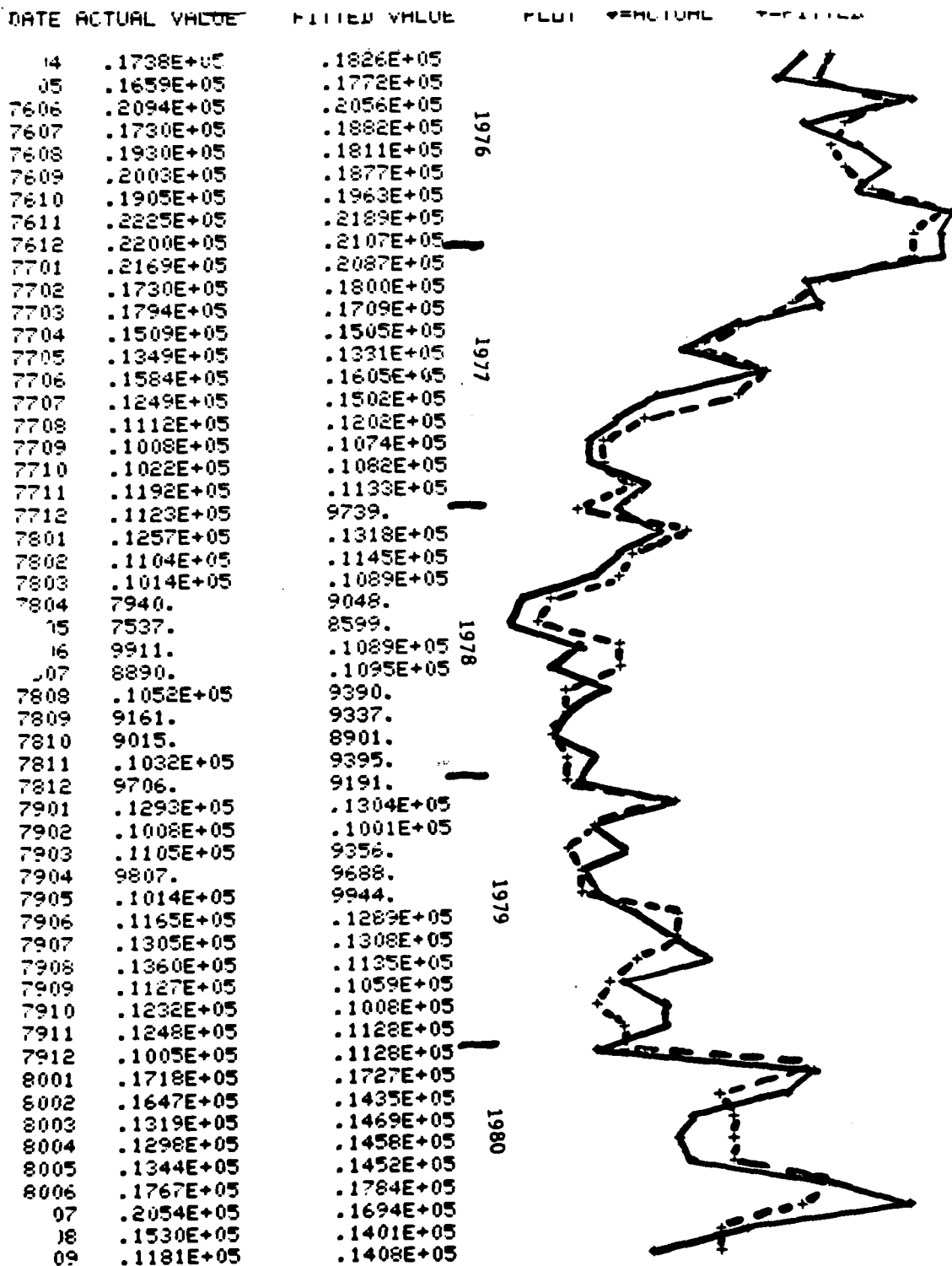


Figure A.11.1.2. Category I-IIIB

— Exams  
 --- Model Fit

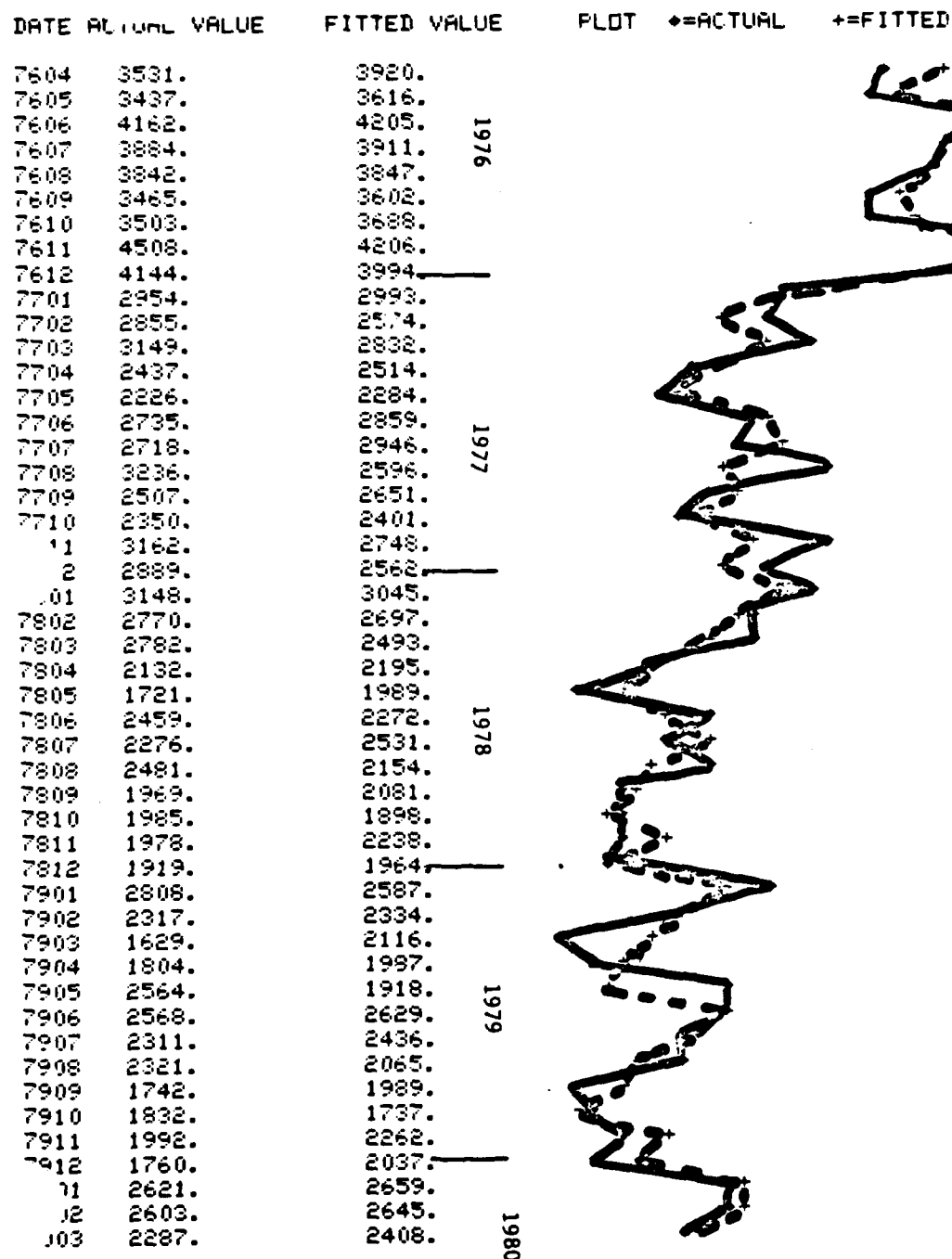


Figure A.11.1.3. HSDG/CAT I-III A  
 — Accessions  
 --- 2 Stage Model Fit

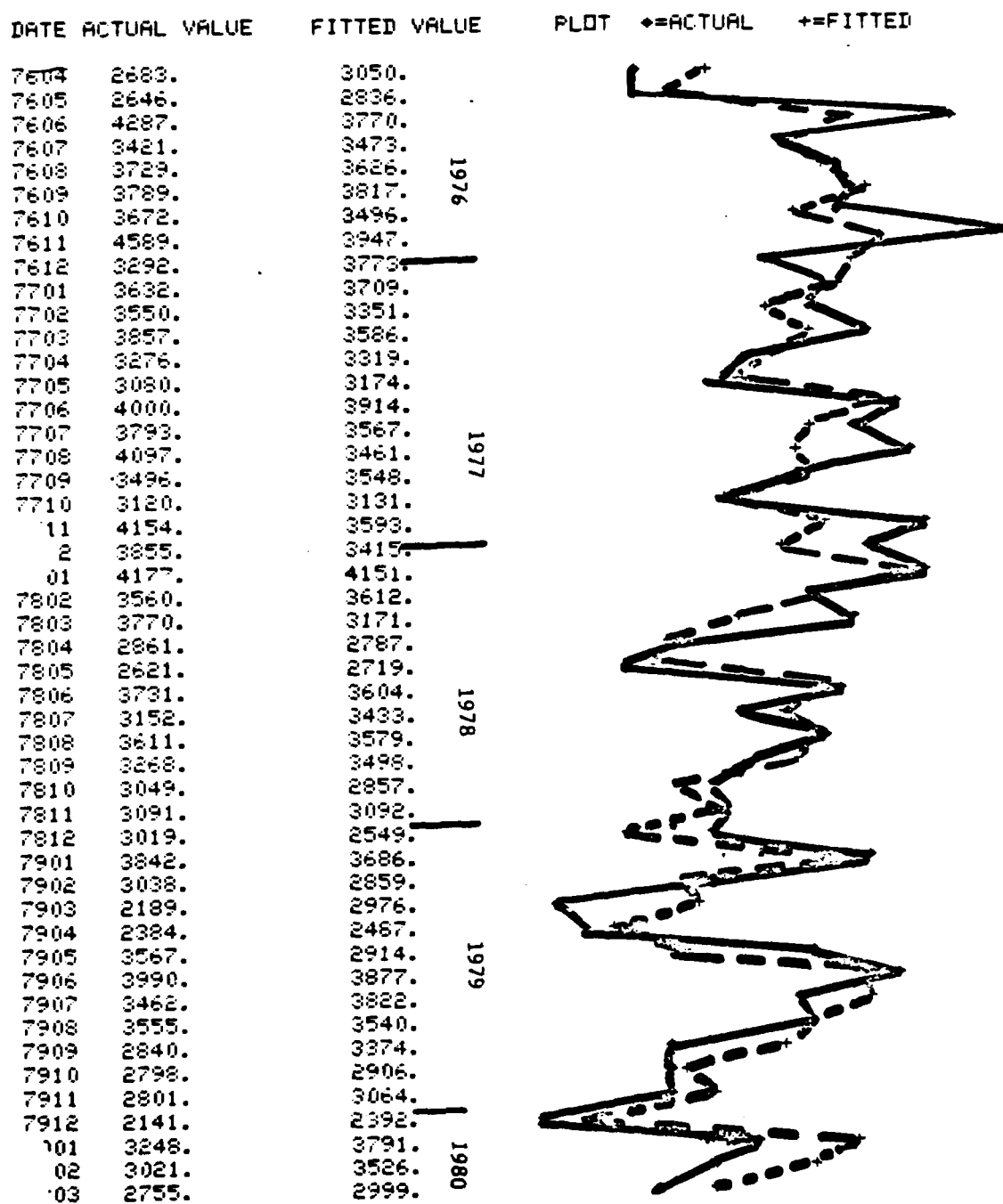


Figure A.11.1.4. HSDG/CAT IIIB-IV

— Accessions  
 --- Model Fit

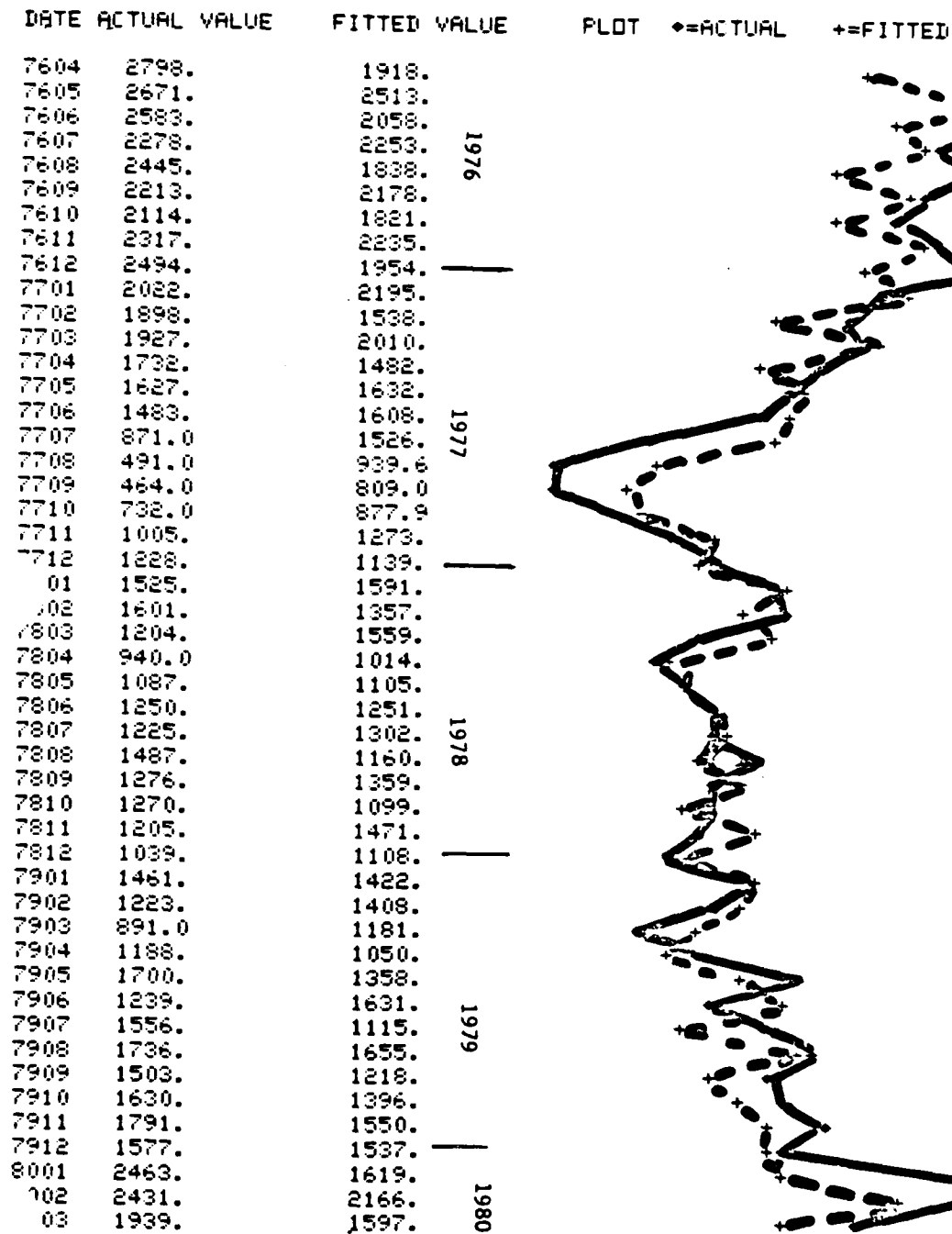


Figure A.11.1.5. NON-HSDG/CAT I-IIIA

— Accessions  
 --- Model Fit

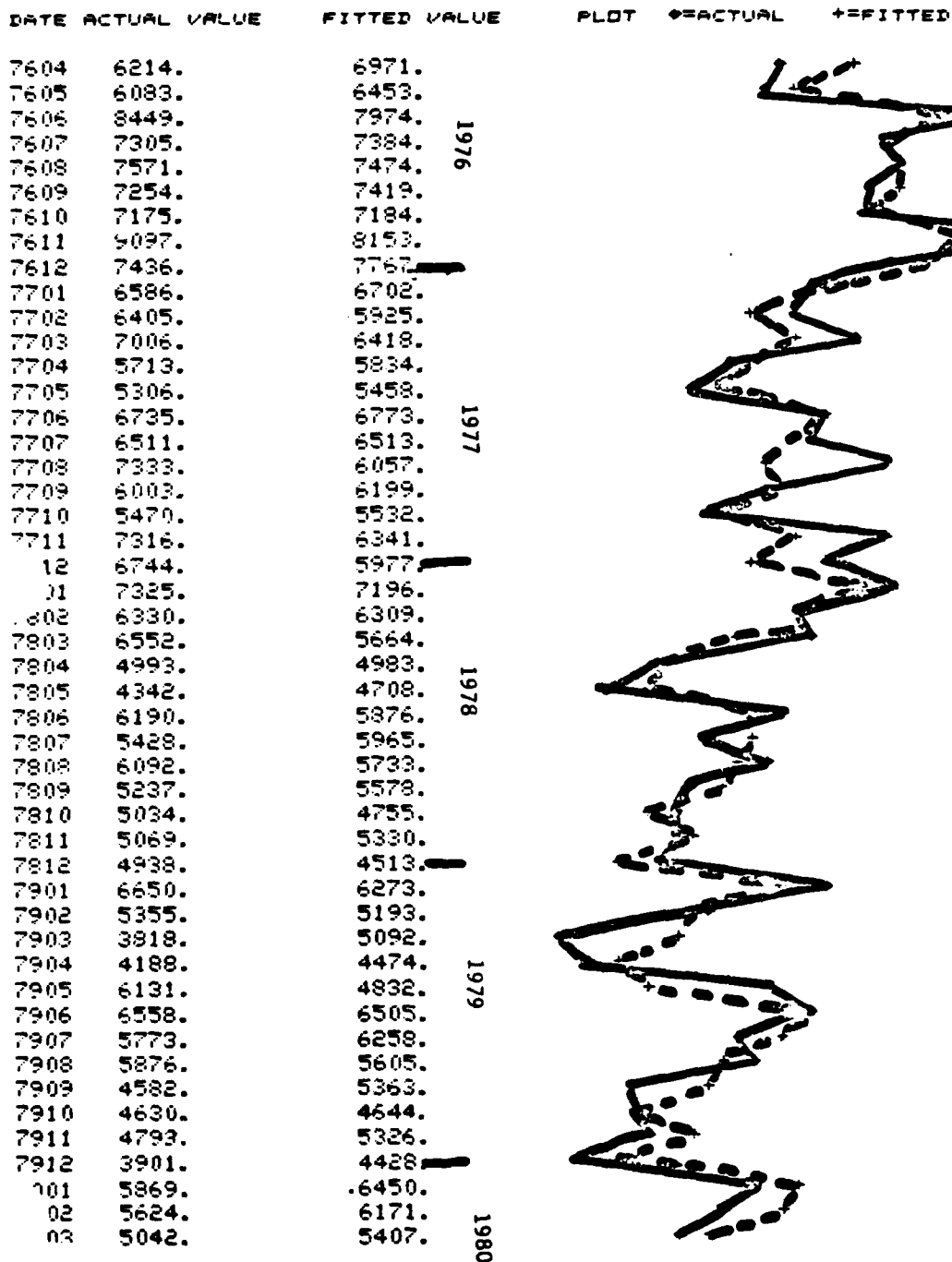


Figure A.11.1.6. Total High School

— Accessions  
 --- Model Fit

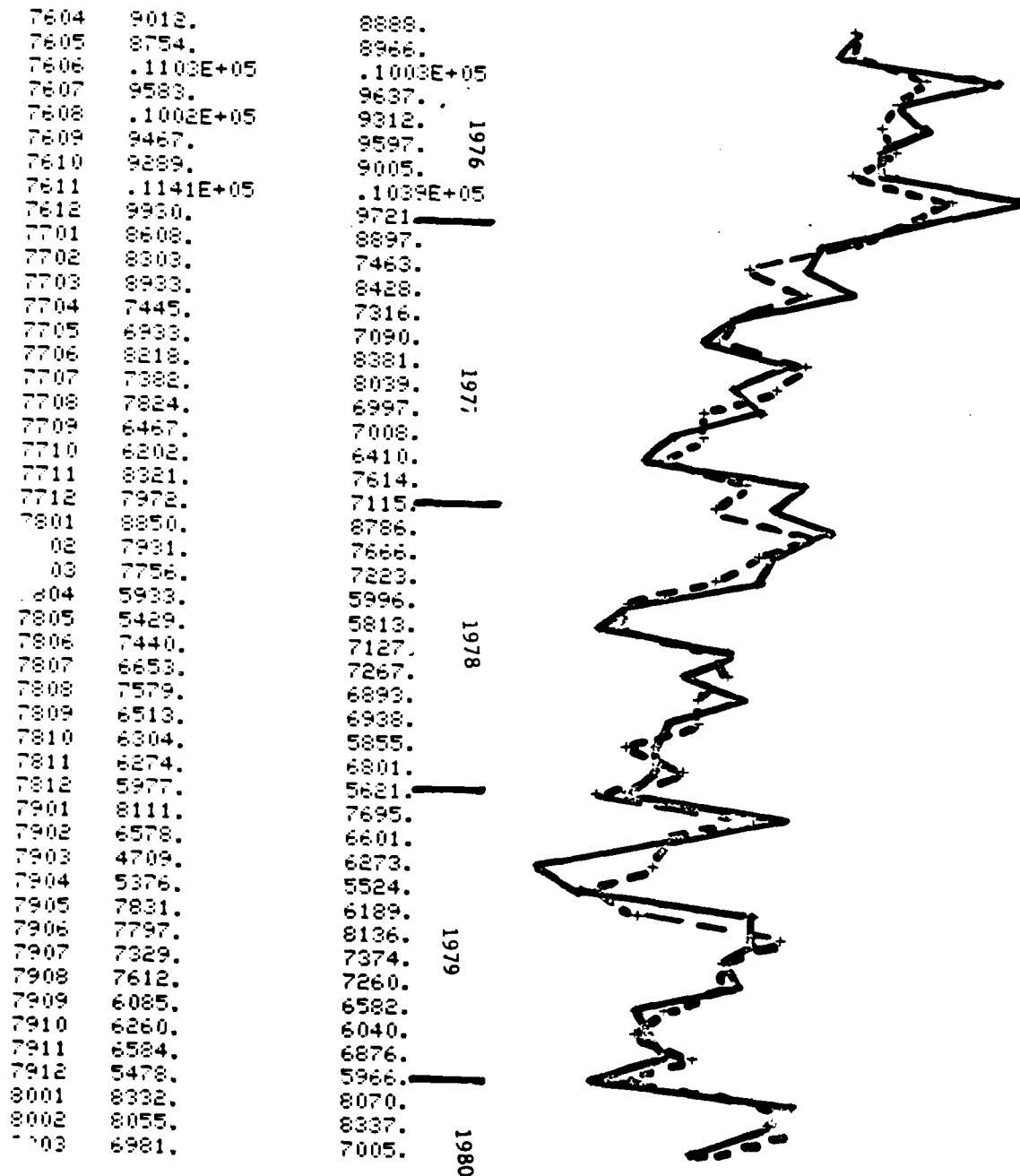


Figure A.11.1.7. High School &amp; NON/HSDG/CAT I-IIIA

— Accessions  
--- Model Fit

Section A.11.2. Are the Exam Models Consistent over Different Time Spans?

The time frame was split into halves, and the coefficients in each of the two exam model structures were re-estimated over each of the two time spans. The purpose of this exercise was to provide verification that the basic model structure provides a description of the process that is consistent across different time spans.

Each of the resulting split time frames had 27 observations. These samples were clearly too small to attach any degree of statistical significance to the results; however, in a directional sense, the results provide clear evidence of the stability in the model structure.

The resulting analysis shows a high degree of structural robustness. With the exception of the production recruiter variable, each of the estimated variable coefficients kept the same sign in both samples. There was variation in the magnitude of the coefficients, most notably in the relative pay variable, but this would be expected given the small sample sizes. Overall, the basic structure of the estimated system showed little sensitivity to the change in time frame.

The re-estimated coefficients are presented in Table A.11.2.1 and A.11.2.2.

Table A.11.2.1. Category I-III exam model coefficients estimated over two time frames.

|                | ESTIMATED MODEL COEFFICIENTS |           |           |
|----------------|------------------------------|-----------|-----------|
|                | TOTAL                        |           |           |
|                | TIME FRAME                   |           |           |
|                | 7604-8009                    | 7604-7806 | 7807-8009 |
| GI Bill        | 2948                         | 2057      | ---       |
| Unemployment   | 366                          | 404       | 141       |
| Objectives     | .070                         | .809      | .030      |
| Relative Pay   | 6832                         | 11620     | 1085      |
| Recruiters     | 1.05                         | -.715     | .228      |
| JAN            | 1289                         | 949       | 1542      |
| SEPOCT         | -693                         | -1103     | -513      |
| \$ ADV (4-11)  | .10                          | .055      | .301      |
| \$ ADV (0-1)   | .485                         | .551      | .599      |
| R <sup>2</sup> | 90                           | 97        | 78        |

Table A.11.2.2. Category IIIB-IV exam model coefficients estimated over two time frames.

|                | ESTIMATED MODEL COEFFICIENTS |           |           |
|----------------|------------------------------|-----------|-----------|
|                | TOTAL<br>TIME FRAME          |           |           |
|                | 7604-8009                    | 7604-7806 | 7807-8009 |
| GI Bill        | 5713                         | 5043      | ---       |
| Unemployment   | 543                          | 332       | 729       |
| Objectives     | .247                         | .223      | .208      |
| Relative Pay   | 13846                        | 30421     | 17832     |
| Recruiters     | 3.76                         | -.165     | 4.29      |
| JAN            | 3435                         | 4280      | 3250      |
| SEPTOCT        | -781                         | -1271     | -878      |
| \$ ADV (O-S)   | .465                         | .647      | .235      |
| R <sup>2</sup> | 90                           | 97        | 78        |

Section A.11.3. Are the Estimated Advertising Coefficients Sensitive to the Other Variables Included in the Model?

When evaluating the kind of multivariable structure specified in the exam models, it is important to determine whether the structural implications of each of the independent variables (the coefficient sign and the order of magnitude of coefficient size) had been strongly biased by the inclusion of one of the other variables in the model specification.

One way to evaluate the kind of structural sensitivity is to drop each of the variables from the model specification one at a time and to re-estimate the coefficients of the remaining variables under the reduced model specification. Particular attention was paid to the impact of the re-estimation on the advertising variables.

This re-estimation procedure was carried out for both of the exam models with the following results:

- . the advertising variables in both exam model specifications maintain consistent signs and size with the removal of each of the other variables,
- . the other variables are all consistent with respect to sign in the face of variable removal,  
  
the size of the coefficients is less stable for some of the variables, and
- . the overall system structure is highly stable for both models.

The impact of variable exclusion on the advertising coefficients is summarized in Tables A.11.3.1 and A.11.3.2, where we see how the advertising variables change from the original model as the variables are dropped. Clearly, the unemployment variable has the biggest impact on the estimated advertising coefficients.

Tables A.11.3.3 and A.11.3.4 present the complete re-estimated model specification for each exam series, dropping the variables one at a time.

Table A.11.3.1. CATEGORY I-III A EXAM MODEL

EFFECT OF DROPPING VARIABLE  
ON ADVERTISING COEFFICIENTS  
 (% Change in Advertising Coefficient from Original Model)

| Variable Dropped               | Long Term (4-11)<br>Advertising Aggregate | Immediate Reponse<br>Advertising | Total<br>Advertising |
|--------------------------------|-------------------------------------------|----------------------------------|----------------------|
| GI Bill                        | -2%                                       | +12%                             | +1.2%                |
| Unemployment                   | 137                                       | -2                               | 108                  |
| Objectives                     | 55                                        | -38                              | 10                   |
| Relative Pay                   | 74                                        | -28                              | 31                   |
| Recruiters                     | 67                                        | 27                               | 59                   |
| JAN                            | -27                                       | 2                                | -26                  |
| SEPOCT                         | -12                                       | 19                               | -7.4                 |
| Long Term \$ADV (4-11)         | —                                         | -19                              |                      |
| Immediate Response \$ADV (0-1) | -26                                       | —                                |                      |

Table A.11.3.2. CATEGORY IIIB-IV EXAM MODEL

EFFECT OF DROPPING VARIABLE  
ON ADVERTISING AGGREGATE (0-5)  
(% Change in Advertising Coefficient from Original Model)

|              |     |
|--------------|-----|
| GI Bill      | -5% |
| Unemployment | +37 |
| Objectives   | -17 |
| Relative Pay | 0   |
| Recruiters   | 29  |
| JAN          | 11  |
| SEPOCT       | -2  |

Table A.11.3.3  
EXCLUDING VARIABLES FROM  
CATEGORY I-III A EXAM MODEL

VARIABLE DROPPED  
(Coefficients re-estimated under reduced specification)

|                | CAT-I-III A<br>EXAM MODEL | GI BILL | UNEM.  | OBJ.  | PAY   | RECR. | JAN   | SEPOCT | (4 - 11) | (0 - 1) |
|----------------|---------------------------|---------|--------|-------|-------|-------|-------|--------|----------|---------|
| GI BILL        | 2948*                     |         | 4134*  | 3538* | 3496* | 2914* | 2623* | 2855*  | 2606*    | 2975*   |
| Unemployment   | 366*                      | 599*    |        | 324*  | 351*  | 356*  | 419*  | 423*   | 413*     | 365*    |
| Objectives     | .070*                     | .179    | .031   |       | .039  | .072* | .079* | .067*  | .087*    | .053*   |
| Rel. Pay       | 6832*                     | 15659*  | 5589   | 4126* |       | 4996* | 6540* | 6413*  | 8909*    | 5743*   |
| Recruiters     | 1.05*                     | .88     | .80    | 1.13* | .475  |       | .897  | 1.08*  | 1.64*    | 1.37*   |
| JAN            | 1289*                     | 727     | 1754*  | 1379* | 1257* | 1236* |       | 1315*  | 1208*    | 1298*   |
| SEPOCT         | -695*                     | -534    | -1194* | -673* | -650* | -705* | -721* |        | -660*    | -770*   |
| \$ ADV (4-11)  | .10*                      | .098    | .237*  | .155* | .174* | .167* | .073  | .088   |          | .074*   |
| \$ ADV (0-1)   | .485*                     | .541    | .480   | .302  | .344  | .618* | .497* | .577*  | .394*    |         |
| R <sup>2</sup> | .93                       | .81     | .85    | .92   | .91   | .92   | .90   | .91    | .92      | .92     |

\*Indicates "t" value exceeded 2.0

Table A.11.3.4  
EXCLUDING VARIABLES FROM  
CATEGORY IIIB-IV EXAM MODEL

VARIABLE DROPPED  
(Coefficients re-estimated under reduced specification)

|                | CAT-IIIB-IV<br>EXAMS MODEL | GI BILL | UNEM   | OBJ.  | PAY   | RECR.  | JAN    | SEPOCT | (0 - 5) |
|----------------|----------------------------|---------|--------|-------|-------|--------|--------|--------|---------|
| GI Bill        | 5713*                      |         | 6680*  | 7396* | 6446* | 4403*  | 5101*  | 5682*  | 5814*   |
| Unemployment   | 543*                       | 876*    |        | 549*  | 622*  | 562*   | 617*   | 603    | 828*    |
| Objectives     | .247*                      | .412*   | .249*  |       | .221* | .318*  | .260x  | .236*  | .207*   |
| Rel. Pay       | 13846*                     | 23877*  | 16993* | 10240 |       | 10332* | 11240* | 12660* | 13672*  |
| Recruiters     | 3.76*                      | .45     | 3.90*  | 5.59* | 3.11* |        | 2.76*  | 3.78*  | 5.45*   |
| JAN            | 3435*                      | 2419*   | 3793*  | 3659* | 3119* | 2781*  |        | 3490*  | 3855*   |
| SEPOCT         | -781                       | -663    | -1455* | -346  | -447  | -811   | -908   |        | -657    |
| ADV (0-5)      | .465*                      | .486*   | .635*  | .383* | .463* | .602*  | .517*  | .459*  |         |
| R <sup>2</sup> | 90                         | 78      | 87     | 85    | 88    | 87     | 86     | 90     | 85      |

\*indicates "t" value exceeded 2.0

Section A.12. STEP BY STEP PROCEDURES  
FOR USING THE MODELS

A flow chart describing how to use these models in 3 steps is provided in Figure A.12.1. Each step is detailed below.

Step 1. Prepare monthly data on each independent variable.

Ten independent variables and a constant (all one's) are in the final exam models (see Figures A.8.6.1 and A.9.5.1).

- $X_1$  is the G.I. Bill indicator. The variable takes a value of 1 until December of 1976. From January of 1977 on, it takes a value of 0.
- $X_2$  is unemployment (see Data Appendix D.1). Unemployment here is measured for 16-19 year olds and is not seasonally adjusted. The variable is the average of the current and the prior month's unemployment level. The source of this variable is the U.S. Department of Labor.
- $X_3$  is recruiter objectives (C.1). Objectives here are for monthly non-prior-service male accessions. The source of this variable is the General Research Corporation.
- $X_4$  is relative pay. Relative pay (G.3) is the ratio of El Pay (see C.2) and the civilian minimum wage (D.2).
- $X_5$  is recruiter level (C.3). The recruiter level includes recruiters on production as well as station commanders. The source is USAREC.
- $X_6$  is a January indicator. It takes the value 1 in January and 0 elsewhere.
- $X_7$  is a September-October indicator and takes the value 1 in these two months and 0 elsewhere.
- $X_8$  is the net deflated expenditure on radio and local advertising plus television spending one month earlier (F.11). The media expenditures are deflated to constant December 1978 dollars and adjusted to reflect net spending. Deflation for TV and radio requires a weighting of spot and prime (or network) deflators according to use. The source is N W Ayer Incorporated.
- $X_9$  is the net deflated expenditure on all media summed from 4 to 11 months prior to the month in question.
- $X_{10}$  is the net deflated expenditure on all media summed from the month in question back through the previous 5 months.

Step 1

- . PREPARE MONTHLY DATA ON EACH INDEPENDENT VARIABLE.

See Data Appendix for sources  
and listing.

Step 2

- . COMPUTE EXAMS USING EXAM MODEL

See Figure A.12.2 and A.12.3. for a description  
of the model in equation form.

Step 3

- . COMPUTE ACCESSIONS USING ACCESSION MODEL

See Figure A.12.4 for a description  
of the model in equation form.

Figure A.12.1 Flow chart describing how to use the exam  
and accession models

The accession models include either of two additional variables  
(see Figures A.10.6.1 to A.10.6.3).

$X_{11}$  is long-term recruiting objectives (see G.1). This variable is a  
12-month centered moving average. See Figure A.12.4 for how  
our vendor, Computer Sciences Corporation, computes this average.

$X_{12}$  is short-term recruiting objectives (see G.2). This is the ratio  
of  $X_3$  to  $X_{11}$ .

Step 2. Compute exams from the exam models.

The equations to use are shown in Figures A.12.2.1 and A.12.2.2. The coefficients for each of the ten independent variables are listed below (see Figures A.8.6.1 and A.9.5.1).

| <u>Coefficient</u> | <u>CAT I-III A</u> | <u>CAT IIIB-IV</u> |
|--------------------|--------------------|--------------------|
| $a_0$              | -13841             | -35781             |
| $a_1$              | 2948               | 5713               |
| $a_2$              | 366                | 543                |
| $a_3$              | .070               | .247               |
| $a_4$              | 6832               | 13896              |
| $a_5$              | 1.05               | 3.8                |
| $a_6$              | 1289               | 3435               |
| $a_7$              | -695               | -781               |
| $a_8$              | .485               |                    |
| $a_9$              | .10                |                    |
| $a_{10}$           |                    | .465               |

$$Y_t = a_0 + a_1X_1 + a_2X_2 + a_3X_3 + a_4X_4 + a_5X_5 + a_6X_6 + a_7X_7 + a_8X_8 + a_9X_9$$

where

$Y_t$  is predicted CAT I-III A exams.

$X_i$  is the  $i^{\text{th}}$  independent variable. It is described in Step 1 of Section A.12.

$a_i$  is the  $i^{\text{th}}$  coefficient of variable  $i$ . It is listed above in Step 2 of section A.12.

Figure A.12.2. CAT I-III A Model in equation form.

$$Y_t = a_0 + a_1X_1 + a_2X_2 + a_3X_3 + a_4X_4 + a_5X_5 + a_6X_6 + a_7X_7 + a_{10}X_{10}$$

where

$Y_t$  is predicted CAT IIIB-IV exams.

$X_i$  is the  $i^{\text{th}}$  independent variable. It is described in Step 1 of Section A.12.

$a_i$  is the  $i^{\text{th}}$  coefficient of variable 1. It is used in Step 2 of Section A.12.

Figure A.12.2.3. CAT IIIB-IV Model in equation form

Step 3. Compute accessions using accession Models.

The three equations to use are shown in Figures A.12.4 to A.12.6. The coefficients of each variable are listed below. Note that the coefficients are used as exponents.

| <u>Coefficient</u> | <u>HSDG/CAT 1-IIIA</u> | <u>HSDC/CAT IIIB-IV</u> | <u>NHSDG/CAT III B-IV</u> |
|--------------------|------------------------|-------------------------|---------------------------|
| $b_0$              | 6.97                   | 11.4                    | 1.9                       |
| $b_1$              | .86                    | .61                     | .61                       |
| $b_2$              | -.71                   | -.97                    |                           |
| $b_3$              | .078                   | .17                     |                           |
| $b_4$              | .27                    |                         |                           |
| $b_5$              | .35                    | .47                     | .81                       |

$$Z_t = e^{b_0 Y_t^{b_1} X_{11}^{b_2} X_{12}^{b_3} X_1^{b_4} U_{t-1}^{b_5}}$$

where

$Z_t$  is predicted HSDG/CAT I-IIIA accessions and  $e$  is 2.718.

$Y_t$  is predicted CAT I-IIIA exams.

$X_i$  is the  $i^{\text{th}}$  independent variable described in Step 1 of Section A.12.

$U_{t-1}$  is actual HSDG CAT I-IIIA accessions in period  $t-1$  divided by  $Z_{t-1}$ .

Figure A.12.4. HSDG/CAT I-IIIA Accession Model in equation form.

$$Z_t = e^{b_0 Y_t^{b_1} X_{11}^{b_2} X_{12}^{b_3} U_{t-1}^{b_5}}$$

where

$Z_t$  is predicted HSDG/CAT IIIB-IV accessions and  $e$  is 2.718.

$Y_t$  is predicted CAT IIIB-IV exams.

$X_i$  is the  $i^{\text{th}}$  independent variable described in Step 1 of Section A.12.

$U_{t-1}$  is actual HSDG CAT IIIB-IV in period  $t-1$  divided by  $Z_{t-1}$ .

Figure A.12.5. HSDG/CAT IIIB-IV Accession Model in equation form.

$$Z_t = e^{b_0} Y_t U_{t-1}^{b_5}$$

where

$Z_t$  is predicted NHSDG/CAT I-III A accessions  
e is 2.718

$Y_t$  is predicted CAT I-III A exams.

$X_i$  is the  $i^{\text{th}}$  independent variable described in Step 1  
of Section A.12.

$U_{t-1}$  is actual NHSDG CAT I-III A accessions in period  $t-1$   
divided by  $Z_{t-1}$ .

Figure A.12.6. then NHSDG/CAT I-III A Accession Model in equation form.

. If the CENTER option is used and  $n = 2q$  is even, then  $Y_t$  is computed by the following formula:

$$Y_t = \frac{1}{w} \left( \frac{1}{2} X_{t+q} + X_{t+q-1} + \dots + X_{t+1} + X_t + X_{t-1} + \dots + X_{t-q+1} + \frac{1}{2} X_{t-q} \right)$$

with  $w$  as above.

Figure A.12.7. Computation of a centered moving average ( $n = 12$  and  $w = 1$ ).

DATA APPENDIX A  
PERFORMANCE VARIABLES

UNTRANSFORMED DATA SERIES

Data Appendix A. Performance Variables

Accessions by Date of Contract

- A.1 High School Degree/Category I-IIIA
- A.2 High School Degree/Category IIIB-IV
- A.3 Non Degree/Category I-IIIA
- A.4 Non-Degree/Category IIIB-IV

ASVAB Exams

- A.5 Category I-IIIA
- A.6 Category IIIB-IV

Data Appendix B. Media Variables

Advertising Spending

- B.1 Television
- B.2 Radio
- B.3 Newspaper
- B.4 Outdoor
- B.5 Direct Mail
- B.6 Local Advertising
- B.7 Regular Magazines
- B.8 Special Magazines

Media Deflators

- B.9 Spot Television
- B.10 Network Television
- B.11 Spot Radio
- B.12 Network Radio
- B.13 Newspapers
- B.14 Magazines
- B.15 Outdoor

Data Appendix C. Policy Variables

- C.1 Recruiter Accession Objectives
- C.2 El Pay
- C.3 Recruiter Numbers

Data Appendix D. Environmental Variables

- D.1 Youth (16-19) Unemployment
- D.2 Civilian Minimum Wage

ADJUSTED OR TRANSFORMED DATA SERIES

Data Appendix E. Performance Variables

Accessions by Date of Contract (the December 1976 GI Bill determined spike removed from the data)

- E.1 High School Degree/Category I-IIIA
- E.2 High School Degree/Category IIIB-IV
- E.3 Non Degree/Category I-IIIA

ASVAB Exams (the December 1976 GI bill Determined spike removed from the data)

- E.4 Category I-IIIA
- E.5 Category IIIB-IV

Data Appendix F. Media Variables

Advertising spending (deflated to constant Dec. 1978 dollars, and adjusted to reflect net spending levels throughout)

- F.1 Television
- F.2 Radio
- F.3 Newspaper
- F.4 Outdoor
- F.5 Direct Mail
- F.6 Local Advertising
- F.7 Regular Magazines
- F.8 Special Magazines

Aggregated Advertising Spending (aggregation is over deflated net dollars)

- F.9 Total Media at Current period
- F.10 Total Media Sum of Periods T-4 through T-11
- F.11 Television (lagged 1 period) + Local Advertising + Newspaper
- F.12 Total Media - Sum of Current Period Through Period T-5

Data Appendix G. Policy Variables

- G.1 Recruiter Accession Objectives - Twelve Month Centered Moving Average
- G.2 Recruiter Accession Objectives - Ratio of Monthly Objectives to Moving Average
- G.3 Relative Pay - the Ratio of EI Pay to the Civilian Minimum Wage

Series - Accession by date of contract

Source - Defense Manpower Data Center

Definition - Monthly Accessions into the Army counted during the month the original contract was signed.

Defining the data in this manner washes out the delays caused by the Delayed Entry Program.

Comments - Before use in the analysis each series was adjusted to remove the Dec. 1976 spike by replacing that month of data with the process mean.

Accessions by Date of Contract

- A.1 High School Degree/Category I-IIIA
- A.2 High School Degree/Category IIIB-IV
- A.3 Non Degree/Category I-IIIA

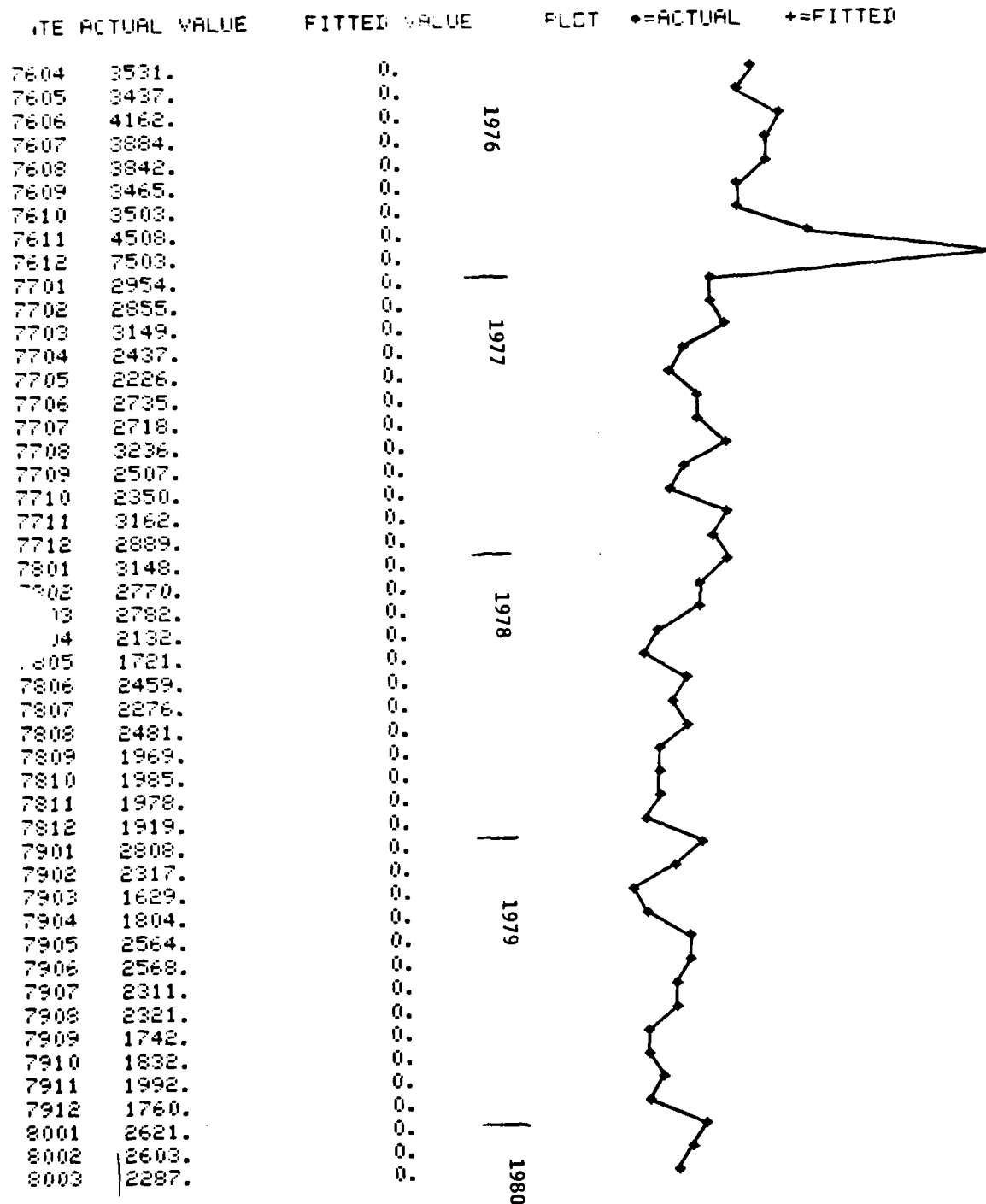
The Data Appendices include a listing of each of the variables used in the analysis.

The data is listed in the untransformed state as received from the original source, and also listed as transformed where appropriate.

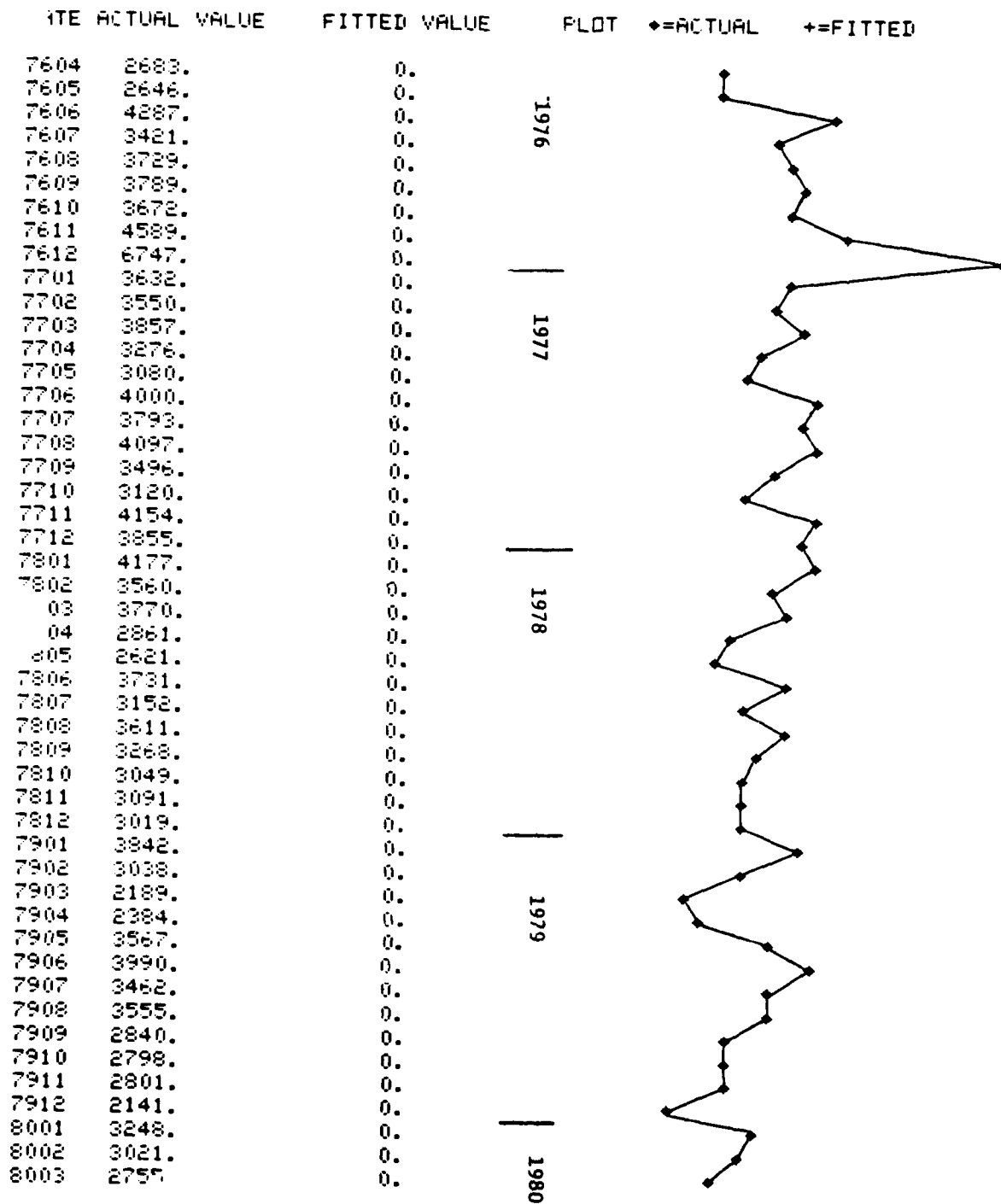
For each type of variable find a description, statement of source, and relevant comments.

For the data used directly in the model a plot is included. For the secondary data series--media deflators, a listing only is included.

## A.1

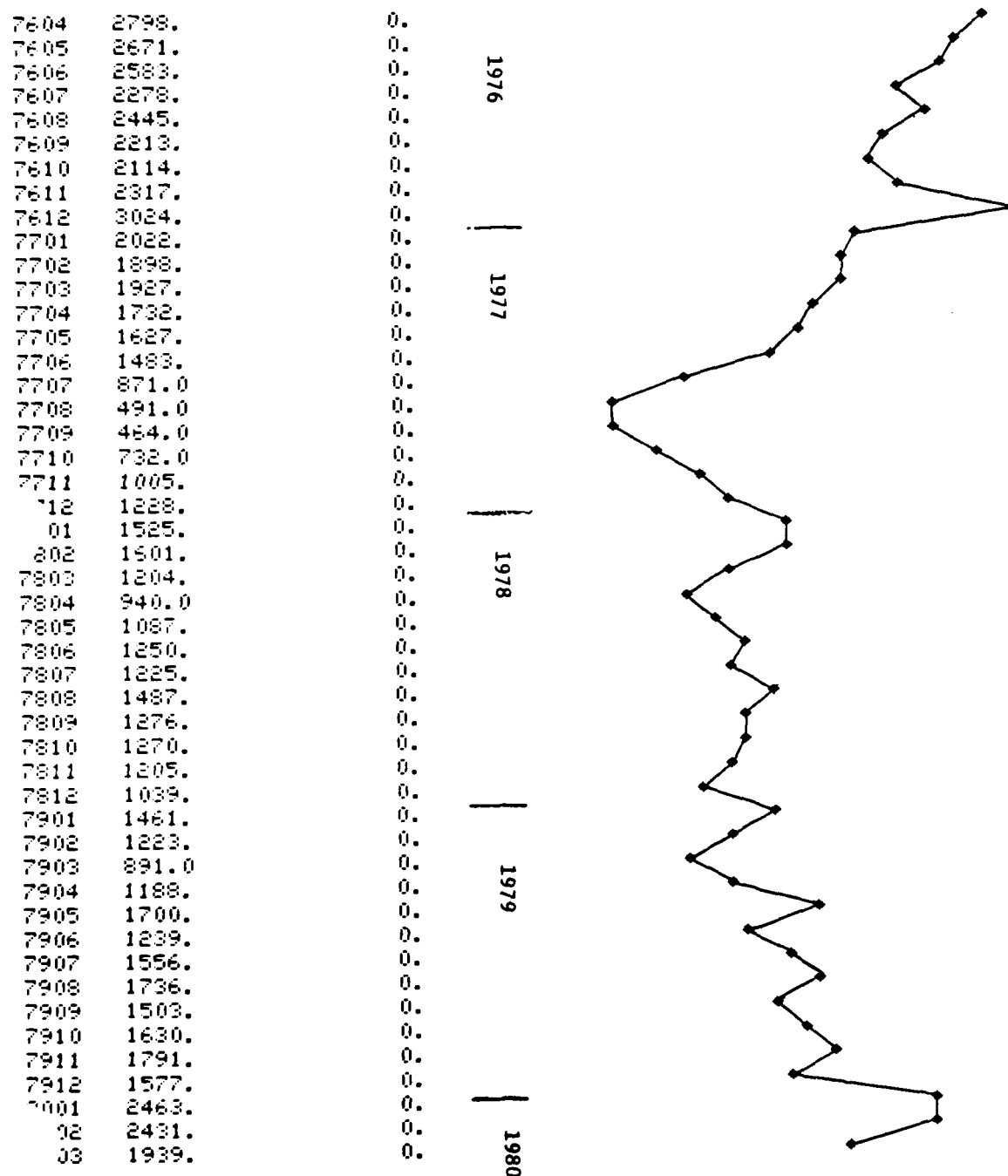
HSDG/CATEGORY I-IIIA ACCESSIONS  
(CONTRACT DATA)

HSDG/CATEGORY IIIB-IV ACCESSIONS  
(CONTRACT DATE)



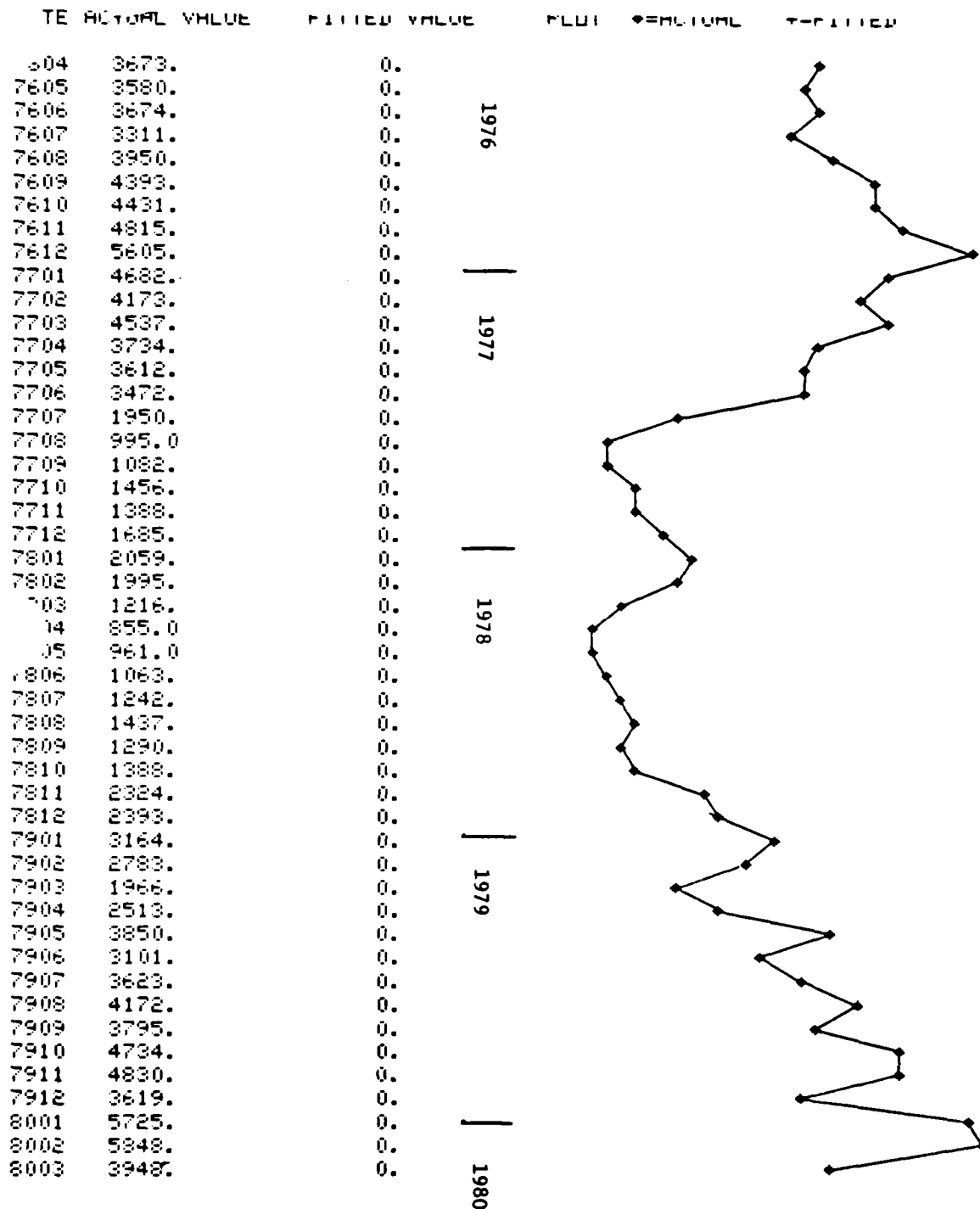
NHSDG/CATEGORY I-III ACCESS.0.0  
(CONTRACT DATE

DATE ACTUAL VALUE      FITTED VALUE      PLOT   ♦=ACTUAL   +=FITTED



A.4

NHSDG/CATEGORY IIIB-IV ACCESSIONS  
(CONTRACT DATE)



Series - ASVAB 6-7 Exams

Source - Defense Manpower Data Center

Definition - The number of ASVAB 6-7 exams completed throughout all Armed Forces Entry Examination stations administered under U.S. Army auspices.

Comments - The series was sorted by mental category score.

Before using in the analysis the december 1976 spike was removed and replaced by the process mean.

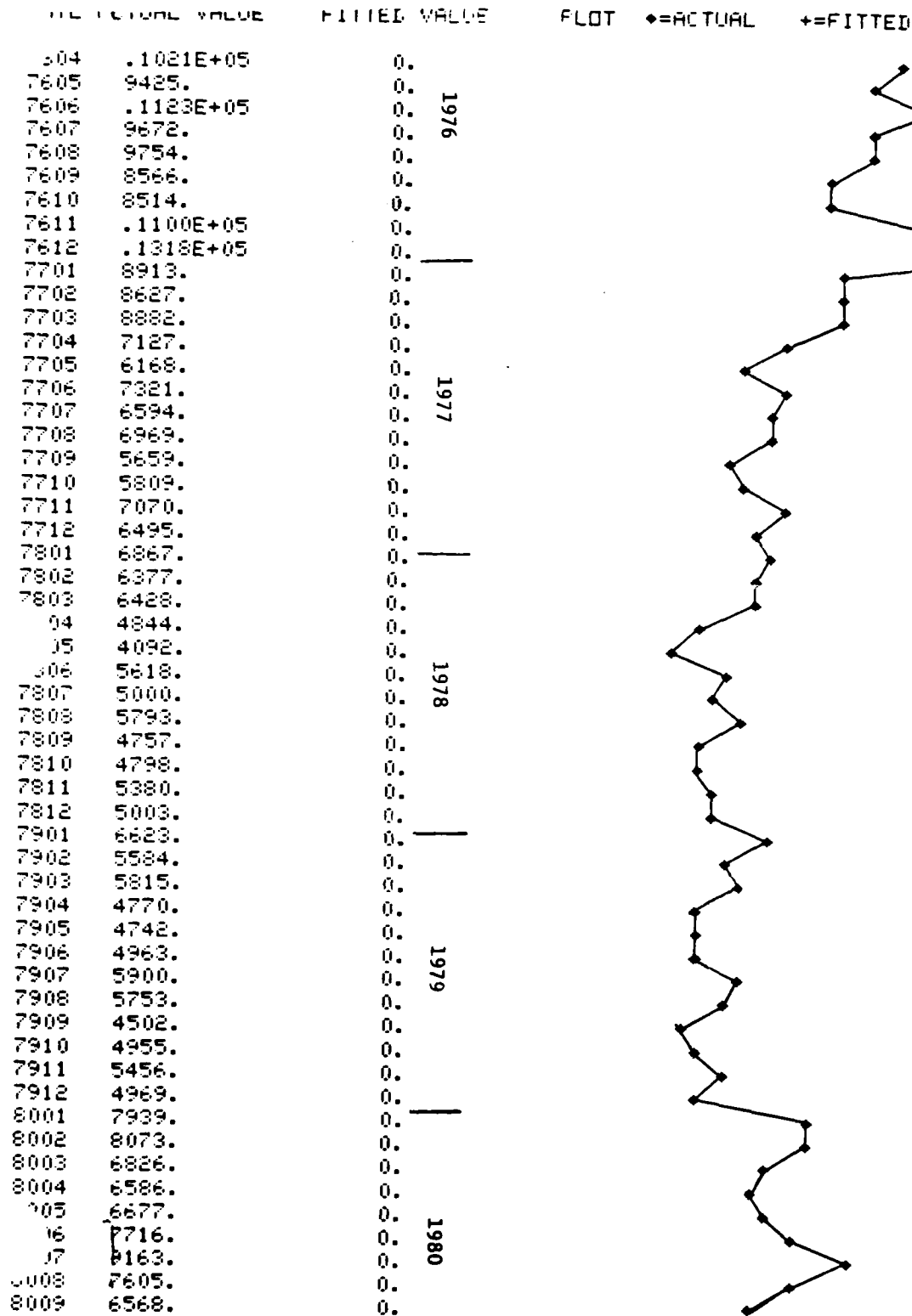
ASVAB Exams

A.5 Category I-III A

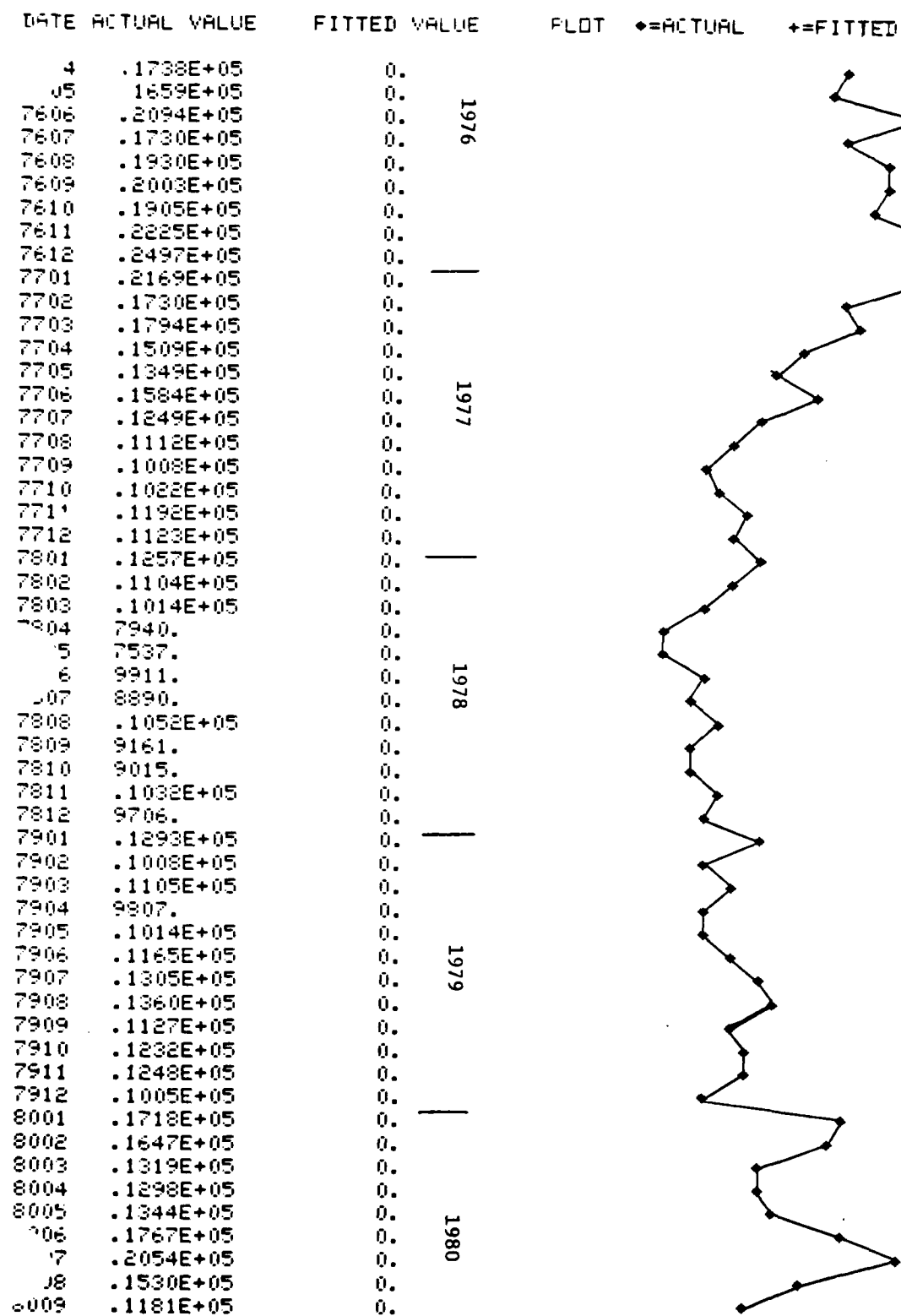
A.6 Category IIIB-IV

## A.5

## CATEGORY I-III A ASVAB EXAMS



## CATEGORY IIIB-IV ASVAB EXAMS



DATA APPENDIX B  
MEDIA VARIABLES

Series - Net and Deflated Media Spending Variables

Transformation - All media series were deflated by the appropriate deflators. The data from April 1976 through September 1978 had been expressed as gross expenditures and needed to be divided by 1.15 to achieve net expenditures.

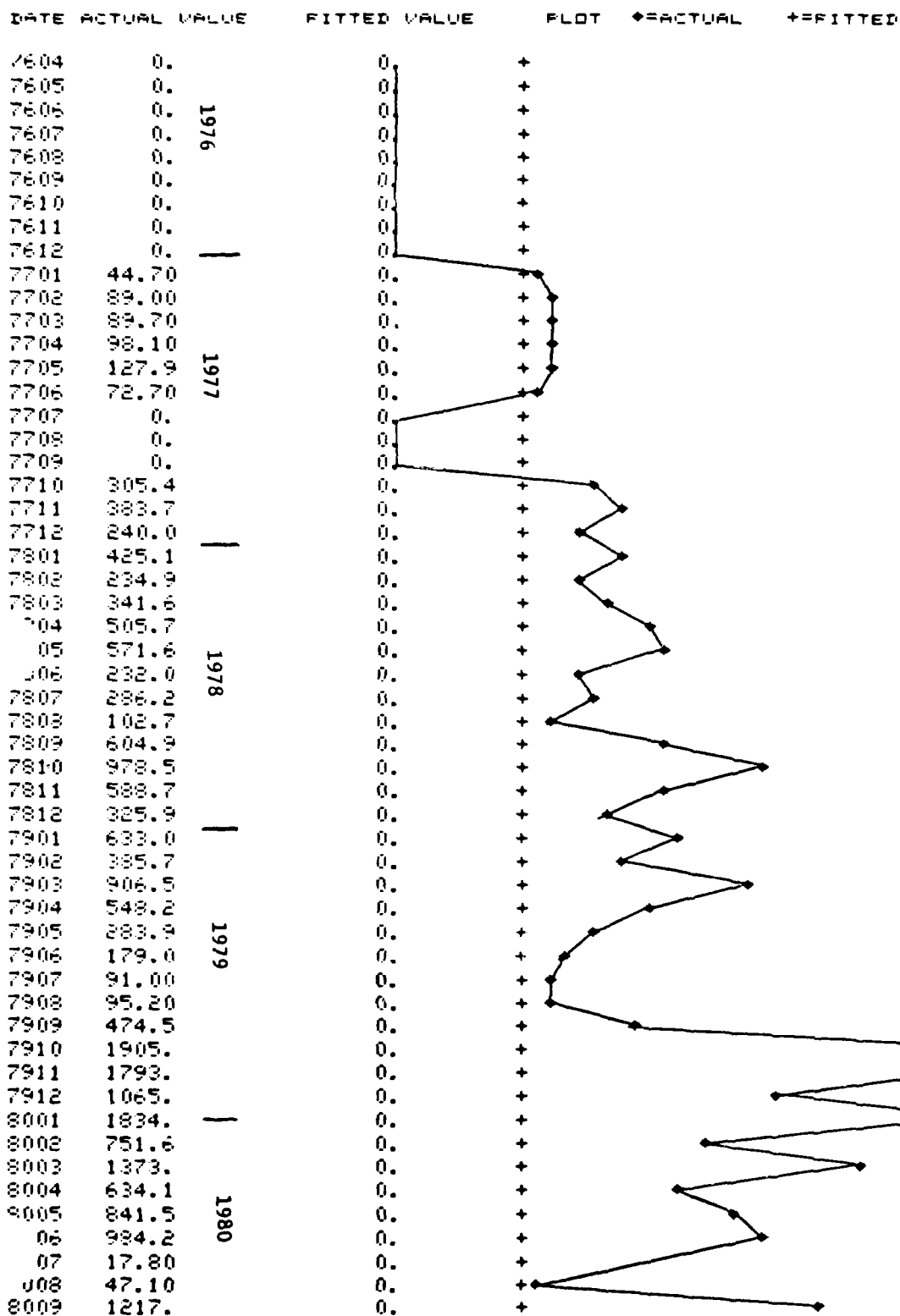
- F.1 Television\*
- F.2 Radio\*\*
- F.3 Newspaper
- F.4 Outdoor
- F.5 Direct Mail
- F.6 Local Advertising
- F.7 Regular Magazines
- F.8 Special Magazines

---

\* The TV deflator is a weighted average of the TV spot deflator B.9 and the TV prime deflator B.10. The weights are the proportions of Spot and prime TV to total TV expenditures. We estimated that Spot TV was 100% of total TV expenditures until October 1977; then only 8% until October 1978; and the 25% until October 1980.

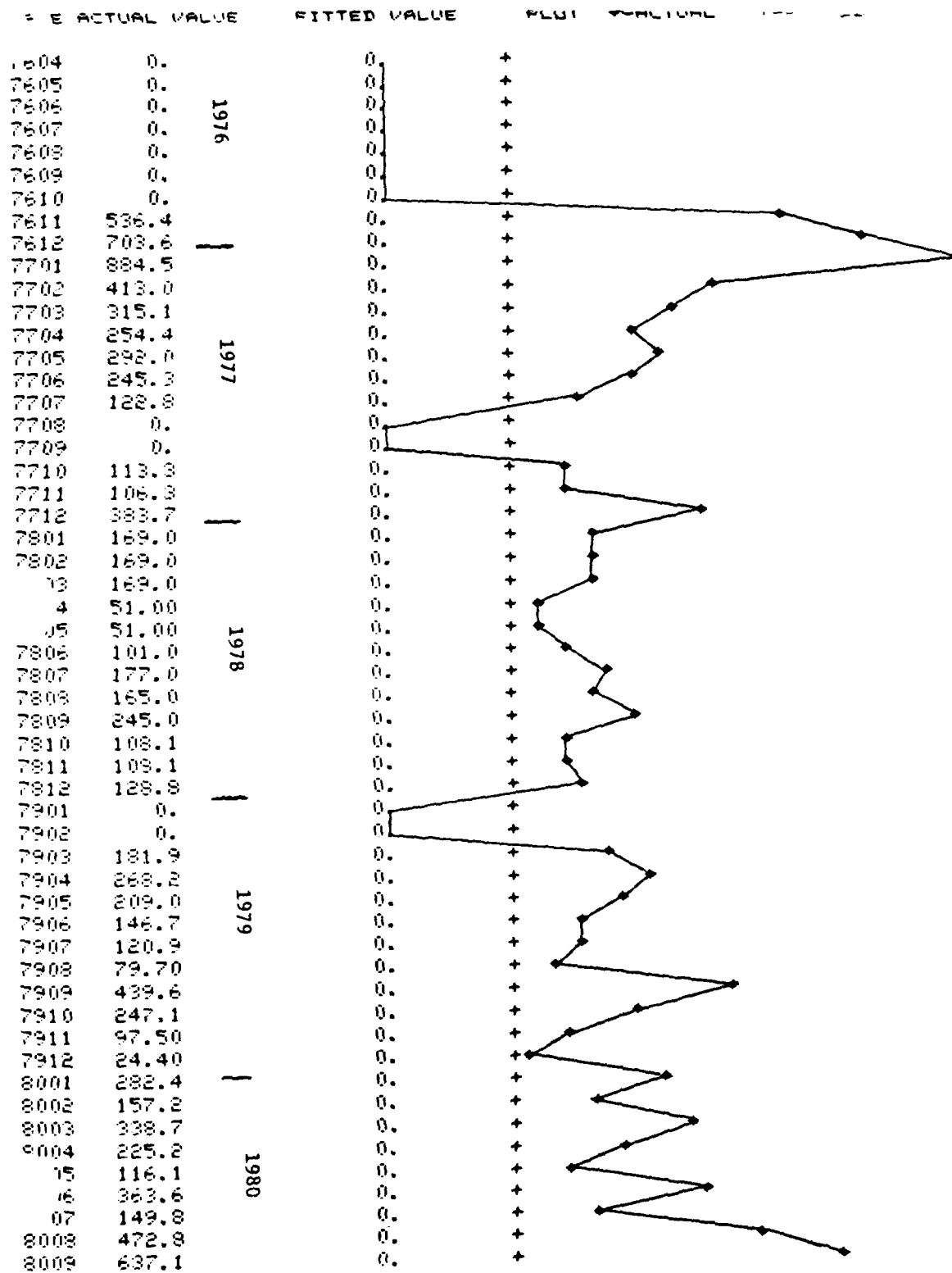
\*\* The radio deflator is a similarly weighted average of the radio spot deflator B.11 and the radio network deflator B.12. We estimated that Spot radio was 100% of radio expenditures until October 1976, then 86% until October 1977; and finally 50% until October 1980.

B.1  
\$ TELEVISION SPENDING

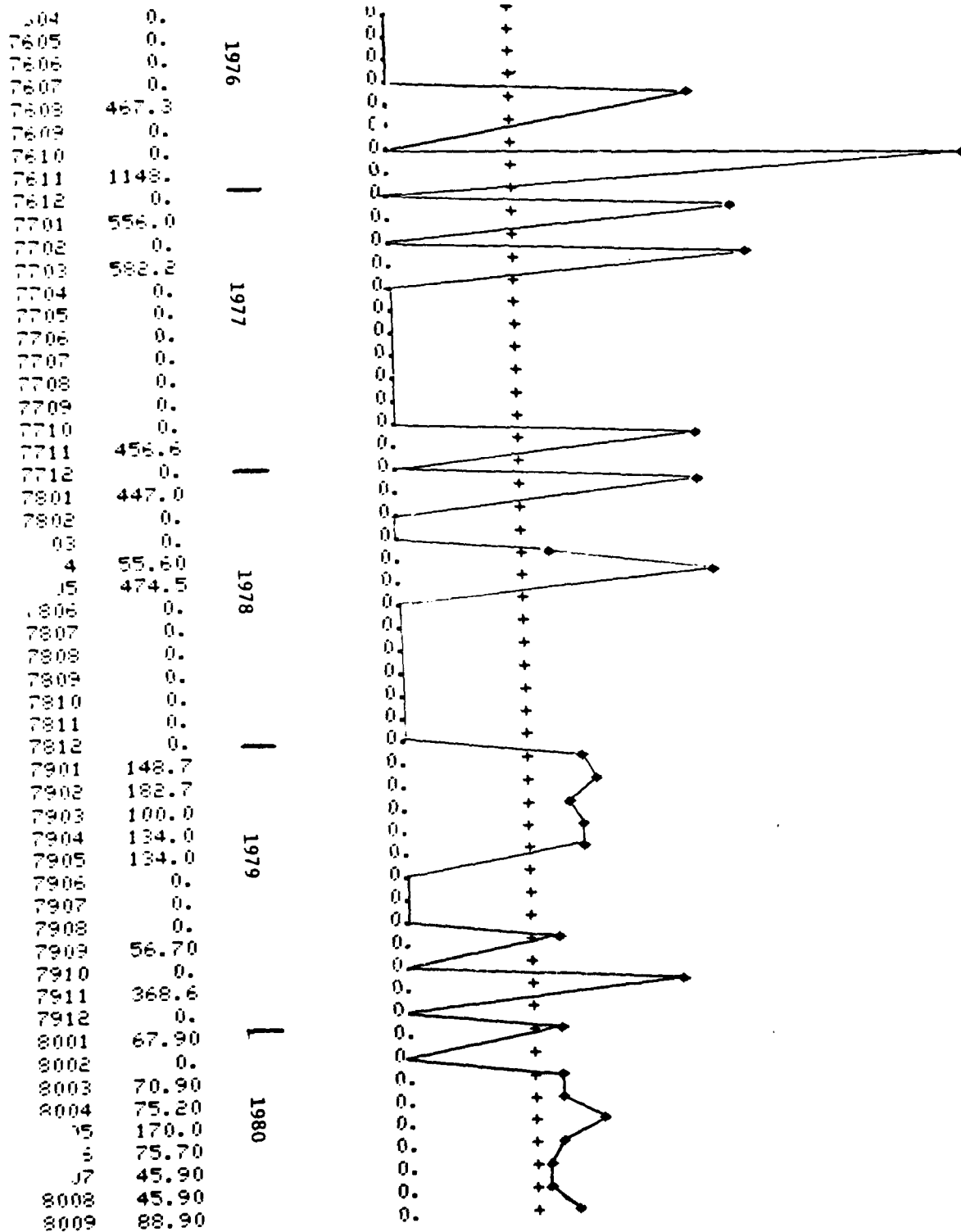


B.2

## \$ RADIO SPENDING



## \$ NEWSPAPER SPENDING



B.4

## \$ OUTDOOR SPENDING

| TE   | ACTUAL VALUE | FITTED VALUE | PLOT | ♦ACTUAL | +FITTED |
|------|--------------|--------------|------|---------|---------|
| 7604 | 896.7        | 0.           | +    |         |         |
| 7605 | 912.2        | 0.           | +    |         |         |
| 7606 | 922.1        | 0.           | +    |         |         |
| 7607 | 923.8        | 0.           | +    |         |         |
| 7608 | 549.7        | 0.           | +    |         |         |
| 7609 | 0.           | 0.           | +    |         |         |
| 7610 | 0.           | 0.           | +    |         |         |
| 7611 | 0.           | 0.           | +    |         |         |
| 7612 | 0.           | 0.           | +    |         |         |
| 7701 | 0.           | 0.           | +    |         |         |
| 7702 | 0.           | 0.           | +    |         |         |
| 7703 | 0.           | 0.           | +    |         |         |
| 7704 | 0.           | 0.           | +    |         |         |
| 7705 | 702.4        | 0.           | +    |         |         |
| 7706 | 694.3        | 0.           | +    |         |         |
| 7707 | 1.600        | 0.           | +    |         |         |
| 7708 | 0.           | 0.           | +    |         |         |
| 7709 | 0.           | 0.           | +    |         |         |
| 7710 | 0.           | 0.           | +    |         |         |
| 7711 | 0.           | 0.           | +    |         |         |
| 7712 | 0.           | 0.           | +    |         |         |
| 7801 | 0.           | 0.           | +    |         |         |
| 7802 | 0.           | 0.           | +    |         |         |
| 7803 | 0.           | 0.           | +    |         |         |
| 7804 | 0.           | 0.           | +    |         |         |
| 7805 | 0.           | 0.           | +    |         |         |
| 7806 | 0.           | 0.           | +    |         |         |
| 7807 | 0.           | 0.           | +    |         |         |
| 7808 | 0.           | 0.           | +    |         |         |
| 7809 | 0.           | 0.           | +    |         |         |
| 7810 | 0.           | 0.           | +    |         |         |
| 7811 | 0.           | 0.           | +    |         |         |
| 7812 | 0.           | 0.           | +    |         |         |
| 7901 | 0.           | 0.           | +    |         |         |
| 7902 | 0.           | 0.           | +    |         |         |
| 7903 | 0.           | 0.           | +    |         |         |
| 7904 | 0.           | 0.           | +    |         |         |
| 7905 | 0.           | 0.           | +    |         |         |
| 7906 | 0.           | 0.           | +    |         |         |
| 7907 | 0.           | 0.           | +    |         |         |
| 7908 | 0.           | 0.           | +    |         |         |
| 7909 | 0.           | 0.           | +    |         |         |
| 7910 | 0.           | 0.           | +    |         |         |
| 7911 | 0.           | 0.           | +    |         |         |
| 7912 | 0.           | 0.           | +    |         |         |
| 8001 | 0.           | 0.           | +    |         |         |
| 8002 | 0.           | 0.           | +    |         |         |
| 8003 | 0.           | 0.           | +    |         |         |
| 8004 | 0.           | 0.           | +    |         |         |
| 8005 | 0.           | 0.           | +    |         |         |
| 8006 | 0.           | 0.           | +    |         |         |
| 8007 | 0.           | 0.           | +    |         |         |
| 8008 | 0.           | 0.           | +    |         |         |
| 8009 | 0.           | 0.           | +    |         |         |

1976

1977

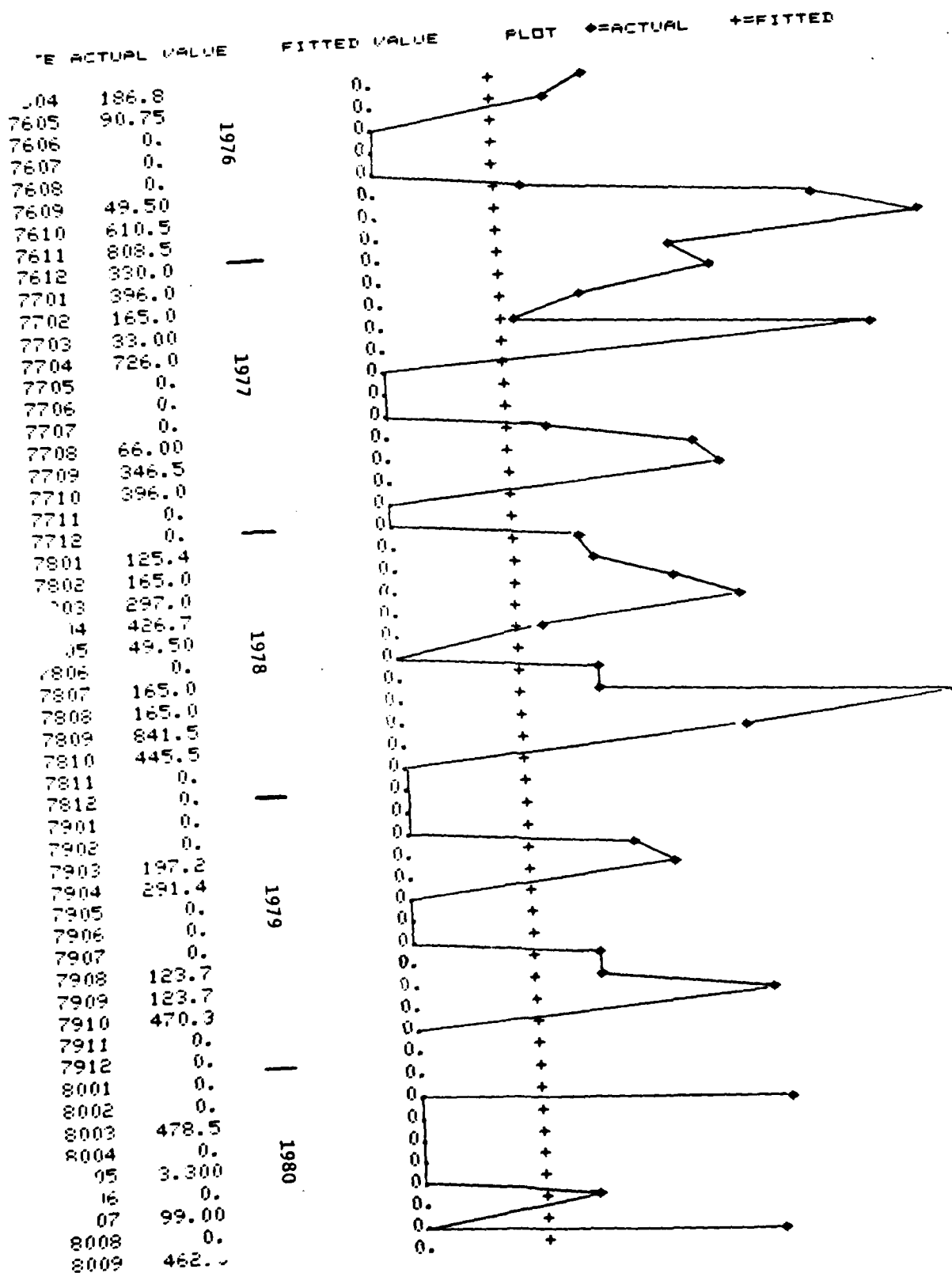
1978

1979

1980

B.5

## \$ DIRECT MAIL



## \$ LOCAL ADVERTISING

|      |       |    |
|------|-------|----|
| 7604 | 298.0 | 0. |
| 7605 | 295.6 | 0. |
| 7606 | 290.0 | 0. |
| 7607 | 288.9 | 0. |
| 7608 | 298.9 | 0. |
| 7609 | 301.9 | 0. |
| 7610 | 309.2 | 0. |
| 7611 | 290.4 | 0. |
| 7612 | 200.4 | 0. |
| 7701 | 211.0 | 0. |
| 7702 | 241.2 | 0. |
| 7703 | 259.7 | 0. |
| 7704 | 284.0 | 0. |
| 7705 | 282.5 | 0. |
| 7706 | 242.3 | 0. |
| 7707 | 231.3 | 0. |
| 7708 | 255.2 | 0. |
| 7709 | 266.4 | 0. |
| 7710 | 287.3 | 0. |
| 7711 | 283.2 | 0. |
| 7712 | 253.1 | 0. |
| 7801 | 265.3 | 0. |
| 7802 | 288.3 | 0. |
| 7803 | 311.0 | 0. |
| 7804 | 319.0 | 0. |
| 7805 | 350.8 | 0. |
| 7806 | 370.9 | 0. |
| 7807 | 341.4 | 0. |
| 7808 | 370.9 | 0. |
| 7809 | 402.5 | 0. |
| 7810 | 373.4 | 0. |
| 7811 | 377.2 | 0. |
| 7812 | 347.6 | 0. |
| 7901 | 310.4 | 0. |
| 7902 | 336.1 | 0. |
| 7903 | 359.1 | 0. |
| 7904 | 389.6 | 0. |
| 7905 | 454.6 | 0. |
| 7906 | 411.2 | 0. |
| 7907 | 441.3 | 0. |
| 7908 | 461.3 | 0. |
| 7909 | 545.0 | 0. |
| 7910 | 582.7 | 0. |
| 7911 | 423.8 | 0. |
| 7912 | 465.3 | 0. |
| 8001 | 421.7 | 0. |
| 8002 | 442.9 | 0. |
| 8003 | 420.9 | 0. |
| 8004 | 401.5 | 0. |
| 8005 | 404.6 | 0. |
| 8006 | 387.5 | 0. |
| 8007 | 440.0 | 0. |
| 8008 | 594.7 | 0. |
| 8009 | 649.0 | 0. |

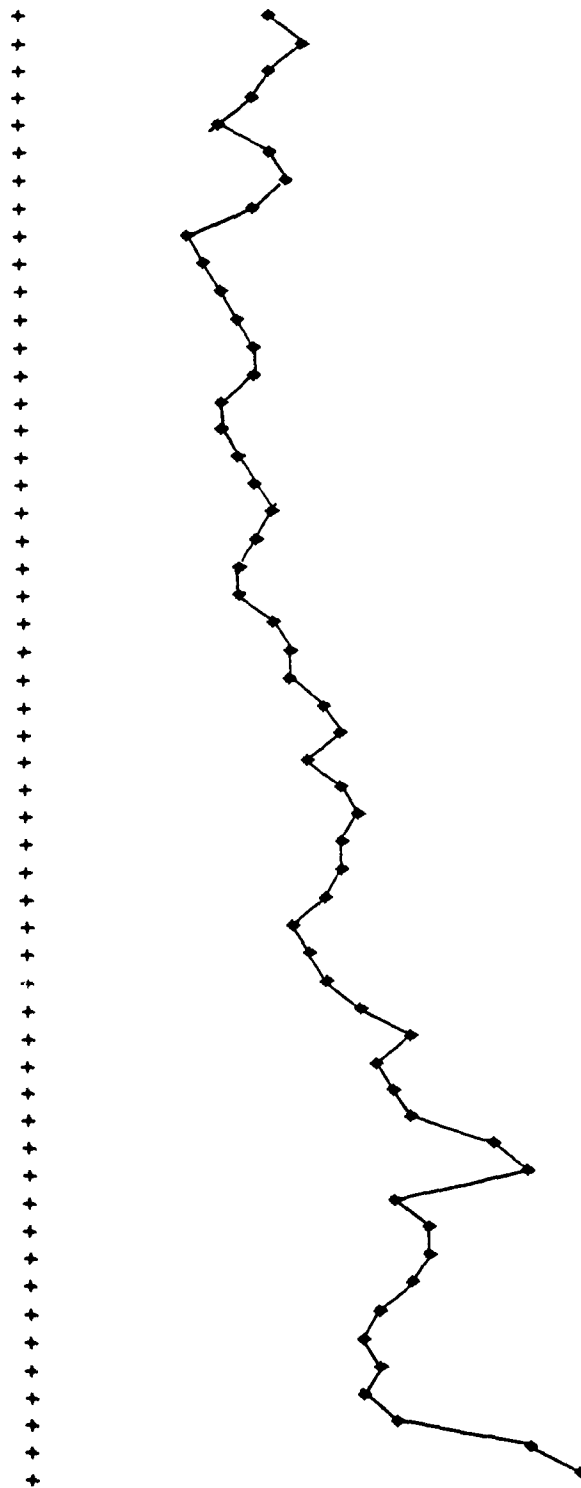
1976

1977

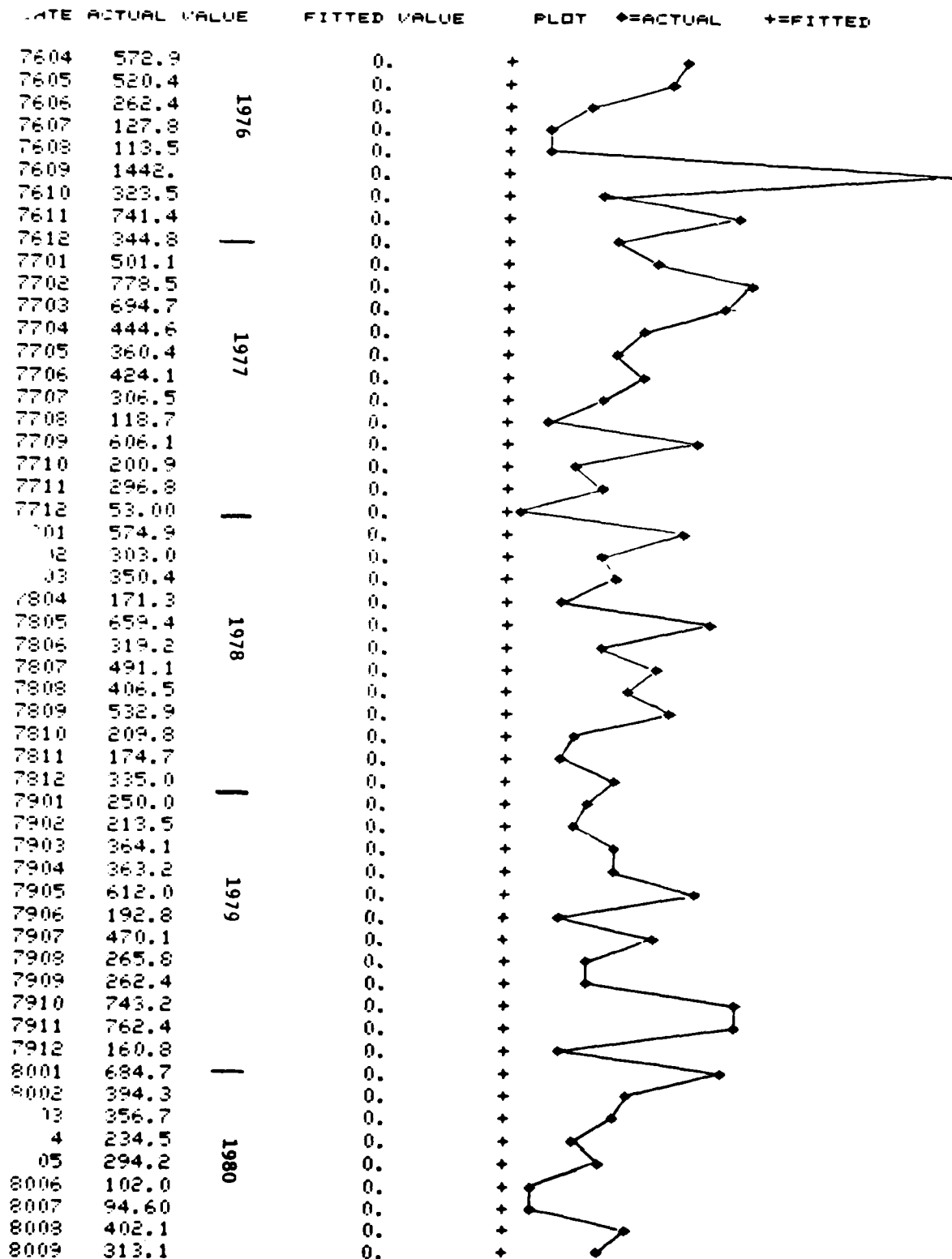
1978

1979

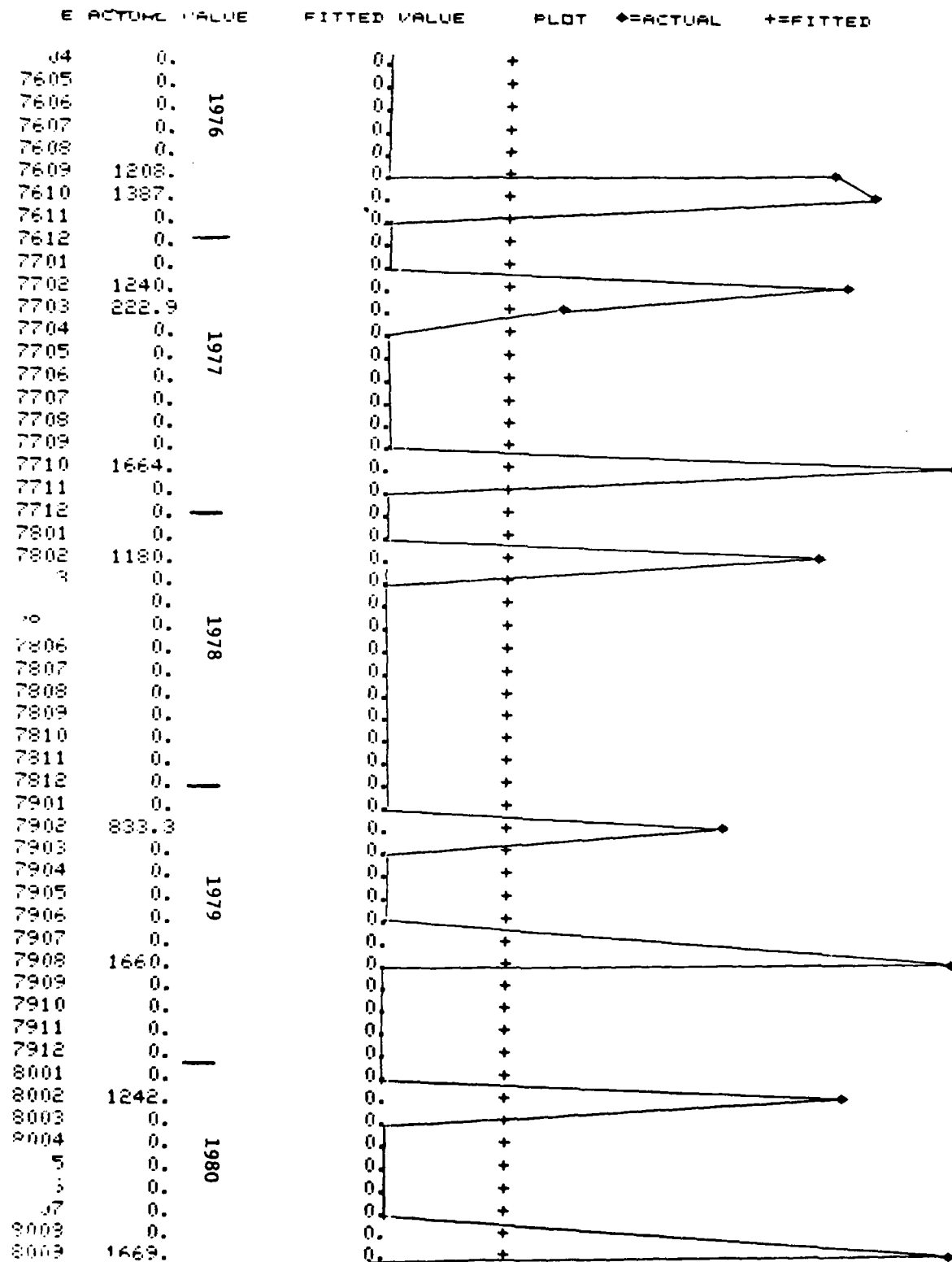
1980



## \$ REGULAR MAGAZINE SPENDING



## \$ SPECIAL MAGAZINE SPENDING



Series - Media Deflators

Source - Marketing and Media Decision  
Decisions Publications Inc.

Definition - Monthly deflators for each media type. December 1978 is  
used as the reference point.

Media Deflators

- B.10 Television
- B.11 Spot Television
- B.12 Network Radio
- B.13 Spot Radio
- B.14 Newspapers
- B.15 Magazines
- B.16 Outdoor

|      | B.9                 | P.10                 | B.11                   | B.12                      |
|------|---------------------|----------------------|------------------------|---------------------------|
|      | SPOT TV<br>DEFLATOR | PRIME TV<br>DEFLATOR | SPOT RADIO<br>DEFLATOR | NETWORK RADIO<br>DEFLATOR |
| 7407 | .610000             | .420000              | .760000                | .860000                   |
| 7408 | .560000             | .420000              | .760000                | .880000                   |
| 7409 | .650000             | .570000              | .760000                | .840000                   |
| 7410 | .710000             | .690000              | .770000                | .780000                   |
| 7411 | .710000             | .690000              | .770000                | .820000                   |
| 7412 | .750000             | .660000              | .770000                | .840000                   |
| 7501 | .740000             | .570000              | .770000                | .870000                   |
| 7502 | .680000             | .600000              | .770000                | .830000                   |
| 7503 | .710000             | .600000              | .780000                | .830000                   |
| 7504 | .690000             | .570000              | .770000                | .870000                   |
| 7505 | .710000             | .540000              | .780000                | .880000                   |
| 7506 | .660000             | .450000              | .780000                | .870000                   |
| 7507 | .640000             | .390000              | .780000                | .820000                   |
| 7508 | .620000             | .400000              | .780000                | .810000                   |
| 7509 | .660000             | .570000              | .790000                | .800000                   |
| 7510 | .710000             | .680000              | .790000                | .870000                   |
| 7511 | .740000             | .690000              | .810000                | .800000                   |
| 7512 | .750000             | .600000              | .810000                | .800000                   |
| 7601 | .730000             | .590000              | .810000                | .820000                   |
| 7602 | .740000             | .630000              | .810000                | .790000                   |
| 7603 | .800000             | .630000              | .810000                | .790000                   |
| 7604 | .870000             | .640000              | .800000                | .770000                   |
| 7605 | .900000             | .620000              | .820000                | .780000                   |
| 7606 | .840000             | .570000              | .820000                | .790000                   |
| 7607 | .800000             | .530000              | .820000                | .790000                   |
| 7608 | .800000             | .490000              | .840000                | .770000                   |
| 7609 | .960000             | .650000              | .840000                | .740000                   |
| 7610 | .990000             | .790000              | .850000                | .880000                   |
| 7611 | 1.05000             | .870000              | .850000                | .750000                   |
| 7612 | .990000             | .740000              | .850000                | .750000                   |
| 7701 | .910000             | .740000              | .860000                | .840000                   |
| 7702 | .870000             | .780000              | .860000                | .810000                   |
| 7703 | .950000             | .810000              | .850000                | .790000                   |
| 7704 | 1.04000             | .820000              | .850000                | .800000                   |
| 7705 | 1.01000             | .790000              | .870000                | .810000                   |
| 7706 | .900000             | .740000              | .870000                | .870000                   |
| 7707 | .870000             | .600000              | .890000                | .890000                   |
| 7708 | .830000             | .590000              | .890000                | .880000                   |
| 7709 | .880000             | .730000              | .890000                | .870000                   |
| 7710 | .950000             | 1.05000              | .890000                | .980000                   |
| 7711 | 1.02000             | 1.07000              | .900000                | .870000                   |
| 7712 | 1.04000             | .860000              | .910000                | .870000                   |

|      |         |         |         |         |
|------|---------|---------|---------|---------|
| 7801 | .980000 | .820000 | .910000 | .910000 |
| 7802 | .900000 | .840000 | .910000 | .850000 |
| 7803 | 1.01000 | .820000 | .910000 | .840000 |
| 7804 | .990000 | .920000 | .920000 | .850000 |
| 7805 | 1.09000 | .920000 | .920000 | .830000 |
| 7806 | 1.05000 | .800000 | .940000 | .860000 |
| 7807 | .970000 | .680000 | .950000 | .910000 |
| 7808 | .870000 | .660000 | .970000 | .900000 |
| 7809 | .890000 | .880000 | .980000 | .930000 |
| 7810 | 1.01000 | 1.17000 | .980000 | 1.11000 |
| 7811 | 1.08000 | 1.15000 | .980000 | .910000 |
| 7812 | 1.00000 | 1.00000 | 1.00000 | 1.00000 |
| 7901 | 1.00000 | .910000 | 1.01000 | 1.05000 |
| 7902 | .960000 | 1.02000 | 1.02000 | .960000 |
| 7903 | 1.10000 | .930000 | 1.03000 | .960000 |
| 7904 | 1.07000 | 1.04000 | 1.04000 | .980000 |
| 7905 | 1.16000 | 1.03000 | 1.05000 | .990000 |
| 7906 | 1.09000 | .880000 | 1.06000 | .990000 |
| 7907 | .890000 | .740000 | 1.07000 | .960000 |
| 7908 | .900000 | .740000 | 1.08000 | .980000 |
| 7909 | .950000 | 1.04000 | 1.11000 | 1.00000 |
| 7910 | 1.26000 | 1.33000 | 1.11000 | 1.14000 |
| 7911 | 1.27000 | 1.32000 | 1.12000 | 1.09000 |
| 7912 | 1.18000 | 1.13000 | 1.12000 | 1.04000 |
| 8001 | 1.02000 | .980000 | 1.13000 | 1.00000 |
| 8002 | .980000 | 1.00000 | 1.13000 | .990000 |
| 8003 | 1.05000 | 1.03000 | 1.21000 | 1.00000 |
| 8004 | 1.09000 | 1.10000 | 1.23000 | .990000 |
| 8005 | 1.24000 | 1.12000 | 1.23000 | 1.00000 |
| 8006 | 1.06000 | 1.06000 | 1.24000 | 1.10000 |
| 8007 | .860000 | .730000 | 1.26000 | 1.18000 |
| 8008 | .860000 | .720000 | 1.26000 | 1.12000 |
| 8009 | .950000 | 1.06000 | 1.26000 | 1.19000 |

|      | B.13                  | E.14                 | B.15                |
|------|-----------------------|----------------------|---------------------|
|      | NEWSPAPER<br>DEFLATOR | MAGAZINE<br>DEFLATOR | OUTDOOR<br>DEFLATOR |
| 7407 | .700000               | .790000              | .680000             |
| 7408 | .700000               | .800000              | .680000             |
| 7409 | .710000               | .800000              | .690000             |
| 7410 | .720000               | .810000              | .720000             |
| 7411 | .740000               | .810000              | .720000             |
| 7412 | .760000               | .810000              | .730000             |
| 7501 | .780000               | .830000              | .720000             |
| 7502 | .790000               | .830000              | .720000             |
| 7503 | .800000               | .830000              | .720000             |
| 7504 | .800000               | .850000              | .720000             |
| 7505 | .810000               | .850000              | .720000             |
| 7506 | .820000               | .850000              | .720000             |
| 7507 | .820000               | .850000              | .720000             |
| 7508 | .820000               | .840000              | .720000             |
| 7509 | .820000               | .850000              | .730000             |
| 7510 | .820000               | .830000              | .750000             |
| 7511 | .820000               | .840000              | .750000             |
| 7512 | .820000               | .850000              | .760000             |
| 7601 | .830000               | .840000              | .780000             |
| 7602 | .830000               | .840000              | .780000             |
| 7603 | .830000               | .840000              | .770000             |
| 7604 | .830000               | .850000              | .770000             |
| 7605 | .830000               | .850000              | .780000             |
| 7606 | .830000               | .850000              | .780000             |
| 7607 | .840000               | .850000              | .790000             |
| 7608 | .840000               | .850000              | .790000             |
| 7609 | .870000               | .850000              | .790000             |
| 7610 | .870000               | .850000              | .830000             |
| 7611 | .870000               | .880000              | .830000             |
| 7612 | .870000               | .890000              | .840000             |
| 7701 | .910000               | .890000              | .870000             |
| 7702 | .920000               | .900000              | .870000             |
| 7703 | .920000               | .900000              | .870000             |
| 7704 | .920000               | .900000              | .870000             |
| 7705 | .940000               | .900000              | .870000             |
| 7706 | .940000               | .910000              | .870000             |
| 7707 | .940000               | .910000              | .870000             |
| 7708 | .950000               | .900000              | .870000             |
| 7709 | .950000               | .910000              | .880000             |
| 7710 | .950000               | .920000              | .920000             |
| 7711 | .950000               | .940000              | .920000             |
| 7712 | .950000               | .950000              | .940000             |

|      |          |          |          |
|------|----------|----------|----------|
| 7801 | .960000  | .960000  | .960000  |
| 7802 | .970000  | .990000  | .960000  |
| 7803 | .980000  | .990000  | .960000  |
| 7804 | .990000  | .990000  | .960000  |
| 7805 | .990000  | .990000  | .960000  |
| 7806 | .990000  | 1.000000 | .960000  |
| 7807 | 1.000000 | 1.010000 | .960000  |
| 7808 | 1.000000 | 1.010000 | .960000  |
| 7809 | 1.000000 | 1.010000 | .960000  |
| 7810 | 1.000000 | 1.010000 | .990000  |
| 7811 | 1.000000 | 1.000000 | .990000  |
| 7812 | 1.000000 | 1.000000 | 1.000000 |
| 7901 | 1.030000 | 1.050000 | 1.080000 |
| 7902 | 1.070000 | 1.060000 | 1.080000 |
| 7903 | 1.070000 | 1.060000 | 1.080000 |
| 7904 | 1.080000 | 1.080000 | 1.080000 |
| 7905 | 1.090000 | 1.080000 | 1.080000 |
| 7906 | 1.090000 | 1.090000 | 1.080000 |
| 7907 | 1.090000 | 1.090000 | 1.080000 |
| 7908 | 1.090000 | 1.090000 | 1.090000 |
| 7909 | 1.100000 | 1.090000 | 1.120000 |
| 7910 | 1.120000 | 1.090000 | 1.090000 |
| 7911 | 1.130000 | 1.100000 | 1.090000 |
| 7912 | 1.140000 | 1.100000 | 1.080000 |
| 8001 | 1.200000 | 1.150000 | 1.190000 |
| 8002 | 1.210000 | 1.160000 | 1.190000 |
| 8003 | 1.220000 | 1.170000 | 1.190000 |
| 8004 | 1.230000 | 1.170000 | 1.190000 |
| 8005 | 1.250000 | 1.170000 | 1.190000 |
| 8006 | 1.250000 | 1.170000 | 1.210000 |
| 8007 | 1.260000 | 1.200000 | 1.210000 |
| 8008 | 1.270000 | 1.200000 | 1.210000 |
| 8009 | 1.290000 | 1.210000 | 1.230000 |

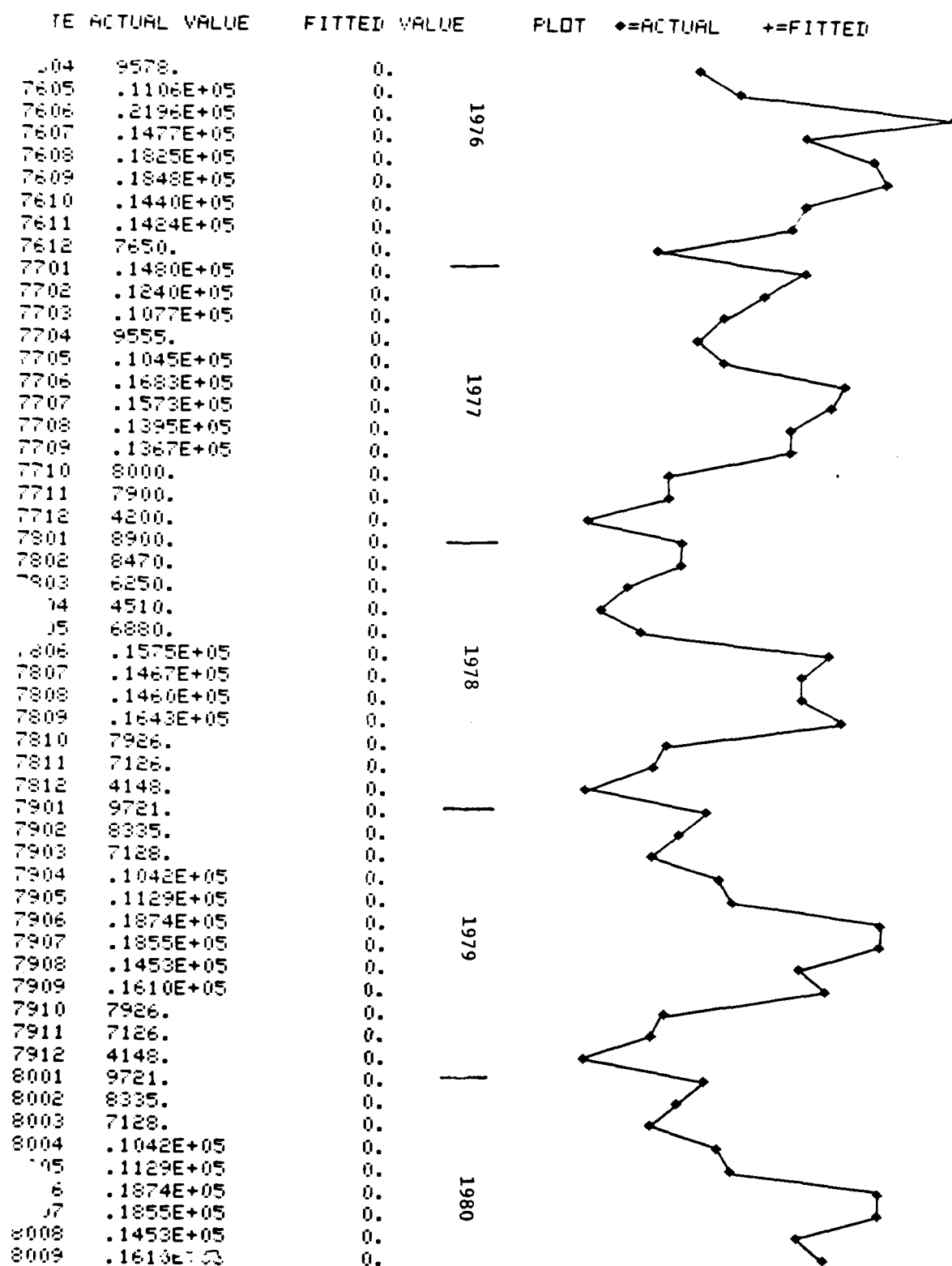
DATA APPENDIX C  
POLICY VARIABLES

Series - Recruiter Objectives

Source - General Research Corporation  
ELIM - COMPLIP System Documentation

Definition - The monthly male accession objective by month

## C.1

RECRUITER OBJECTIVES  
(ACCESSIONS)

Series - El Pay

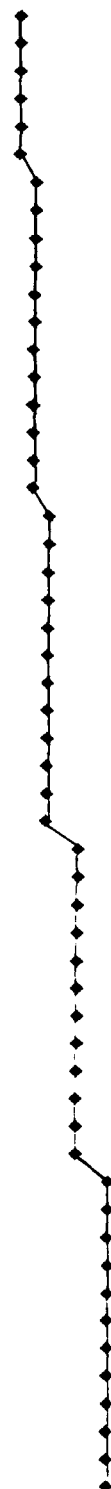
Source - USAREC

Definition - The monthly pay level for recruits

C..

## EI PAY

| DATE | ACTUAL VALUE | FITTED VALUE | YEAR | PERCENTAGE | TESTED |
|------|--------------|--------------|------|------------|--------|
| 604  | 361.2        | 0.           | 1976 |            |        |
| 605  | 361.2        | 0.           |      |            |        |
| 7606 | 361.2        | 0.           |      |            |        |
| 7607 | 361.2        | 0.           |      |            |        |
| 7608 | 361.2        | 0.           |      |            |        |
| 7609 | 361.2        | 0.           |      |            |        |
| 7610 | 374.4        | 0.           |      |            |        |
| 7611 | 374.4        | 0.           |      |            |        |
| 7612 | 374.4        | 0.           |      |            |        |
| 7701 | 374.4        | 0.           | 1977 |            |        |
| 7702 | 374.4        | 0.           |      |            |        |
| 7703 | 374.4        | 0.           |      |            |        |
| 7704 | 374.4        | 0.           |      |            |        |
| 7705 | 374.4        | 0.           |      |            |        |
| 7706 | 374.4        | 0.           |      |            |        |
| 7707 | 374.4        | 0.           |      |            |        |
| 7708 | 374.4        | 0.           |      |            |        |
| 7709 | 374.4        | 0.           |      |            |        |
| 7710 | 397.5        | 0.           |      |            |        |
| 7711 | 397.5        | 0.           | 1978 |            |        |
| 7712 | 397.5        | 0.           |      |            |        |
| 7801 | 397.5        | 0.           |      |            |        |
| 7802 | 397.5        | 0.           |      |            |        |
| 7803 | 397.5        | 0.           |      |            |        |
| 7804 | 397.5        | 0.           |      |            |        |
| 7805 | 397.5        | 0.           |      |            |        |
| 7806 | 397.5        | 0.           |      |            |        |
| 7807 | 397.5        | 0.           |      |            |        |
| 7808 | 397.5        | 0.           |      |            |        |
| 7809 | 397.5        | 0.           | 1979 |            |        |
| 7810 | 419.4        | 0.           |      |            |        |
| 7811 | 419.4        | 0.           |      |            |        |
| 7812 | 419.4        | 0.           |      |            |        |
| 7901 | 419.4        | 0.           |      |            |        |
| 7902 | 419.4        | 0.           |      |            |        |
| 7903 | 419.4        | 0.           |      |            |        |
| 7904 | 419.4        | 0.           |      |            |        |
| 7905 | 419.4        | 0.           |      |            |        |
| 7906 | 419.4        | 0.           |      |            |        |
| 7907 | 419.4        | 0.           | 1980 |            |        |
| 7908 | 419.4        | 0.           |      |            |        |
| 7909 | 419.4        | 0.           |      |            |        |
| 7910 | 448.0        | 0.           |      |            |        |
| 7911 | 448.0        | 0.           |      |            |        |
| 7912 | 448.0        | 0.           |      |            |        |
| 8001 | 448.0        | 0.           |      |            |        |
| 8002 | 448.0        | 0.           |      |            |        |
| 8003 | 448.0        | 0.           |      |            |        |
| 8004 | 448.0        | 0.           |      |            |        |
| 8005 | 448.0        | 0.           |      |            |        |
| 8006 | 448.0        | 0.           |      |            |        |
| 8007 | 448.0        | 0.           |      |            |        |
| 8008 | 448.0        | 0.           |      |            |        |
| 8009 | 448.0        | 0.           |      |            |        |



Series - Production Recruiters

Source - USAREC

Definition - The total number of Army recruiting station commanders  
and recruiters on production each month

# PRODUCTION RECRUITERS

|      |       |    |
|------|-------|----|
| 7604 | 4739. | 0. |
| 7605 | 4734. | 0. |
| 7606 | 4710. | 0. |
| 7607 | 4607. | 0. |
| 7608 | 4591. | 0. |
| 7609 | 4578. | 0. |
| 7610 | 4667. | 0. |
| 7611 | 4758. | 0. |
| 7612 | 4894. | 0. |
| 7701 | 4982. | 0. |
| 7702 | 4999. | 0. |
| 7703 | 5018. | 0. |
| 7704 | 5000. | 0. |
| 7705 | 5042. | 0. |
| 7706 | 5066. | 0. |
| 7707 | 5016. | 0. |
| 7708 | 5056. | 0. |
| 7709 | 5030. | 0. |
| 7710 | 5019. | 0. |
| 7711 | 4997. | 0. |
| 7712 | 4931. | 0. |
| 7801 | 4892. | 0. |
| 7802 | 4850. | 0. |
| 7803 | 4776. | 0. |
| 7804 | 4855. | 0. |
| 7805 | 4884. | 0. |
| 7806 | 4845. | 0. |
| 7807 | 4832. | 0. |
| 7808 | 4835. | 0. |
| 7809 | 4797. | 0. |
| 7810 | 4790. | 0. |
| 7811 | 4771. | 0. |
| 7812 | 4765. | 0. |
| 7901 | 4681. | 0. |
| 7902 | 4642. | 0. |
| 7903 | 4638. | 0. |
| 7904 | 4789. | 0. |
| 7905 | 5018. | 0. |
| 7906 | 5248. | 0. |
| 7907 | 5277. | 0. |
| 7908 | 5244. | 0. |
| 7909 | 5125. | 0. |
| 7910 | 5031. | 0. |
| 7911 | 4993. | 0. |
| 7912 | 5025. | 0. |
| 8001 | 5160. | 0. |
| 8002 | 5180. | 0. |
| 8003 | 5339. | 0. |
| 8004 | 5560. | 0. |
| 8005 | 5569. | 0. |
| 8006 | 5549. | 0. |
| 8007 | 5570. | 0. |
| 8008 | 5544. | 0. |
| 8009 | 5474. | 0. |

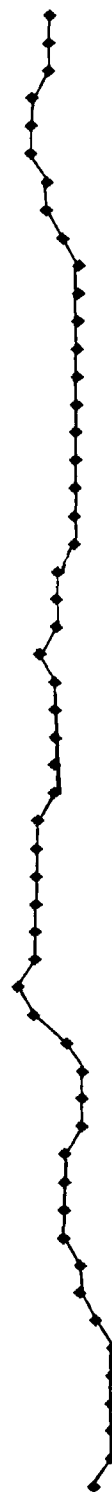
1976

1977

1978

1979

1980



DATA APPENDIX D  
ENVIRONMENTAL VARIABLES

Series - Youth Unemployment Rate

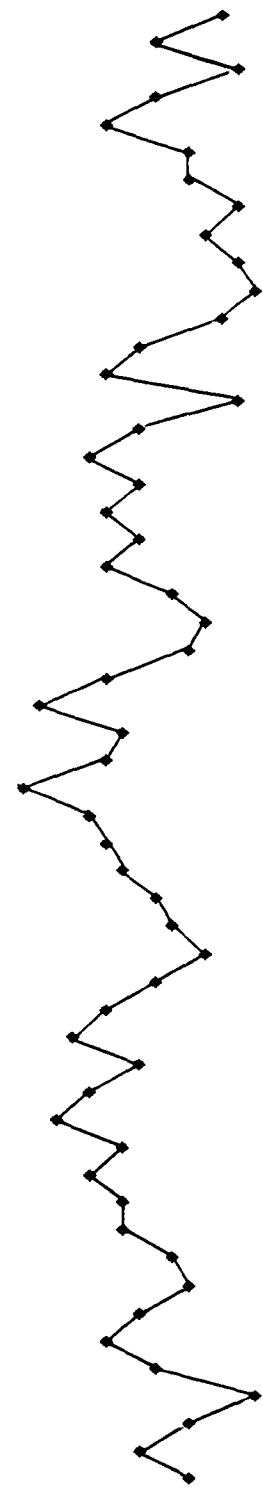
Source - U.S. Dept. of Labor (Bur. Labor Statistics)

Definition - The non seasonally adjusted unemployment rate among 16-19 year olds

D.1

UNEMPLOYMENT RATE (16-19)

| DATE | ACTUAL VALUE | FITTED VALUE | FLOT | ◆=ACTUAL | + =FITTED |
|------|--------------|--------------|------|----------|-----------|
| 04   | 19.70        | 0.           |      |          |           |
| 05   | 17.40        | 0.           |      |          |           |
| 606  | 20.40        | 0.           | 1976 |          |           |
| 7607 | 17.50        | 0.           |      |          |           |
| 7608 | 15.40        | 0.           |      |          |           |
| 7609 | 18.50        | 0.           |      |          |           |
| 7610 | 18.30        | 0.           |      |          |           |
| 7611 | 20.20        | 0.           |      |          |           |
| 7612 | 19.40        | 0.           |      |          |           |
| 7701 | 20.40        | 0.           |      |          |           |
| 7702 | 21.00        | 0.           |      |          |           |
| 7703 | 19.90        | 0.           |      |          |           |
| 7704 | 16.40        | 0.           |      |          |           |
| 7705 | 15.20        | 0.           | 1977 |          |           |
| 7706 | 20.30        | 0.           |      |          |           |
| 7707 | 16.40        | 0.           |      |          |           |
| 7708 | 14.50        | 0.           |      |          |           |
| 7709 | 16.80        | 0.           |      |          |           |
| 7710 | 15.40        | 0.           |      |          |           |
| 7711 | 16.80        | 0.           |      |          |           |
| 7712 | 15.10        | 0.           |      |          |           |
| 7801 | 17.60        | 0.           |      |          |           |
| 7802 | 19.40        | 0.           |      |          |           |
| 7803 | 18.20        | 0.           |      |          |           |
| 7804 | 15.40        | 0.           |      |          |           |
| 05   | 13.00        | 0.           | 1978 |          |           |
| 6    | 16.20        | 0.           |      |          |           |
| 07   | 15.20        | 0.           |      |          |           |
| 7808 | 12.20        | 0.           |      |          |           |
| 7809 | 14.90        | 0.           |      |          |           |
| 7810 | 15.10        | 0.           |      |          |           |
| 7811 | 16.20        | 0.           |      |          |           |
| 7812 | 16.90        | 0.           |      |          |           |
| 7901 | 18.00        | 0.           |      |          |           |
| 7902 | 13.00        | 0.           |      |          |           |
| 7903 | 17.50        | 0.           |      |          |           |
| 7904 | 15.30        | 0.           |      |          |           |
| 7905 | 13.80        | 0.           | 1979 |          |           |
| 7906 | 16.60        | 0.           |      |          |           |
| 7907 | 14.80        | 0.           |      |          |           |
| 7908 | 13.20        | 0.           |      |          |           |
| 7909 | 15.60        | 0.           |      |          |           |
| 7910 | 14.70        | 0.           |      |          |           |
| 7911 | 16.20        | 0.           |      |          |           |
| 7912 | 15.90        | 0.           |      |          |           |
| 8001 | 18.00        | 0.           |      |          |           |
| 8002 | 18.50        | 0.           |      |          |           |
| 8003 | 16.40        | 0.           |      |          |           |
| 8004 | 15.40        | 0.           |      |          |           |
| 8005 | 17.50        | 0.           | 1980 |          |           |
| 8006 | 20.80        | 0.           |      |          |           |
| 07   | 18.30        | 0.           |      |          |           |
| 8    | 16.40        | 0.           |      |          |           |
| 09   | 18.30        | 0.           |      |          |           |



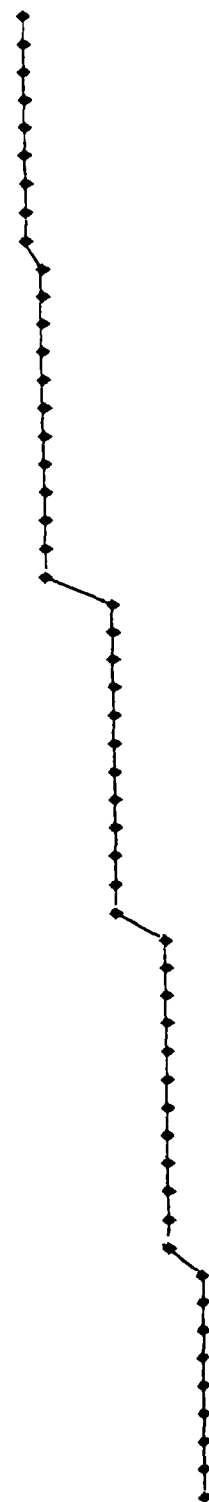
Series - Civilian Minimum Wage Rate

Source - U.S. Department of Labor

Definition - Monthly minimum wage as mandated by Congress

D.2  
MINIMUM WAGE

| DATE | ACTUAL VALUE | FITTED VALUE | PLOT | ♦=ACTUAL | + = FITTED |
|------|--------------|--------------|------|----------|------------|
| 7604 | 381.3        | 0.           | +    |          |            |
| 7605 | 381.3        | 0.           | +    |          |            |
| 7606 | 381.3        | 0.           | +    |          |            |
| 7607 | 381.3        | 0.           | +    |          |            |
| 7608 | 381.3        | 0.           | +    |          |            |
| 7609 | 381.3        | 0.           | +    |          |            |
| 7610 | 381.3        | 0.           | +    |          |            |
| 7611 | 381.3        | 0.           | +    |          |            |
| 7612 | 381.3        | 0.           | +    |          |            |
| 7701 | 398.7        | 0.           | +    |          |            |
| 7702 | 398.7        | 0.           | +    |          |            |
| 7703 | 398.7        | 0.           | +    |          |            |
| 7704 | 398.7        | 0.           | +    |          |            |
| 7705 | 398.7        | 0.           | +    |          |            |
| 7706 | 398.7        | 0.           | +    |          |            |
| 7707 | 398.7        | 0.           | +    |          |            |
| 7708 | 398.7        | 0.           | +    |          |            |
| 7709 | 398.7        | 0.           | +    |          |            |
| 7710 | 398.7        | 0.           | +    |          |            |
| 7711 | 398.7        | 0.           | +    |          |            |
| 7712 | 398.7        | 0.           | +    |          |            |
| 7801 | 459.3        | 0.           | +    |          |            |
| 7802 | 459.3        | 0.           | +    |          |            |
| 7803 | 459.3        | 0.           | +    |          |            |
| 7804 | 459.3        | 0.           | +    |          |            |
| 7805 | 459.3        | 0.           | +    |          |            |
| 7806 | 459.3        | 0.           | +    |          |            |
| 7807 | 459.3        | 0.           | +    |          |            |
| 7808 | 459.3        | 0.           | +    |          |            |
| 7809 | 459.3        | 0.           | +    |          |            |
| 7810 | 459.3        | 0.           | +    |          |            |
| 7811 | 459.3        | 0.           | +    |          |            |
| 7812 | 459.3        | 0.           | +    |          |            |
| 7901 | 502.7        | 0.           | +    |          |            |
| 7902 | 502.7        | 0.           | +    |          |            |
| 7903 | 502.7        | 0.           | +    |          |            |
| 7904 | 502.7        | 0.           | +    |          |            |
| 7905 | 502.7        | 0.           | +    |          |            |
| 7906 | 502.7        | 0.           | +    |          |            |
| 7907 | 502.7        | 0.           | +    |          |            |
| 7908 | 502.7        | 0.           | +    |          |            |
| 7909 | 502.7        | 0.           | +    |          |            |
| 7910 | 502.7        | 0.           | +    |          |            |
| 7911 | 502.7        | 0.           | +    |          |            |
| 7912 | 502.7        | 0.           | +    |          |            |
| 8001 | 537.3        | 0.           | +    |          |            |
| 8002 | 537.3        | 0.           | +    |          |            |
| 8003 | 537.3        | 0.           | +    |          |            |
| 8004 | 537.3        | 0.           | +    |          |            |
| 8005 | 537.3        | 0.           | +    |          |            |
| 8006 | 537.3        | 0.           | +    |          |            |
| 8007 | 537.3        | 0.           | +    |          |            |
| 8008 | 537.3        | 0.           | +    |          |            |
| 8009 | 537.3        | 0.           | +    |          |            |



DATA APPENDIX E  
PERFORMANCE VARIABLES (TRANSFORMED)

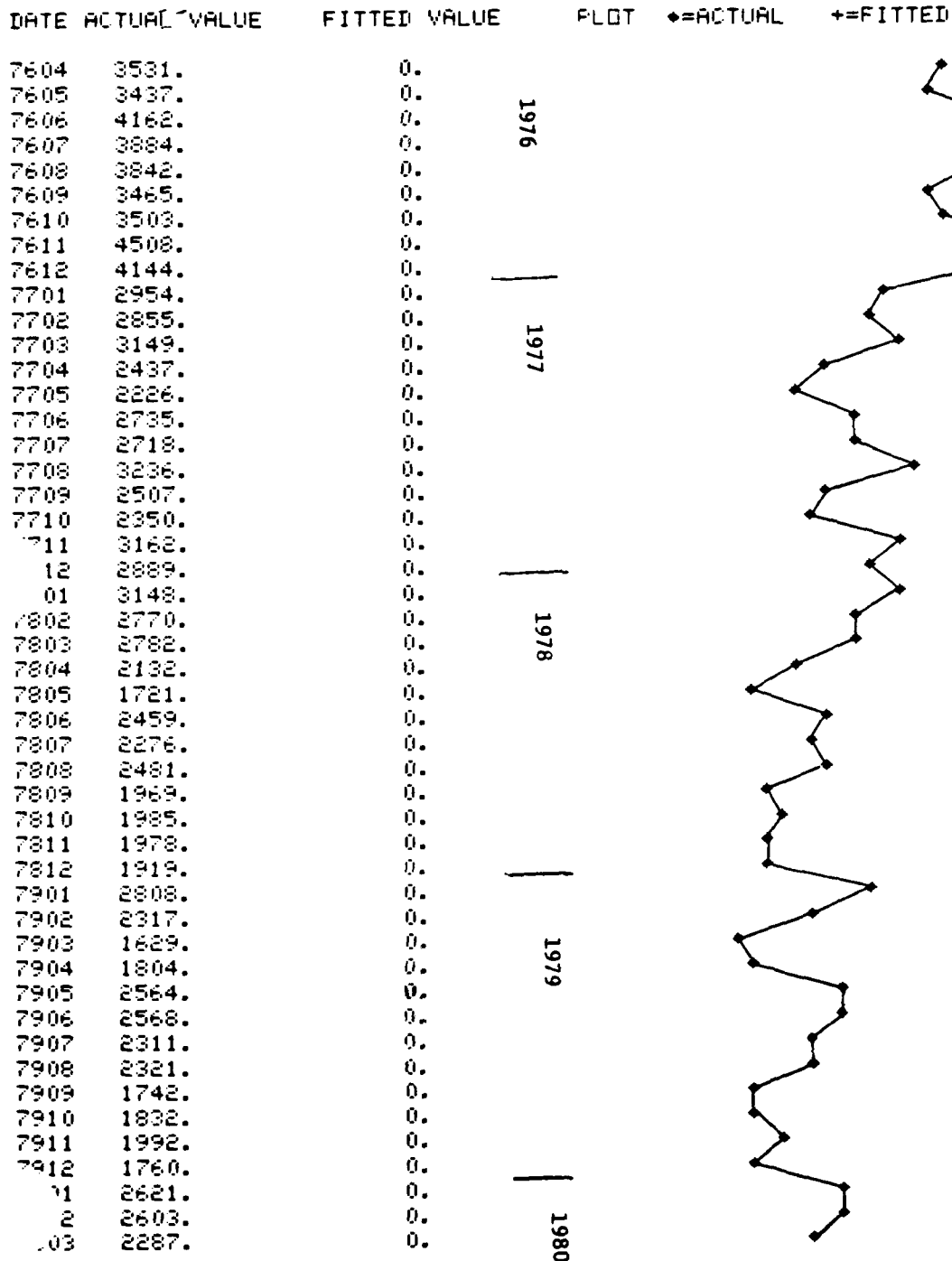
Series -            Accession by Date of Contract

Transformation - The December 1976 value which reflected the impact of the  
GI Bill termination was replaced by the mean of the series  
from April 1976 through December 1976.

- E.1 High School Degree/Category I-IIIA
- E.2 High School Degree/Category IIIB-IV
- E.3 Non Degree/Category I-IIIA
- E.4 Non Degree/Category I-IIIA

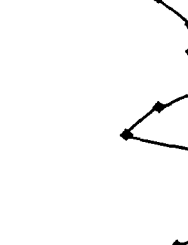
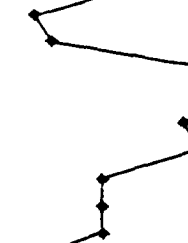
E.1

HSDG/CATEGORY I-III ACCESSIONS  
(CONTRACT DATE)  
DEC. 76 ADJUSTMENT



H906/Q9T 1-3H (OUTRIGER (SAR OUT))

HSDG/CATEGORY IIIB-IV ACCESSIONS  
(CONTRACT DATE)  
DEC. 76 ADJUSTMENT

| DATE | ACTUAL VALUE | FITTED VALUE | FEED | ACTUAL                                                                                |      |                                                                                       |
|------|--------------|--------------|------|---------------------------------------------------------------------------------------|------|---------------------------------------------------------------------------------------|
| 7604 | 2683.        | 0.           | 1976 |    |      |                                                                                       |
| 7605 | 2646.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7606 | 4287.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7607 | 3421.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7608 | 3729.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7609 | 3789.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7610 | 3672.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7611 | 4589.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7612 | 3292.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7701 | 3632.        | 0.           |      |                                                                                       | 1977 |    |
| 7702 | 3550.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7703 | 3857.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7704 | 3276.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7705 | 3080.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7706 | 4000.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7707 | 3793.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7708 | 4097.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7709 | 3496.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7710 | 3120.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7711 | 4154.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7712 | 3855.        | 0.           | 1978 |   |      |                                                                                       |
| 7801 | 4177.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7802 | 3580.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7803 | 3770.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7804 | 2861.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7805 | 2621.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7806 | 3731.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7807 | 3152.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7808 | 3611.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7809 | 3268.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7810 | 3049.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7811 | 3091.        | 0.           |      |                                                                                       | 1979 |  |
| 7812 | 3019.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7901 | 3842.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7902 | 3038.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7903 | 2189.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7904 | 2384.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7905 | 3567.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7906 | 3990.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7907 | 3462.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7908 | 3555.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7909 | 2840.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7910 | 2798.        | 0.           | 1980 |  |      |                                                                                       |
| 7911 | 2801.        | 0.           |      |                                                                                       |      |                                                                                       |
| 7912 | 2141.        | 0.           |      |                                                                                       |      |                                                                                       |
| 8001 | 3248.        | 0.           |      |                                                                                       |      |                                                                                       |
| 8002 | 3021.        | 0.           |      |                                                                                       |      |                                                                                       |
| 8003 | 2755.        | 0.           |      |                                                                                       |      |                                                                                       |

| DATE | ACTUAL VALUE | FITTED VALUE | PLOT | ◆=ACTUAL | + =FITTED |
|------|--------------|--------------|------|----------|-----------|
| 7604 | 2798.        | 0.           | 1976 |          |           |
| 7605 | 2671.        | 0.           |      |          |           |
| 7606 | 2583.        | 0.           |      |          |           |
| 7607 | 2278.        | 0.           |      |          |           |
| 7608 | 2445.        | 0.           |      |          |           |
| 7609 | 2213.        | 0.           |      |          |           |
| 7610 | 2114.        | 0.           |      |          |           |
| 7611 | 2317.        | 0.           |      |          |           |
| 7612 | 2494.        | 0.           |      |          |           |
| 7701 | 2022.        | 0.           |      |          |           |
| 7702 | 1898.        | 0.           |      |          |           |
| 7703 | 1927.        | 0.           |      |          |           |
| 7704 | 1732.        | 0.           |      |          |           |
| 7705 | 1627.        | 0.           |      |          |           |
| 7706 | 1483.        | 0.           |      |          |           |
| 7707 | 871.0        | 0.           |      |          |           |
| 7708 | 491.0        | 0.           |      |          |           |
| 7709 | 464.0        | 0.           |      |          |           |
| 7710 | 732.0        | 0.           |      |          |           |
| 7711 | 1005.        | 0.           |      |          |           |
| 7712 | 1228.        | 0.           |      |          |           |
| 7801 | 1525.        | 0.           |      |          |           |
| 7802 | 1501.        | 0.           |      |          |           |
| 7803 | 1204.        | 0.           |      |          |           |
| 7804 | 940.0        | 0.           |      |          |           |
| 7805 | 1087.        | 0.           |      |          |           |
| 7806 | 1250.        | 0.           |      |          |           |
| 7807 | 1225.        | 0.           |      |          |           |
| 7808 | 1487.        | 0.           |      |          |           |
| 7809 | 1276.        | 0.           |      |          |           |
| 7810 | 1270.        | 0.           |      |          |           |
| 7811 | 1205.        | 0.           |      |          |           |
| 7812 | 1039.        | 0.           |      |          |           |
| 7901 | 1461.        | 0.           |      |          |           |
| 7902 | 1223.        | 0.           |      |          |           |
| 7903 | 891.0        | 0.           |      |          |           |
| 7904 | 1188.        | 0.           |      |          |           |
| 7905 | 1700.        | 0.           |      |          |           |
| 7906 | 1239.        | 0.           |      |          |           |
| 7907 | 1556.        | 0.           |      |          |           |
| 7908 | 1736.        | 0.           |      |          |           |
| 7909 | 1503.        | 0.           |      |          |           |
| 7910 | 1630.        | 0.           |      |          |           |
| 7911 | 1791.        | 0.           |      |          |           |
| 7912 | 1577.        | 0.           |      |          |           |
| 8001 | 2463.        | 0.           |      |          |           |
| 8002 | 131.         | 0.           |      |          |           |
| 8003 | 339.         | 0.           |      |          |           |
|      |              |              | 1980 |          |           |

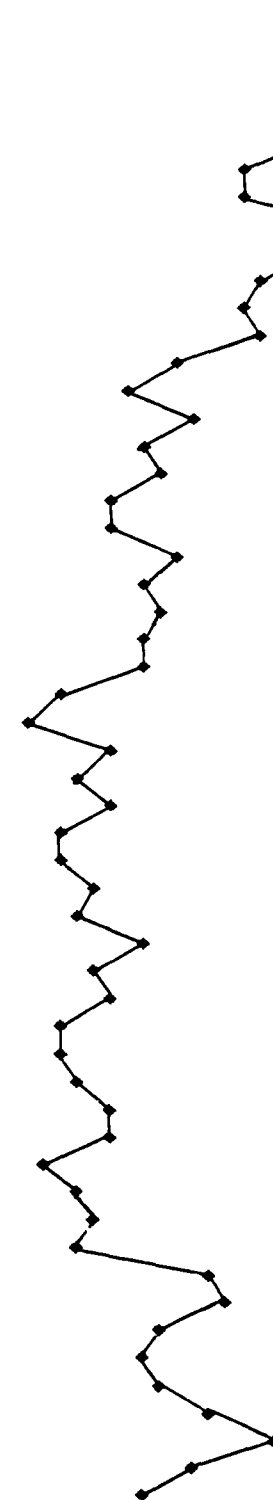
Series - Monthly ASVAB Exams

Transformation - The December 1976 Number which reflected the impact of the GI Bill termination was replaced by the mean of the series from April 1976 through December 1976.

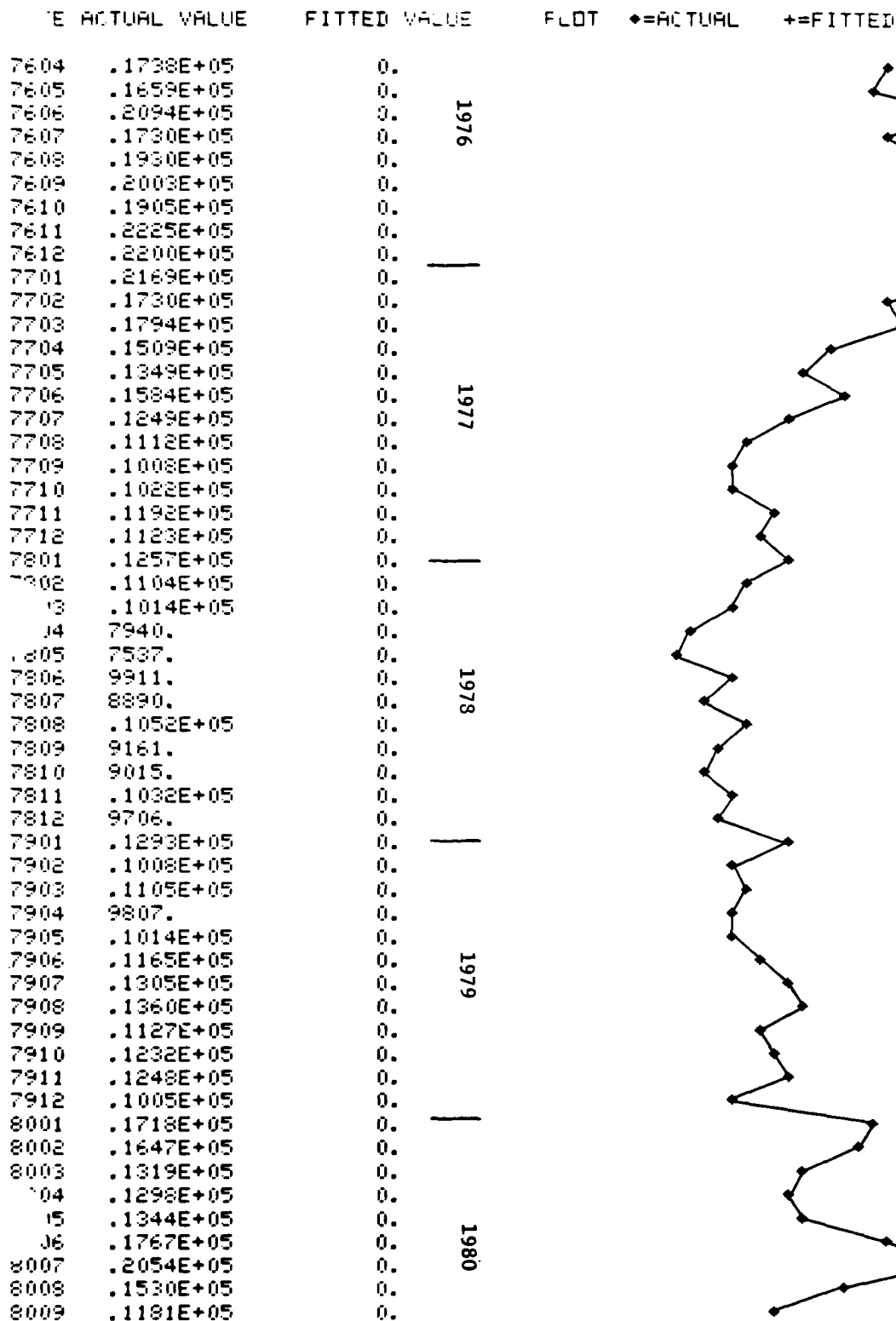
E.4 Category I-III A

E.5 Category IIIB-IV

CATEGORY I-IIIA EXAMS  
DEC. 76 ADJUSTMENT

| DATE | ACTUAL VALUE | FITTED VALUE | PLOT | ◆=ACTUAL                                                                            | + =FITTED |  |  |
|------|--------------|--------------|------|-------------------------------------------------------------------------------------|-----------|--|--|
| 7604 | .1021E+05    | 0.           | 1976 |  |           |  |  |
| 7605 | 9425.        | 0.           |      |                                                                                     |           |  |  |
| 7606 | .1123E+05    | 0.           |      |                                                                                     |           |  |  |
| 7607 | 9672.        | 0.           |      |                                                                                     |           |  |  |
| 7608 | 9754.        | 0.           |      |                                                                                     |           |  |  |
| 7609 | 8566.        | 0.           |      |                                                                                     |           |  |  |
| 7610 | 8514.        | 0.           |      |                                                                                     |           |  |  |
| 7611 | .1100E+05    | 0.           |      |                                                                                     |           |  |  |
| 7612 | 9798.        | 0.           |      |                                                                                     |           |  |  |
| 7701 | 8913.        | 0.           |      |                                                                                     |           |  |  |
| 7702 | 8627.        | 0.           |      |                                                                                     |           |  |  |
| 7703 | 8882.        | 0.           |      |                                                                                     |           |  |  |
| 7704 | 7127.        | 0.           | 1977 |                                                                                     |           |  |  |
| 7705 | 6168.        | 0.           |      |                                                                                     |           |  |  |
| 7706 | 7321.        | 0.           |      |                                                                                     |           |  |  |
| 7707 | 6594.        | 0.           |      |                                                                                     |           |  |  |
| 7708 | 6969.        | 0.           |      |                                                                                     |           |  |  |
| 7709 | 5659.        | 0.           |      |                                                                                     |           |  |  |
| 7710 | 5809.        | 0.           |      |                                                                                     |           |  |  |
| 7711 | 7070.        | 0.           |      |                                                                                     |           |  |  |
| 7712 | 6495.        | 0.           |      |                                                                                     |           |  |  |
| 7801 | 6867.        | 0.           |      |                                                                                     |           |  |  |
| 7802 | 6377.        | 0.           |      |                                                                                     |           |  |  |
| 7803 | 6428.        | 0.           | 1978 |                                                                                     |           |  |  |
| 7804 | 4844.        | 0.           |      |                                                                                     |           |  |  |
| 7805 | 4092.        | 0.           |      |                                                                                     |           |  |  |
| 7806 | 5618.        | 0.           |      |                                                                                     |           |  |  |
| 7807 | 5000.        | 0.           |      |                                                                                     |           |  |  |
| 7808 | 5793.        | 0.           |      |                                                                                     |           |  |  |
| 7809 | 4757.        | 0.           |      |                                                                                     |           |  |  |
| 7810 | 4798.        | 0.           |      |                                                                                     |           |  |  |
| 7811 | 5380.        | 0.           |      |                                                                                     |           |  |  |
| 7812 | 5003.        | 0.           |      |                                                                                     |           |  |  |
| 7901 | 6623.        | 0.           |      |                                                                                     |           |  |  |
| 7902 | 5584.        | 0.           | 1979 |                                                                                     |           |  |  |
| 7903 | 5815.        | 0.           |      |                                                                                     |           |  |  |
| 7904 | 4770.        | 0.           |      |                                                                                     |           |  |  |
| 7905 | 4742.        | 0.           |      |                                                                                     |           |  |  |
| 7906 | 4963.        | 0.           |      |                                                                                     |           |  |  |
| 7907 | 5900.        | 0.           |      |                                                                                     |           |  |  |
| 7908 | 5753.        | 0.           |      |                                                                                     |           |  |  |
| 7909 | 4502.        | 0.           |      |                                                                                     |           |  |  |
| 7910 | 4955.        | 0.           |      |                                                                                     |           |  |  |
| 7911 | 5456.        | 0.           |      |                                                                                     |           |  |  |
| 7912 | 4969.        | 0.           |      |                                                                                     |           |  |  |
| 8001 | 7939.        | 0.           | 1980 |                                                                                     |           |  |  |
| 8002 | 8073.        | 0.           |      |                                                                                     |           |  |  |
| 8003 | 6826.        | 0.           |      |                                                                                     |           |  |  |
| 8004 | 6586.        | 0.           |      |                                                                                     |           |  |  |
| 8005 | 6677.        | 0.           |      |                                                                                     |           |  |  |
| 8006 | 7716.        | 0.           |      |                                                                                     |           |  |  |
| 8007 | 9163.        | 0.           |      |                                                                                     |           |  |  |
| 8008 | 7605.        | 0.           |      |                                                                                     |           |  |  |
| 8009 | 6568.        | 0.           |      |                                                                                     |           |  |  |

## E.5

CATEGORY IIIB-IV EXAMS  
DEC. 76 ADJUSTMENT

DATA APPENDIX F  
MEDIA VARIABLES (TRANSFORMED)

Series - Net and Deflated Media Spending Variables

Transformation - All media series were deflated by the appropriate deflators. The data from April 1976 through September 1978 had been expressed as gross expenditures and needed to be divided by 1.15 to achieve net expenditures.

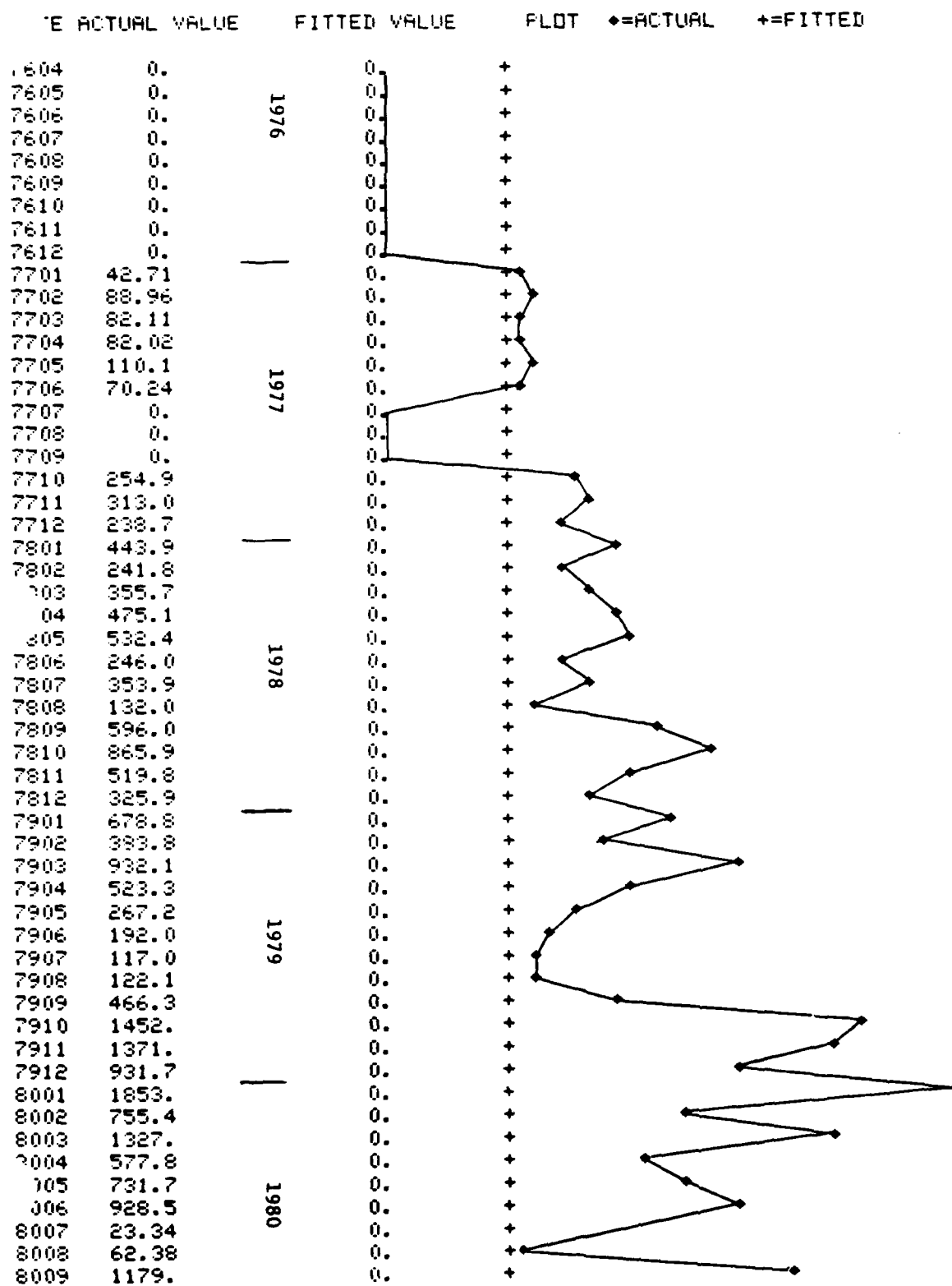
- F.1 Television\*
- F.2 Radio\*\*
- F.3 Newspaper
- F.4 Outdoor
- F.5 Direct Mail
- F.6 Local Advertising
- F.7 Regular Magazines
- F.8 Special Magazines

---

\* The TV deflator is a weighted average of the TV spot deflator B.9 and the TV prime deflator B.10. The weights are the proportions of Spot and prime TV to total TV expenditures. We estimated that Spot TV was 100% of total TV expenditures until October 1977; then only 8% until October 1978; and the 25% until October 1980.

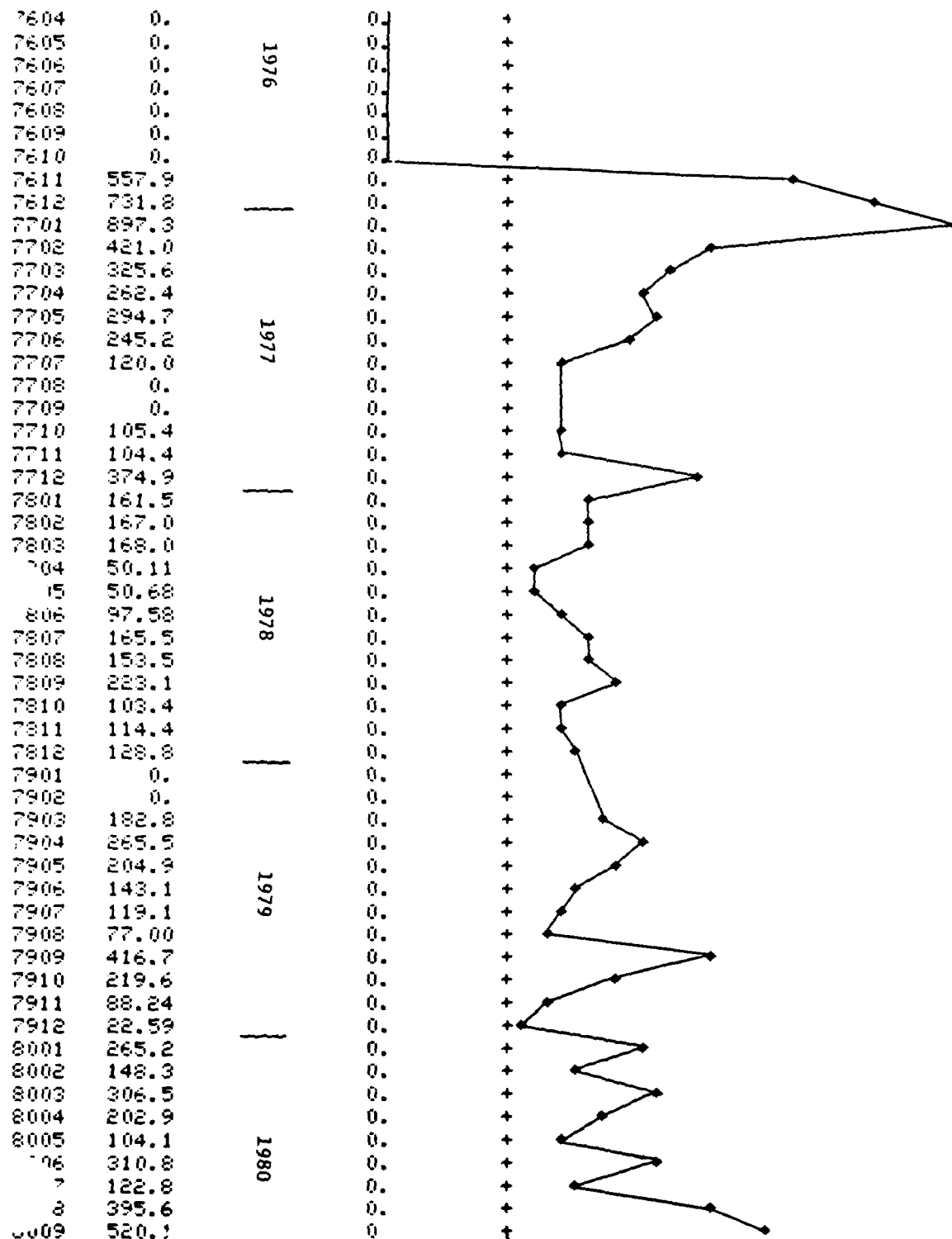
\*\* The radio deflator is a similarly weighted average of the radio spot deflator B.11 and the radio network deflator B.12. We estimated that Spot radio was 100% of radio expenditures until October 1976, then 86% until October 1977; and finally 50% until October 1980.

F.1  
NET TELEVISION SPENDING  
(DEFLATED)



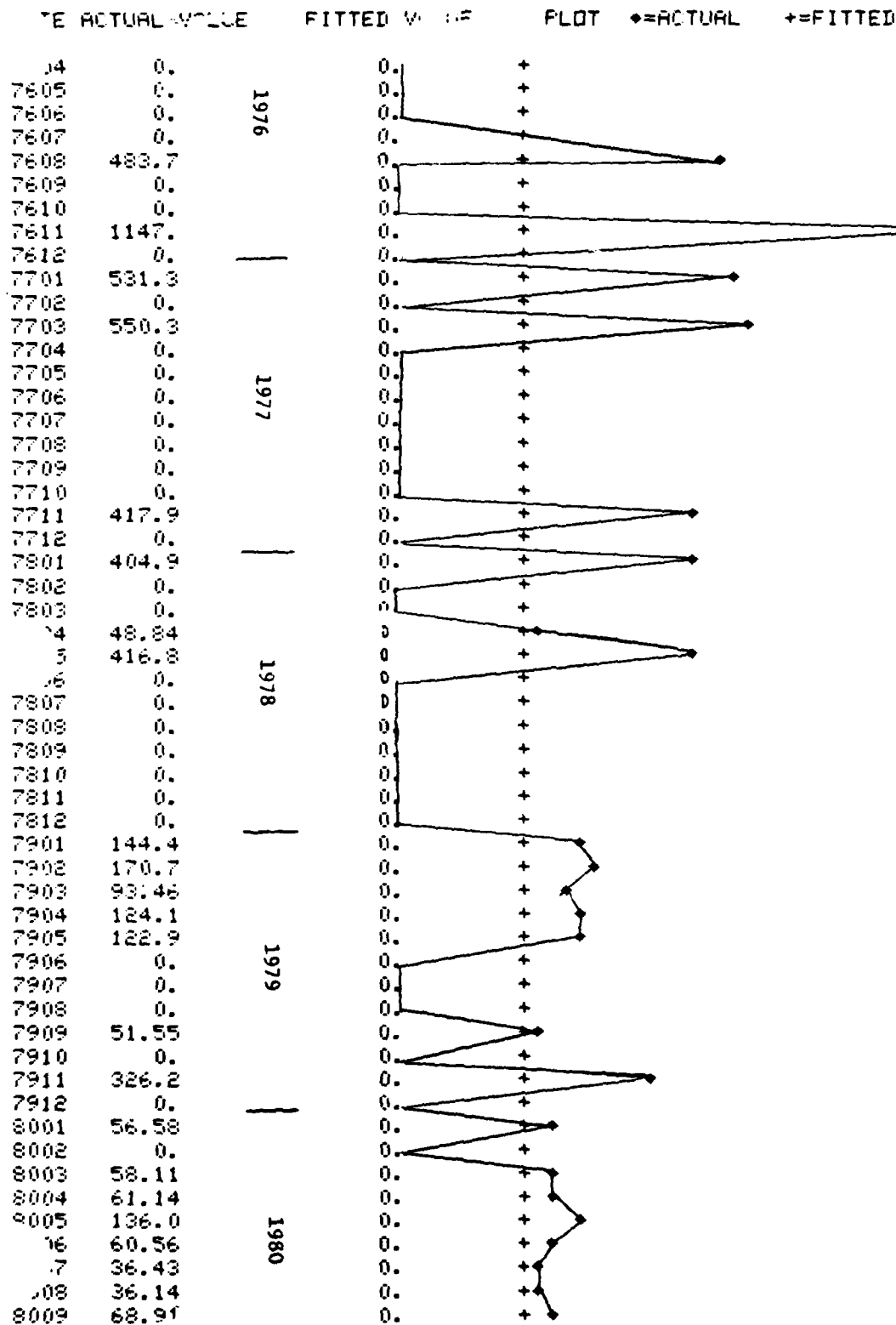
F.2  
NET RADIO SPENDING  
(DEFLATED)

DATE-ACTUAL VALUE      FITTED VALUE      PLOT   ♦=ACTUAL   +=FITTED

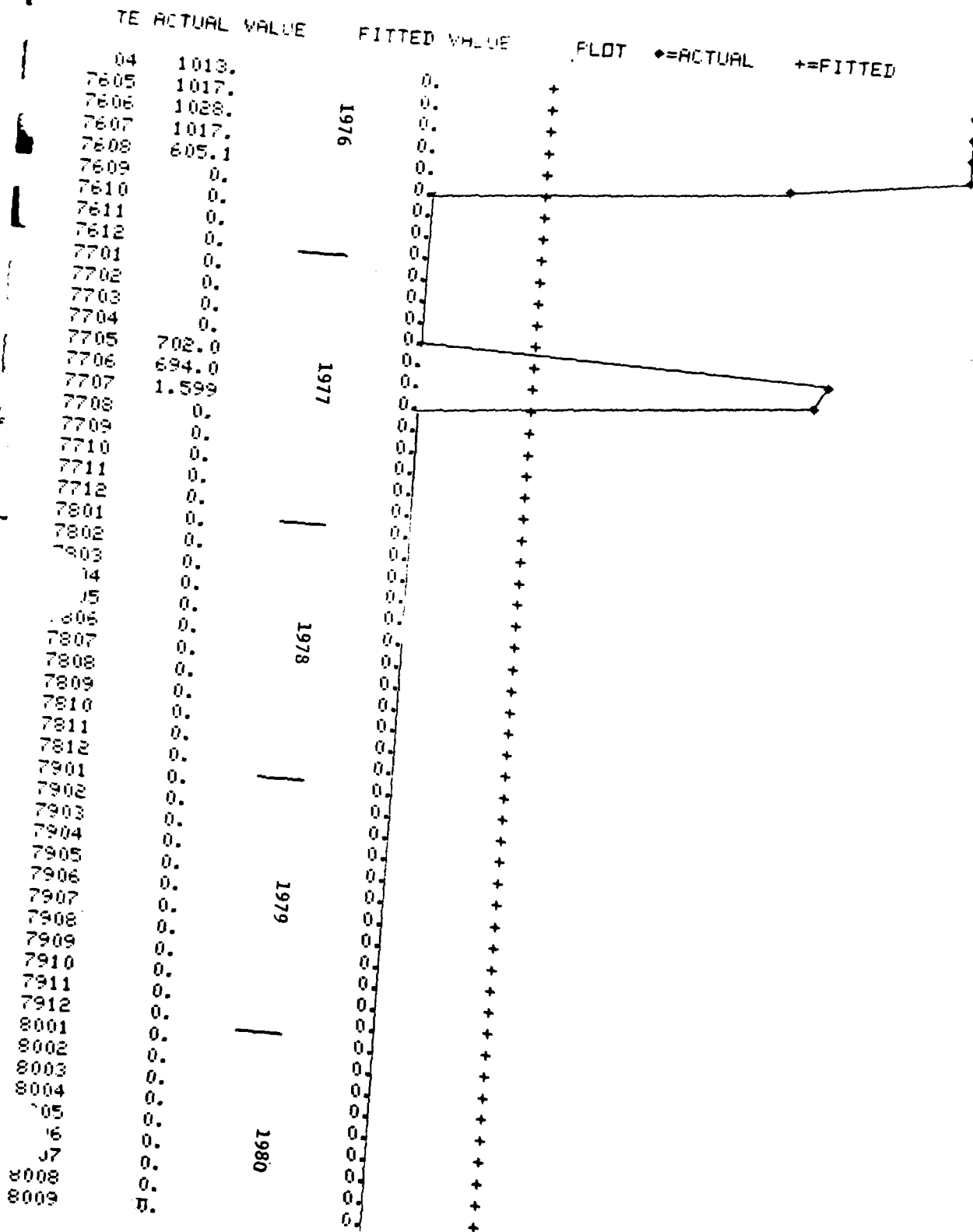


F.3

NET NEWSPAPER SPENDING  
(DEFLATED)

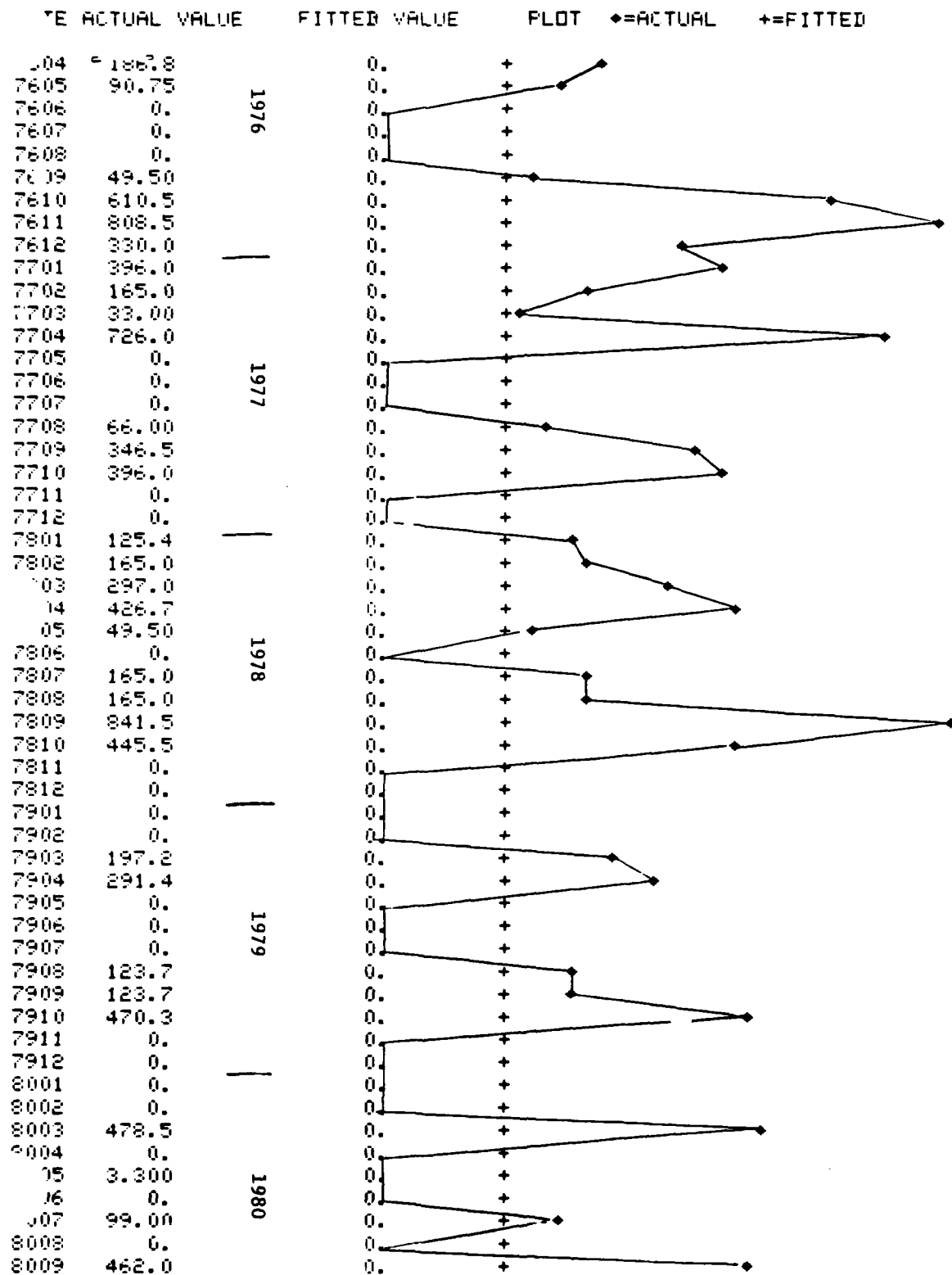


F.4  
NET OUTDOOR SPENDING  
(DEFLATED)



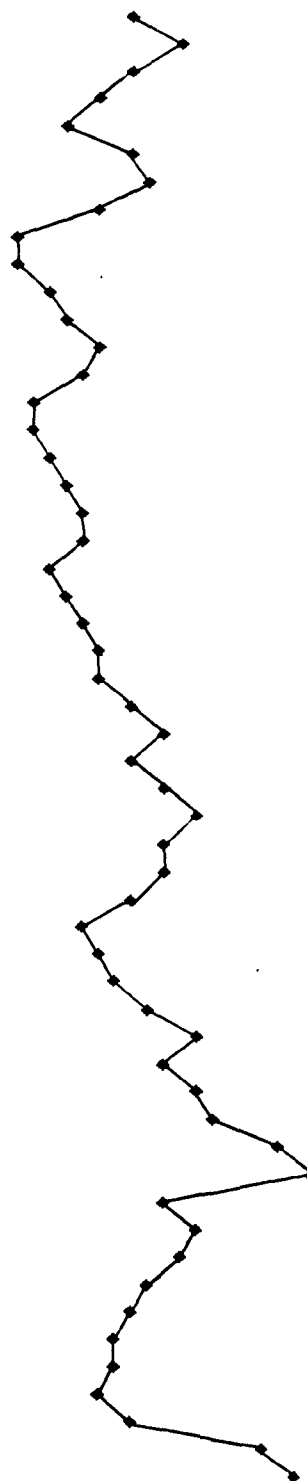
F.5

DIRECT MAIL  
(DEFLATED)

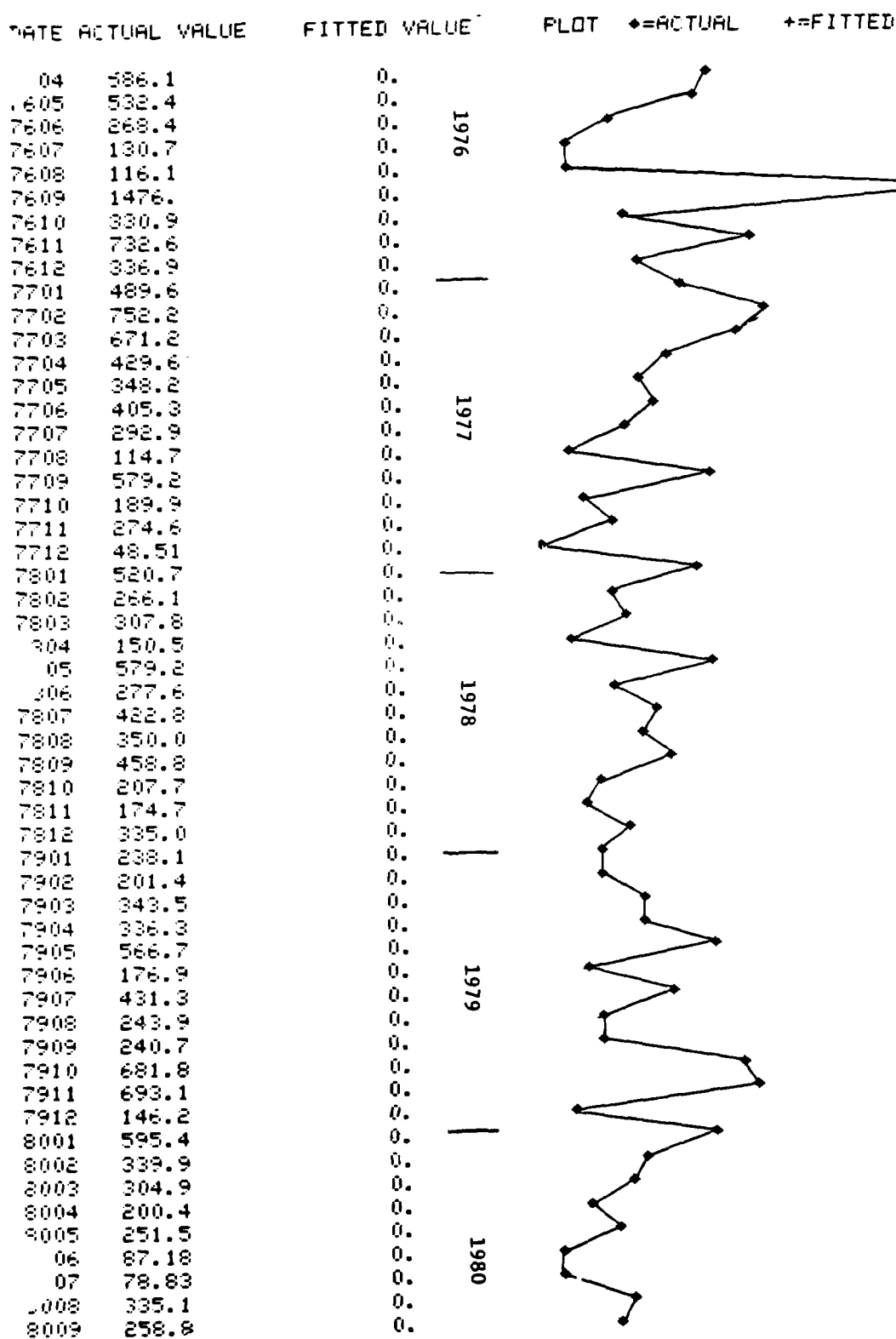


F.6  
LOCAL ADVERTISING  
(DEFLATED)

| TE   | ACTUAL VALUE | FITTED VALUE | PLOT | ◆=ACTUAL | + = FITTED |
|------|--------------|--------------|------|----------|------------|
| 7604 | 351.8        | 0.           |      |          |            |
| 7605 | 392.3        | 0.           |      |          |            |
| 7606 | 349.4        | 0.           | 1976 |          |            |
| 7607 | 319.6        | 0.           |      |          |            |
| 7608 | 277.3        | 0.           |      |          |            |
| 7609 | 347.0        | 0.           |      |          |            |
| 7610 | 355.5        | 0.           |      |          |            |
| 7611 | 322.3        | 0.           |      |          |            |
| 7612 | 230.4        | 0.           |      |          |            |
| 7701 | 231.9        | 0.           |      |          |            |
| 7702 | 262.2        | 0.           |      |          |            |
| 7703 | 282.3        | 0.           |      |          |            |
| 7704 | 308.7        | 0.           |      |          |            |
| 7705 | 300.5        | 0.           |      |          |            |
| 7706 | 257.8        | 0.           | 1977 |          |            |
| 7707 | 246.1        | 0.           |      |          |            |
| 7708 | 268.6        | 0.           |      |          |            |
| 7709 | 280.4        | 0.           |      |          |            |
| 7710 | 302.5        | 0.           |      |          |            |
| 7711 | 298.1        | 0.           |      |          |            |
| 7712 | 266.4        | 0.           |      |          |            |
| 7801 | 276.4        | 0.           |      |          |            |
| 7802 | 297.2        | 0.           |      |          |            |
| 7803 | 317.4        | 0.           |      |          |            |
| 7804 | 322.2        | 0.           |      |          |            |
| 7805 | 354.3        | 0.           |      |          |            |
| 7806 | 374.7        | 0.           | 1978 |          |            |
| 7807 | 341.4        | 0.           |      |          |            |
| 7808 | 370.9        | 0.           |      |          |            |
| 7809 | 402.5        | 0.           |      |          |            |
| 7810 | 373.4        | 0.           |      |          |            |
| 7811 | 377.2        | 0.           |      |          |            |
| 7812 | 347.6        | 0.           |      |          |            |
| 7901 | 301.4        | 0.           |      |          |            |
| 7902 | 314.1        | 0.           |      |          |            |
| 7903 | 335.6        | 0.           |      |          |            |
| 7904 | 360.8        | 0.           |      |          |            |
| 7905 | 417.1        | 0.           |      |          |            |
| 7906 | 377.2        | 0.           | 1979 |          |            |
| 7907 | 404.9        | 0.           |      |          |            |
| 7908 | 423.2        | 0.           |      |          |            |
| 7909 | 495.5        | 0.           |      |          |            |
| 7910 | 520.3        | 0.           |      |          |            |
| 7911 | 375.1        | 0.           |      |          |            |
| 7912 | 408.1        | 0.           |      |          |            |
| 8001 | 401.4        | 0.           |      |          |            |
| 8002 | 366.0        | 0.           |      |          |            |
| 8003 | 345.0        | 0.           |      |          |            |
| 8004 | 326.4        | 0.           |      |          |            |
| 8005 | 323.7        | 0.           |      |          |            |
| 8006 | 310.0        | 0.           | 1980 |          |            |
| 8007 | 349.2        | 0.           |      |          |            |
| 8008 | 468.2        | 0.           |      |          |            |
| 8009 | 503.1        | 0.           |      |          |            |



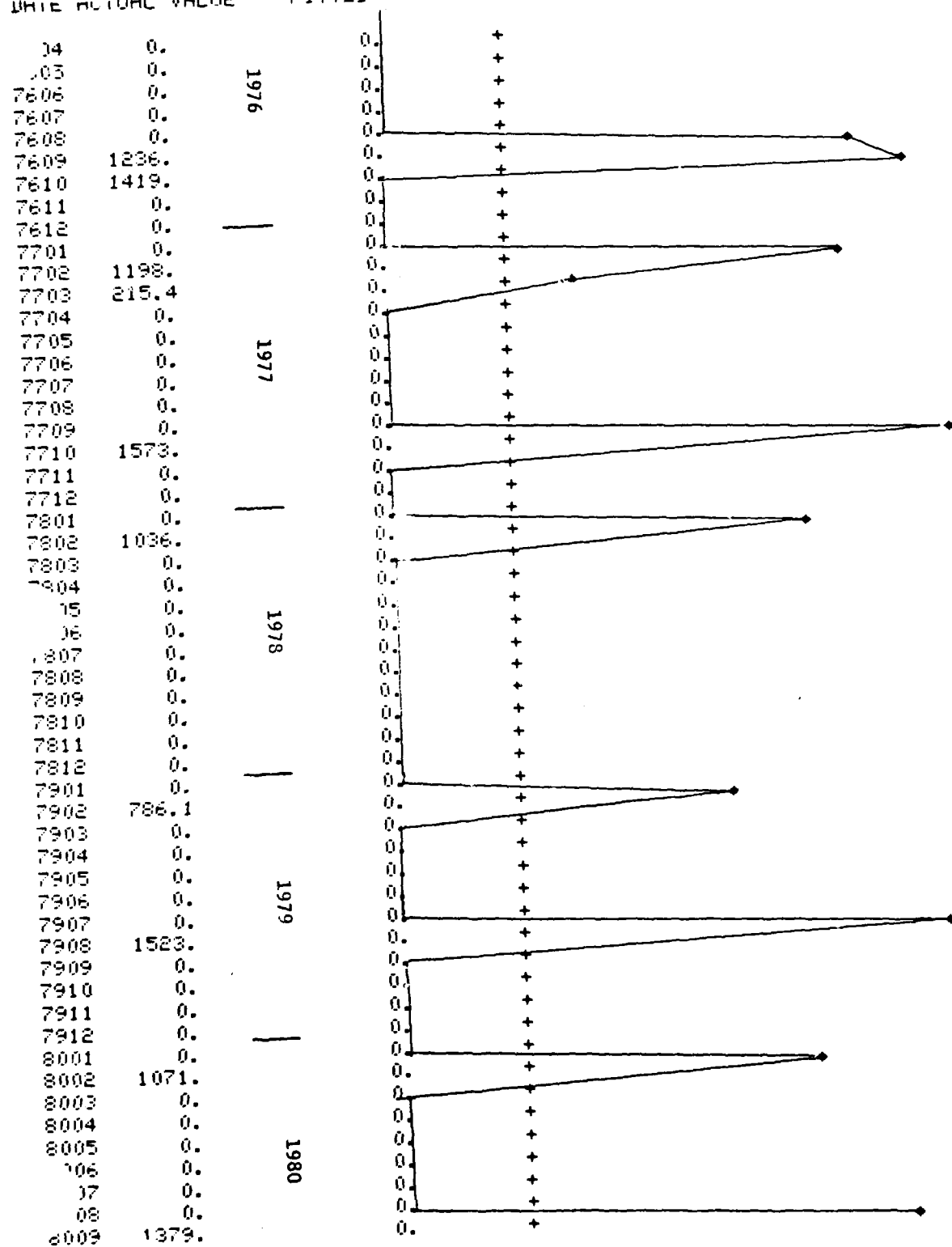
# NET REGULAR MAGAZINE SPENDING (DEFLATED)



F.8

# NET SPECIAL MAGAZINE SPENDING (DEFLATED)

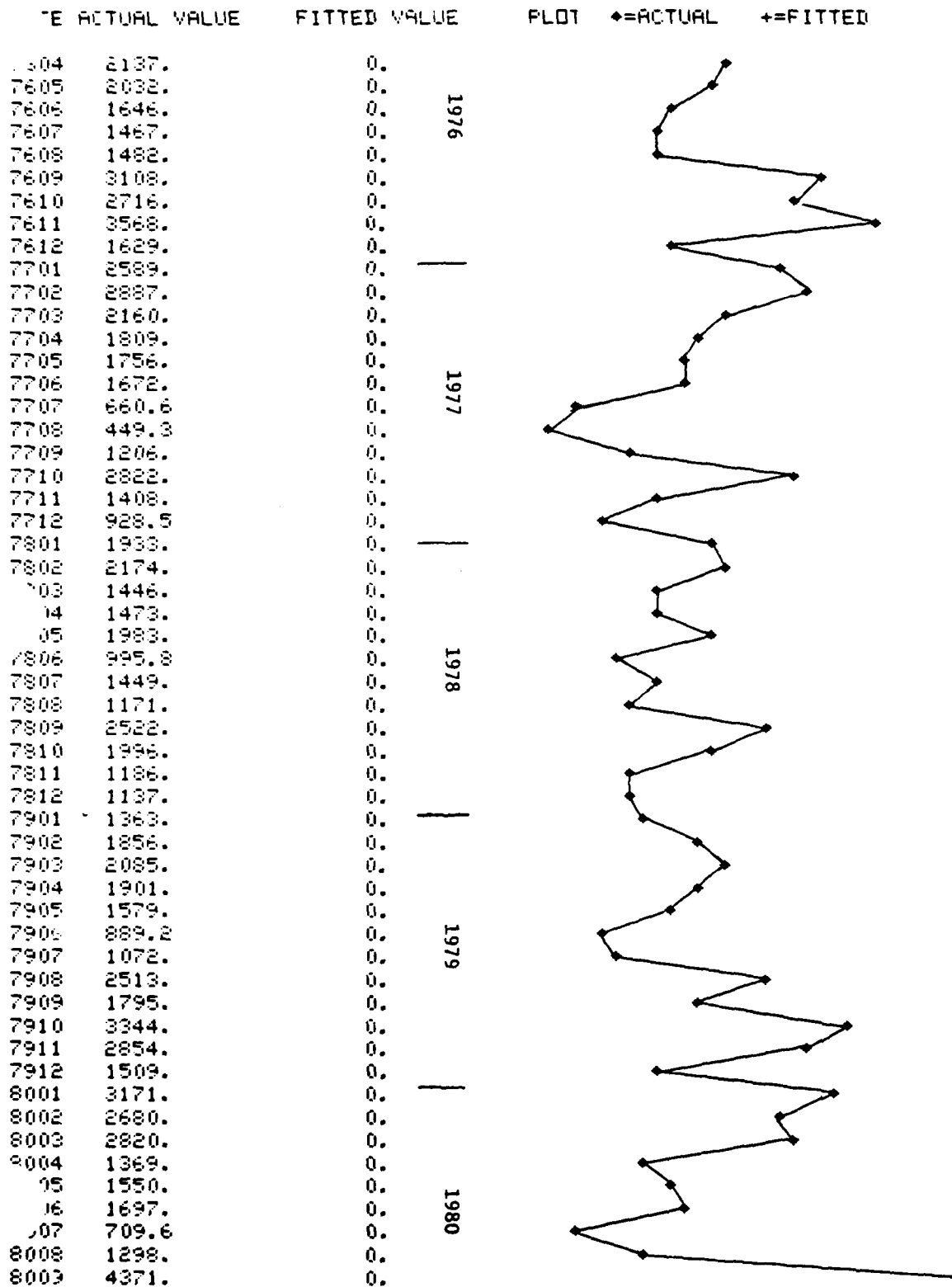
DATE ACTUAL VALUE      FITTED VALUE      PLOT   ♦=ACTUAL   +=FITTED



Series -            Total Media

Transformation - The sum of the all eight deflated media expenditures for  
each month

F.9  
TOTAL MEDIA AGGREGATE  
CURRENT PERIOD  
(DEFLATED)

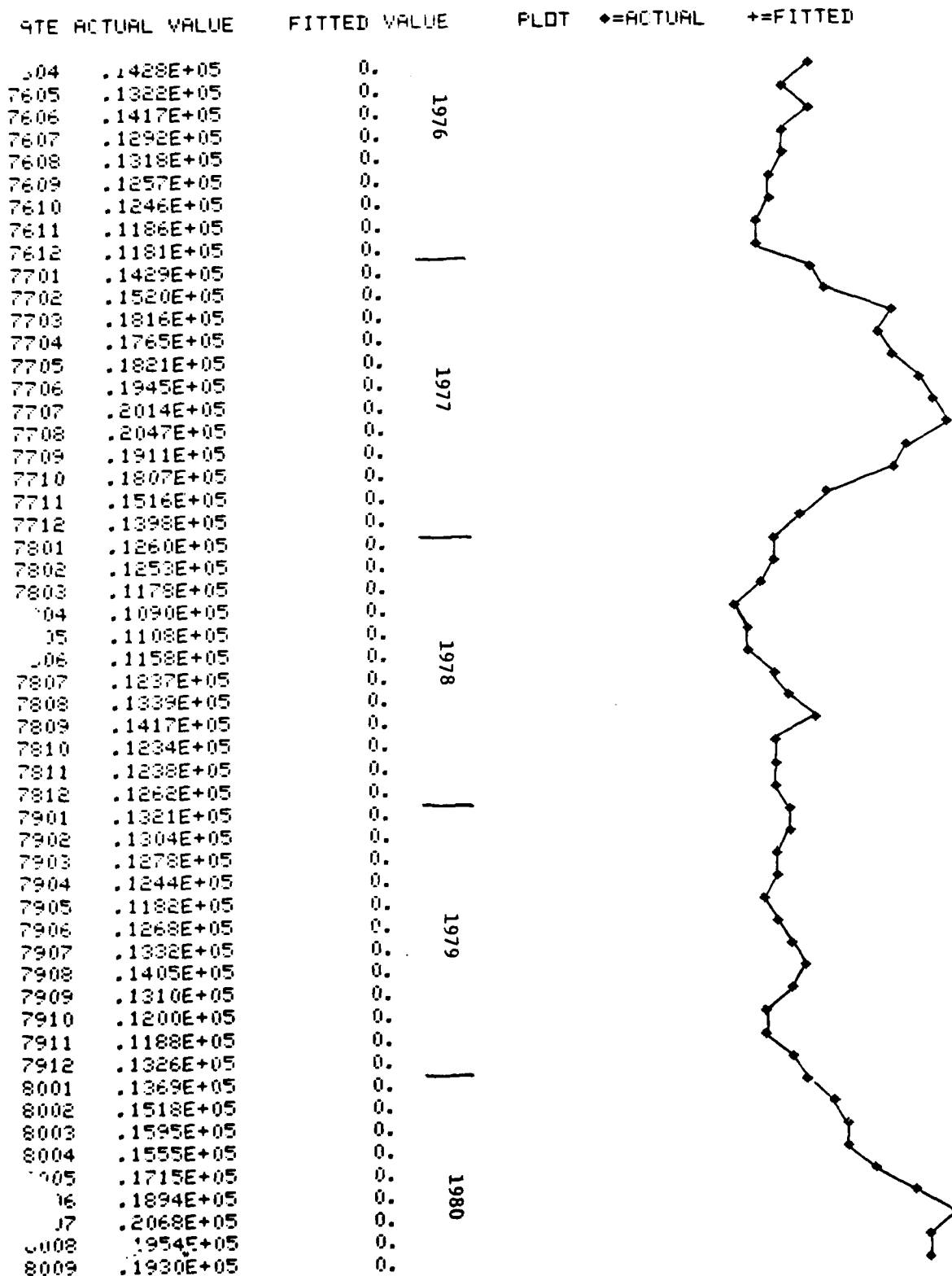


Series - Total Media summed for lags 4 through 11

Transformation - The value at each month is the total media variable summed from lag  $t-4$  through lag  $t-11$ .

F.10

TOTAL MEDIA AGGREGATE  
LAG 4-11  
(DEFLATED)

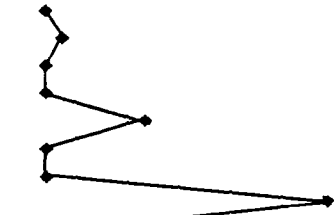
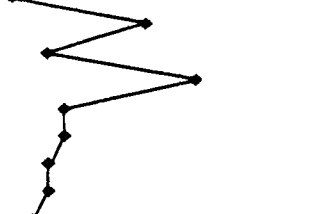
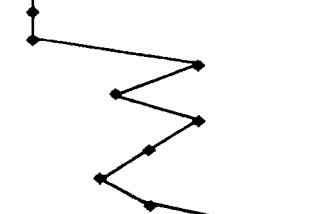
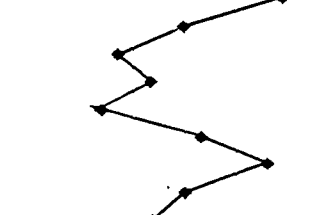
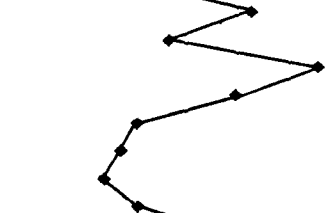


Series - TV, Radio, Local Advertising Aggregate

Transformation - Current value of radio spending + current value of local  
advertising spending + television spending lagged one  
period

## F.11

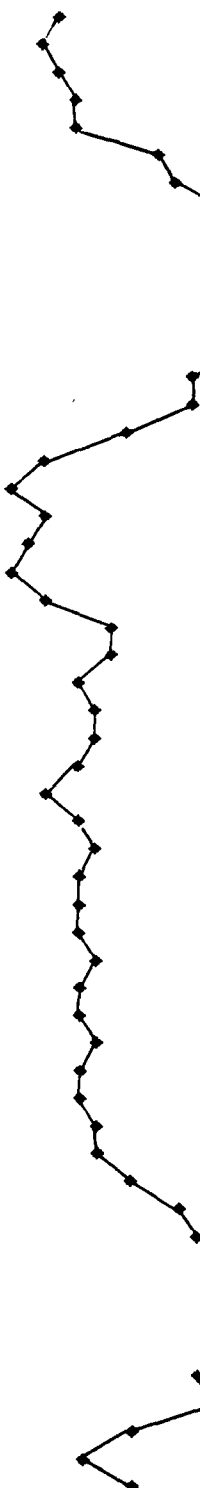
TV (T-1) + LOCAL + NEWSPAPER SPENDING  
(DEFLATED)

| DATE | ACTUAL VALUE | FITTED VALUE | PLOT | ◆=ACTUAL                                                                             | + =FITTED |
|------|--------------|--------------|------|--------------------------------------------------------------------------------------|-----------|
| 7604 | 351.8        | 0.           | 1976 |    |           |
| 7605 | 392.3        | 0.           |      |                                                                                      |           |
| 7606 | 349.4        | 0.           |      |                                                                                      |           |
| 7607 | 319.6        | 0.           |      |                                                                                      |           |
| 7608 | 761.0        | 0.           |      |                                                                                      |           |
| 7609 | 347.0        | 0.           |      |                                                                                      |           |
| 7610 | 355.5        | 0.           |      |                                                                                      |           |
| 7611 | 1469.        | 0.           |      |                                                                                      |           |
| 7612 | 230.4        | 0.           |      |                                                                                      |           |
| 7701 | 763.1        | 0.           |      |                                                                                      |           |
| 7702 | 304.9        | 0.           |      |                                                                                      |           |
| 7703 | 921.5        | 0.           |      |                                                                                      |           |
| 7704 | 390.8        | 0.           | 1977 |    |           |
| 7705 | 382.6        | 0.           |      |                                                                                      |           |
| 7706 | 367.9        | 0.           |      |                                                                                      |           |
| 7707 | 316.4        | 0.           |      |                                                                                      |           |
| 7708 | 268.6        | 0.           |      |                                                                                      |           |
| 7709 | 280.4        | 0.           |      |                                                                                      |           |
| 7710 | 302.5        | 0.           |      |                                                                                      |           |
| 7711 | 970.9        | 0.           |      |                                                                                      |           |
| 7712 | 579.4        | 0.           |      |                                                                                      |           |
| 7801 | 919.9        | 0.           |      |                                                                                      |           |
| 7802 | 741.0        | 0.           |      |                                                                                      |           |
| 7803 | 559.2        | 0.           |      |                                                                                      |           |
| 7804 | 726.7        | 0.           | 1978 |   |           |
| 7805 | 1246.        | 0.           |      |                                                                                      |           |
| 7806 | 907.1        | 0.           |      |                                                                                      |           |
| 7807 | 587.4        | 0.           |      |                                                                                      |           |
| 7808 | 724.8        | 0.           |      |                                                                                      |           |
| 7809 | 534.4        | 0.           |      |                                                                                      |           |
| 7810 | 969.4        | 0.           |      |                                                                                      |           |
| 7811 | 1243.        | 0.           |      |                                                                                      |           |
| 7812 | 867.5        | 0.           |      |                                                                                      |           |
| 7901 | 771.6        | 0.           |      |                                                                                      |           |
| 7902 | 1164.        | 0.           |      |                                                                                      |           |
| 7903 | 812.9        | 0.           |      |                                                                                      |           |
| 7904 | 1417.        | 0.           | 1979 |  |           |
| 7905 | 1063.        | 0.           |      |                                                                                      |           |
| 7906 | 644.4        | 0.           |      |                                                                                      |           |
| 7907 | 596.9        | 0.           |      |                                                                                      |           |
| 7908 | 540.3        | 0.           |      |                                                                                      |           |
| 7909 | 669.1        | 0.           |      |                                                                                      |           |
| 7910 | 986.6        | 0.           |      |                                                                                      |           |
| 7911 | 2153.        | 0.           |      |                                                                                      |           |
| 7912 | 1779.        | 0.           |      |                                                                                      |           |
| 8001 | 1390.        | 0.           |      |                                                                                      |           |
| 8002 | 2219.        | 0.           |      |                                                                                      |           |
| 8003 | 1158.        | 0.           |      |                                                                                      |           |
| 8004 | 1714.        | 0.           | 1980 |  |           |
| 8005 | 1037.        | 0.           |      |                                                                                      |           |
| 8006 | 1102.        | 0.           |      |                                                                                      |           |
| 8007 | 1314.        | 0.           |      |                                                                                      |           |
| 8008 | 527.8        | 0.           |      |                                                                                      |           |
| 8009 | 634.4        | 0.           |      |                                                                                      |           |

Series - Total Media Sum for current period through lag 5

Transformation - The value at each month is the total media variable summed from the current period through lag  $t-5$ .

F.12  
TOTAL MEDIA AGGREGATE  
LAG 0-5  
(DEFLATED)

| DATE | ACTUAL VALUE | FITTED VALUE | PLOT | ◆=ACTUAL                                                                             | + =FITTED |  |  |
|------|--------------|--------------|------|--------------------------------------------------------------------------------------|-----------|--|--|
| 74   | 8783.        | 0.           | 1976 |  |           |  |  |
| 75   | 8747.        | 0.           |      |                                                                                      |           |  |  |
| 7606 | 8859.        | 0.           |      |                                                                                      |           |  |  |
| 7607 | 9700.        | 0.           |      |                                                                                      |           |  |  |
| 7608 | 9375.        | 0.           |      |                                                                                      |           |  |  |
| 7609 | .1187E+05    | 0.           |      |                                                                                      |           |  |  |
| 7610 | .1245E+05    | 0.           |      |                                                                                      |           |  |  |
| 7611 | .1399E+05    | 0.           |      |                                                                                      |           |  |  |
| 7612 | .1397E+05    | 0.           |      |                                                                                      |           |  |  |
| 7701 | .1509E+05    | 0.           |      |                                                                                      |           |  |  |
| 7702 | .1650E+05    | 0.           |      |                                                                                      |           |  |  |
| 7703 | .1555E+05    | 0.           | 1977 |                                                                                      |           |  |  |
| 7704 | .1464E+05    | 0.           |      |                                                                                      |           |  |  |
| 7705 | .1283E+05    | 0.           |      |                                                                                      |           |  |  |
| 7706 | .1287E+05    | 0.           |      |                                                                                      |           |  |  |
| 7707 | .1094E+05    | 0.           |      |                                                                                      |           |  |  |
| 7708 | 8506.        | 0.           |      |                                                                                      |           |  |  |
| 7709 | 7553.        | 0.           |      |                                                                                      |           |  |  |
| 7710 | 8566.        | 0.           |      |                                                                                      |           |  |  |
| 7711 | 8218.        | 0.           |      |                                                                                      |           |  |  |
| 7712 | 7474.        | 0.           |      |                                                                                      |           |  |  |
| 7801 | 8746.        | 0.           | 1978 |                                                                                      |           |  |  |
| 7802 | .1047E+05    | 0.           |      |                                                                                      |           |  |  |
| 7803 | .1071E+05    | 0.           |      |                                                                                      |           |  |  |
| 7804 | 9362.        | 0.           |      |                                                                                      |           |  |  |
| 7805 | 9937.        | 0.           |      |                                                                                      |           |  |  |
| 7806 | .1000E+05    | 0.           |      |                                                                                      |           |  |  |
| 7807 | 9520.        | 0.           |      |                                                                                      |           |  |  |
| 7808 | 8518.        | 0.           |      |                                                                                      |           |  |  |
| 7809 | 9594.        | 0.           |      |                                                                                      |           |  |  |
| 7810 | .1012E+05    | 0.           |      |                                                                                      |           |  |  |
| 7811 | 9320.        | 0.           |      |                                                                                      |           |  |  |
| 7812 | 9461.        | 0.           | 1979 |                                                                                      |           |  |  |
| 7901 | 9375.        | 0.           |      |                                                                                      |           |  |  |
| 7902 | .1006E+05    | 0.           |      |                                                                                      |           |  |  |
| 7903 | 9623.        | 0.           |      |                                                                                      |           |  |  |
| 7904 | 9528.        | 0.           |      |                                                                                      |           |  |  |
| 7905 | 9921.        | 0.           |      |                                                                                      |           |  |  |
| 7906 | 9673.        | 0.           |      |                                                                                      |           |  |  |
| 7907 | 9383.        | 0.           |      |                                                                                      |           |  |  |
| 7908 | .1004E+05    | 0.           |      |                                                                                      |           |  |  |
| 7909 | 9749.        | 0.           |      |                                                                                      |           |  |  |
| 7910 | .1119E+05    | 0.           |      |                                                                                      |           |  |  |
| 7911 | .1247E+05    | 0.           | 1980 |                                                                                      |           |  |  |
| 7912 | .1309E+05    | 0.           |      |                                                                                      |           |  |  |
| 8001 | .1518E+05    | 0.           |      |                                                                                      |           |  |  |
| 8002 | .1535E+05    | 0.           |      |                                                                                      |           |  |  |
| 8003 | .1638E+05    | 0.           |      |                                                                                      |           |  |  |
| 8004 | .1440E+05    | 0.           |      |                                                                                      |           |  |  |
| 8005 | .1310E+05    | 0.           |      |                                                                                      |           |  |  |
| 8006 | .1329E+05    | 0.           |      |                                                                                      |           |  |  |
| 8007 | .1083E+05    | 0.           |      |                                                                                      |           |  |  |
| 8008 | 9443.        | 0.           |      |                                                                                      |           |  |  |
| 8009 | .1402E+05    | 0.           |      |                                                                                      |           |  |  |

DATA APPENDIX G  
POLICY VARIABLES (TRANSFORMED)

Series -           Recruiter Accession Objectives Smoothed

Transformation - A centered twelve month moving average of the accession  
objective series

Comments -       This variable is designed to capture the long term or  
overall mission component of objectives.

G.1  
RECRUITER OBJECTIVES  
12 MONTH MOVING AVERAGE

| DATE | ACTUAL VALUE | FITTED VALUE | FLOT | ◆=ACTUAL | + =FITTED |
|------|--------------|--------------|------|----------|-----------|
| 7604 | .1422E+05    | 0.           |      |          |           |
| 7605 | .1432E+05    | 0.           |      |          |           |
| 7606 | .1434E+05    | 0.           |      |          |           |
| 7607 | .1423E+05    | 0.           |      |          |           |
| 7608 | .1413E+05    | 0.           |      |          |           |
| 7609 | .1405E+05    | 0.           |      |          |           |
| 7610 | .1403E+05    | 0.           |      |          |           |
| 7611 | .1400E+05    | 0.           |      |          |           |
| 7612 | .1376E+05    | 0.           |      |          |           |
| 7701 | .1359E+05    | 0.           |      |          |           |
| 7702 | .1345E+05    | 0.           |      |          |           |
| 7703 | .1307E+05    | 0.           |      |          |           |
| 7704 | .1260E+05    | 0.           |      |          |           |
| 7705 | .1207E+05    | 0.           |      |          |           |
| 7706 | .1166E+05    | 0.           |      |          |           |
| 7707 | .1128E+05    | 0.           |      |          |           |
| 7708 | .1087E+05    | 0.           |      |          |           |
| 7709 | .1051E+05    | 0.           |      |          |           |
| 7710 | .1011E+05    | 0.           |      |          |           |
| 7711 | 9756.        | 0.           |      |          |           |
| 7712 | 9562.        | 0.           |      |          |           |
| 7801 | 9473.        | 0.           |      |          |           |
| 7802 | 9456.        | 0.           |      |          |           |
| 7803 | 9598.        | 0.           |      |          |           |
| 7804 | 9710.        | 0.           |      |          |           |
| 7805 | 9675.        | 0.           |      |          |           |
| 7806 | 9640.        | 0.           |      |          |           |
| 7807 | 9672.        | 0.           |      |          |           |
| 7808 | 9701.        | 0.           |      |          |           |
| 7809 | 9732.        | 0.           |      |          |           |
| 7810 | .1001E+05    | 0.           |      |          |           |
| 7811 | .1044E+05    | 0.           |      |          |           |
| 7812 | .1075E+05    | 0.           |      |          |           |
| 7901 | .1104E+05    | 0.           |      |          |           |
| 7902 | .1120E+05    | 0.           |      |          |           |
| 7903 | .1118E+05    | 0.           |      |          |           |
| 7904 | .1117E+05    | 0.           |      |          |           |
| 7905 | .1117E+05    | 0.           |      |          |           |
| 7906 | .1117E+05    | 0.           |      |          |           |
| 7907 | .1117E+05    | 0.           |      |          |           |
| 7908 | .1117E+05    | 0.           |      |          |           |
| 7909 | .1117E+05    | 0.           |      |          |           |
| 7910 | .1117E+05    | 0.           |      |          |           |
| 7911 | .1117E+05    | 0.           |      |          |           |
| 7912 | .1117E+05    | 0.           |      |          |           |
| 8001 | .1117E+05    | 0.           |      |          |           |
| 8002 | .1117E+05    | 0.           |      |          |           |
| 8003 | .1117E+05    | 0.           |      |          |           |
| 8004 | .1117E+05    | 0.           |      |          |           |
| 8005 | .1117E+05    | 0.           |      |          |           |
| 8006 | .1117E+05    | 0.           |      |          |           |
| 8007 | .1117E+05    | 0.           |      |          |           |
| 8008 | .1117E+05    | 0.           |      |          |           |
| 8009 | .1117E+05    | 0.           |      |          |           |

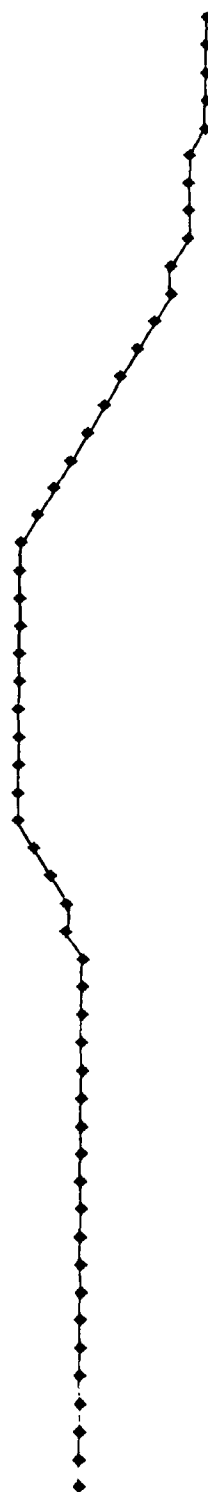
1976

1977

1978

1979

1980



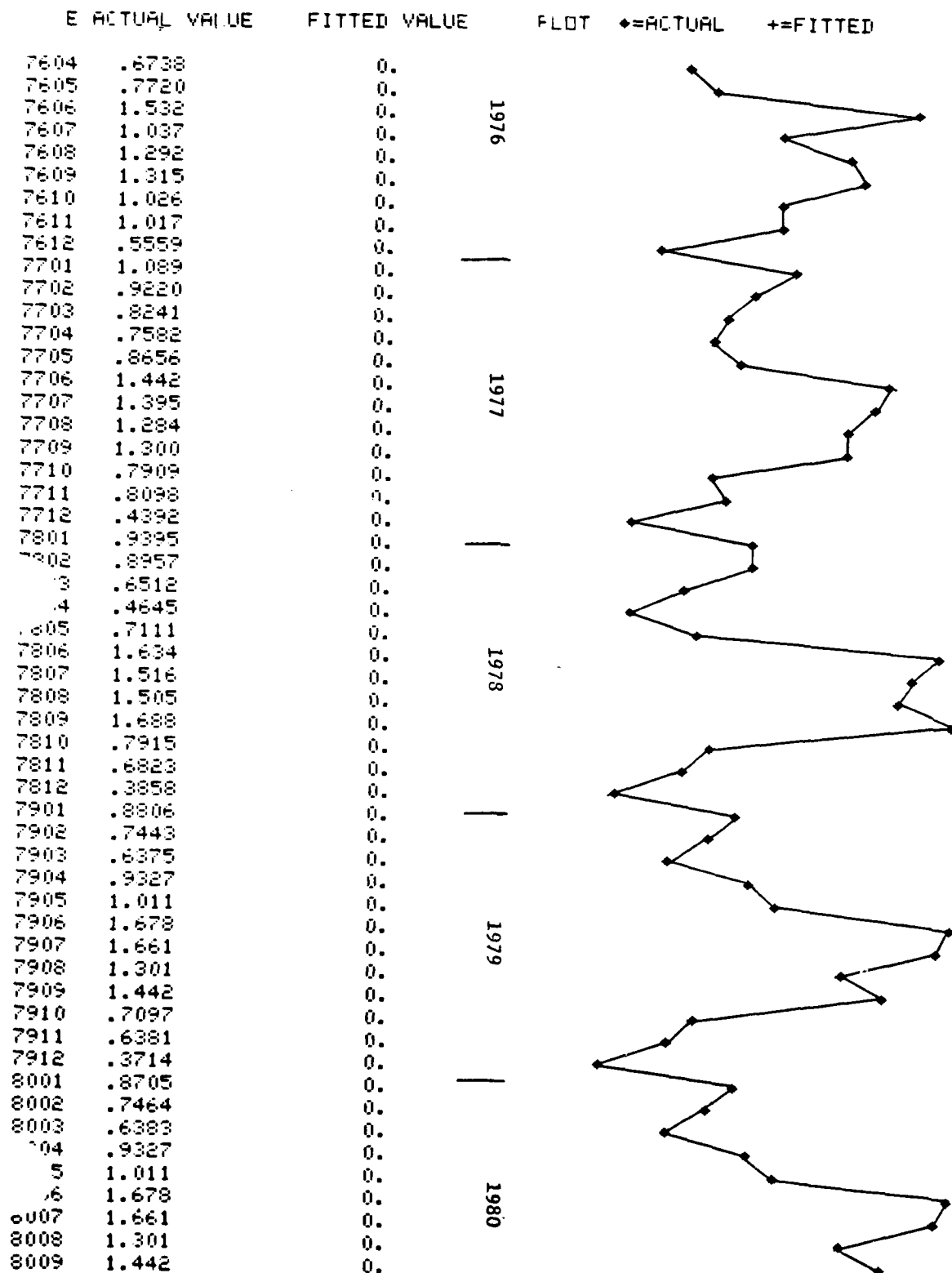
Series - Recruiter Objectives - Monthly Effects

Transformation - The ratio of the accession objective to the smoothed objectives series

Comments - This variable is designed to capture the monthly administration variation in objectives.

G.2

## RECRUITER OBJECTIVES / SMOOTHED OBJECTIVES



AD-A132 396

A STUDY OF THE EFFECTIVENESS OF THE ARMY'S NATIONAL  
ADVERTISING EXPENDITURES VOLUME 3 APPENDICES(U) N W  
AYER INC NEW YORK 31 AUG 81 81-3 MDA903-79-D-0001

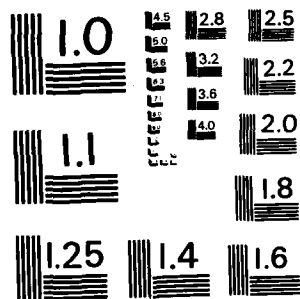
313

UNCLASSIFIED

F/G 5/3

NL





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

Series - Relative Pay

Transformation - The ratio of monthly El pay to monthly civilian minimum  
wage rate

## RELATIVE PAY

|      | THE ACTUAL VALUE | FITTED VALUE | PLOT | ◆=ACTUAL | +=FITTED |
|------|------------------|--------------|------|----------|----------|
| 7604 | .9473            | 0.           | 1976 |          |          |
| 7605 | .9473            | 0.           |      |          |          |
| 7606 | .9473            | 0.           |      |          |          |
| 7607 | .9473            | 0.           |      |          |          |
| 7608 | .9473            | 0.           |      |          |          |
| 7609 | .9473            | 0.           |      |          |          |
| 7610 | .9819            | 0.           |      |          |          |
| 7611 | .9819            | 0.           |      |          |          |
| 7612 | .9819            | 0.           |      |          |          |
| 7701 | .9391            | 0.           |      |          |          |
| 7702 | .9391            | 0.           |      |          |          |
| 7703 | .9391            | 0.           |      |          |          |
| 7704 | .9391            | 0.           | 1977 |          |          |
| 7705 | .9391            | 0.           |      |          |          |
| 7706 | .9391            | 0.           |      |          |          |
| 7707 | .9391            | 0.           |      |          |          |
| 7708 | .9391            | 0.           |      |          |          |
| 7709 | .9391            | 0.           |      |          |          |
| 7710 | .9970            | 0.           |      |          |          |
| 7711 | .9970            | 0.           |      |          |          |
| 7712 | .9970            | 0.           |      |          |          |
| 7801 | .8654            | 0.           |      |          |          |
| 7802 | .8654            | 0.           |      |          |          |
| 7803 | .8654            | 0.           | 1978 |          |          |
| 7804 | .8654            | 0.           |      |          |          |
| 7805 | .8654            | 0.           |      |          |          |
| 7806 | .8654            | 0.           |      |          |          |
| 7807 | .8654            | 0.           |      |          |          |
| 7808 | .8654            | 0.           |      |          |          |
| 7809 | .8654            | 0.           |      |          |          |
| 7810 | .9131            | 0.           |      |          |          |
| 7811 | .9131            | 0.           |      |          |          |
| 7812 | .9131            | 0.           |      |          |          |
| 7901 | .8343            | 0.           |      |          |          |
| 7902 | .8343            | 0.           | 1979 |          |          |
| 7903 | .8343            | 0.           |      |          |          |
| 7904 | .8343            | 0.           |      |          |          |
| 7905 | .8343            | 0.           |      |          |          |
| 7906 | .8343            | 0.           |      |          |          |
| 7907 | .8343            | 0.           |      |          |          |
| 7908 | .8343            | 0.           |      |          |          |
| 7909 | .8343            | 0.           |      |          |          |
| 7910 | .8912            | 0.           |      |          |          |
| 7911 | .8912            | 0.           |      |          |          |
| 7912 | .8912            | 0.           |      |          |          |
| 8001 | .8338            | 0.           | 1980 |          |          |
| 8002 | .8338            | 0.           |      |          |          |
| 8003 | .8338            | 0.           |      |          |          |
| 8004 | .8338            | 0.           |      |          |          |
| 8005 | .8338            | 0.           |      |          |          |
| 8006 | .8338            | 0.           |      |          |          |
| 8007 | .8338            | 0.           |      |          |          |
| 8008 | .8338            | 0.           |      |          |          |
| 8009 | .8338            | 0.           |      |          |          |

END

DATE  
FILMED

9 83

DT