



**Dillard College of Business Administration**

**Syllabus: [Intro to Econometrics - 30374 - ECON 3543 - 301](#)  
**Summer I Session, 2022****

Time	Days	Where	Date Range	Instructors
8:00-10.00am	MTWR	DB306	Jun 01, 2020 - Jul 01	John Martinez

**CONTACT INFORMATION:**

INSTRUCTOR: Dr. John E. Martinez  
OFFICE BLDG: Dillard College, Second Floor, Rm 255  
OFFICE PHONE: (940) 397-4722  
E-MAIL: [john.martinez@msutexas.edu](mailto:john.martinez@msutexas.edu)  
OFFICE HOURS: 10:00-11:30 am on MTWR, or by appointment.  
ZOOM LINK: <https://msutexas-edu.zoom.us/j/97369415614>

**COURSE MATERIALS:**

**Required Text:**

Gujarati, Damodar; Essentials of Econometrics, Third edition  
ISBN 978-0-07-297092-0, Publisher: Mcgraw-Hill Irwin, Publication date: 2006

The text is designed to help students fully understand regression analysis, its components, and its uses. Taking into consideration current statistical technology, it focuses on the use and interpretation of software, while also demonstrating the logic, reasoning, and calculations that lie behind any statistical analysis. Furthermore, the text emphasizes the application of regression tools to real-life business concerns. This multilayered, yet pragmatic approach fully equips students to derive the benefit and meaning of a regression analysis.

**Other Required Materials:**

Students are required to have a video webcam. RESPONDUS will be used for monitoring purposes.

**COURSE DESCRIPTION:**

The application of statistical methods to economic and financial analysis; particular attention is given to the regression analysis including limited and dichotomous dependent variables, regression diagnostics, hypothesis testing, analysis of variance, and selected topics in time series forecasting.

**COURSE PREREQUISITE:**

Junior standing or above or consent of the chair, and BUAD 3033 or equivalent.

## **OBJECTIVES:**

### **LEARNING GOALS:**

#### **General Learning Goals:**

Upon successful completion of this course, the student should:

- Demonstrate problem-solving and decision-making abilities through the critical analysis, evaluation, and interpretation of business information.
- Demonstrate a competency in speaking and writing for common business scenarios.
- Be able to utilize available technology for common business applications.

#### **Course Specific Learning Goals:**

Upon successful completion of this course, the student should:

- Be able to utilize SAS and EXCEL programs for solving business and economic problems. Demonstrate a competency, not only in using SAS and EXCEL programs, but also in interpreting output generated from those technologies.,
- Understand basic ordinary least squares (OLS) regression and its application in economic research.
- Grasp the assumptions under which OLS regression analysis is developed and understand the reasons for these assumptions.
- Develop an understanding of the classical regression model and understand issues that arise when its fundamental assumptions are violated and to develop an appreciation for limitations that accompany OLS regression analysis and be able to identify instances in which application exceed common sense limitations.
- Demonstrate ability to read and interpret articles in which regression analysis is employed and identify specific items that validate (or invalidate) the model(s) and application(s).
- Understand extended applications of basic OLS regression analyses in selected, specialized econometric models.

#### **Other Requirements:**

Each student should have a thumb drive (USB) on which to keep various data sets and assignments that will be a part of each class. Projects and other selected assignments will include the requirement that electronic versions of your work be submitted. Maintaining these items on an accessible storage device will reduce stress that may otherwise develop with respect to submissions.

#### **Assessment:**

Attainment of learning goals will be assessed by a combination of class discussions, problems and exercises in class, quizzes, and exams. Exercises and exams will assess student problem solving and decision making abilities as demonstrated by critical analysis, evaluation, and interpretation of business and economic information.

#### **Information about SAS Certification**

Taking SAS certification exams help you validate your skills and increase your value to an employer. You can choose SAS certifications across many subjects, including programming, data management, and analytics, to name a few. For more information on SAS certification go here: [https://www.sas.com/en\\_us/certification.html](https://www.sas.com/en_us/certification.html).

All students, teachers, professors or staff associated with an academic institution qualify for **50% discount** on all SAS certification exams. Please contact [certification@sas.com](mailto:certification@sas.com) to receive the discount code that will reduce the exam fee by 50% during the registration process.

## Resources for Learning SAS

SAS Certification Prep Guides: [https://www.sas.com/store/books/categories/certification-guide/cBooks-cbooks\\_categories-cbooks\\_categories\\_12-p1.html](https://www.sas.com/store/books/categories/certification-guide/cBooks-cbooks_categories-cbooks_categories_12-p1.html)

Visit SAS Communities Visit our online sites to share and connect with other SAS users and build your SAS skills. Don't miss key communities including: SAS Certification, SAS Training, SAS Academy for Data Science, SAS Programming, New SAS User, SAS Analytics U and SAS Viya for Learners. <https://communities.sas.com/t5/Learn-SAS/ct-p/learn>

## SAS Skill Set Learning Goals

- Data Visualization
- SAS Programming
- Statistical Analysis
- Descriptive Analytics

### COURSE POLICIES:

#### A. Attendance Policy:

There are no mandatory in-class sessions for this course. There will be face-to-face testing options that will minimize expenses for you. Please let me know early in the course if you can not make these face-to-face testing options. You are expected to log into D2L a minimum of once weekly to check for updates and announcements via postings and email. See the university catalog for the University Class Attendance Policy.

#### B. Other Related Policies

**Contact Procedures:** Sending messages either through my email or through D2L is the easiest asynchronous method of contacting me with a substantial issue. I respond to your emails within 48 hours (usually much faster). Text messages to my cell phone work well for quick issues. Calling me by cell is for pressing matters only.

**Course Time:** Deadlines indicated in the syllabus/D2L are for Central Daylight Time. If you are completing coursework in another time zone, please note the time difference and plan accordingly.

**Missed Examination Policy:** Not applicable. You are responsible for managing your schedule to complete the exams by the posted time / date. If an emergency arises (e.g. serious injury, serious illness or death in your immediate family) contact me ASAP for different test arrangements.

### GRADING and EVALUATIONS:

A student's grade will be based on one of the following:

Major Exams	40%	400 Points
Final Exam	30%	300 Points
Research Project	30%	300 Points

### GRADE EVALUATION: As a percent of total points:

A (Above 90), B (80-89), C (70-79), D (60-69), F (below 60)

**Total Points:**

[Avg. Exam Score X 4.0] + [Final Exam X 3.0] + [Research Project X 3.0] + [Bonus Pts.]

**Major exams:**

Two major online exams will be given. Each exam is equally weighted and will involve calculation and derivation of answers as well as their interpretation and meaning. **Questions will come primarily from output generated from designated SAS programs.** Failure to take an exam on the scheduled date without prior approval will result either in an 'F' or 'I' (Incomplete) for the course. Online Exams are scheduled to begin at 10:00am and to be completed by 10:00pm on Friday with a specified time limit of two hours. Students have the option as to the time, but are limited to one attempt only. Additional attempts constitute cheating and will be severely punished.

**Final exam:**

A final exam will be given, but only over the last section of the class. The final is scheduled to be taken during class time on the last day of class [July 1]. The Final will involve calculation and derivation of answers as well as their interpretation and meaning. **Questions will come primarily from output generated from designated SAS programs.**

**Research Project:**

(See attachment at the end of this document for a more detailed account of the requirements for this assignment.)

**Missed Final Exam Policy:** No makeup exams are given. If, because of a truly unavoidable situation, you are absolutely not able to take the final exam at the scheduled time/date, it is **your responsibility** to talk to me well in advance to ask to take the exam early. If a real, legitimate, last minute **emergency** occurs, it is **your responsibility** to contact me before the exam begins. If I am not available in my office, you must leave a voice mail or e-mail **before the exam begins**. Provided there is a legitimate reason for missing the last exam, a student will receive a grad of 'I' for the course. If a student has a legitimate reason for missing either Exam 1 or Exam 2, the average on the other two exams will replace the missing exam score.

**Class Participation:**

Students are expected to participate in all class discussions.

**Bonus Points:**

Students may earn bonus points on quizzes (see example above) and any number or other instructor approved activities.

**Campus Carry:**

Senate Bill 11 passed by the 84th Texas Legislature allows licensed handgun holders to carry concealed handguns on campus, effective August 1, 2016. Areas excluded from concealed carry are appropriately marked, in accordance with state law. For more information regarding campus carry, please refer to the University's webpage at [Campus Carry Polices Link](#).

**Academic Integrity:**

With regard to academic honesty, students are referred to the “Student Honor Creed” of **Midwestern State University Undergraduate Catalog**.

**Americans with Disabilities Act:**

This class follows the guidelines suggested by the Center for Counseling and Disabilities Services for those students who qualify for disability services. **See Midwestern State University Undergraduate Catalog**.

**D2L:**

The Midwestern State University D2L program will be incorporated into this class and will provide the primary default means of communication. Grades will be posted using D2L. **Each student is expected to master the use of the university website, D2L.** Assistance to achieve comfort using this program will be available as needed.

**Syllabus Change Policy:**

This syllabus is a guide for the course and is subject to change. All changes will be announced in class and students will be responsible for incorporating the changes into the syllabus. This syllabus is a guide for the course—not a “contract”—and is subject to change. Syllabus changes will be communicated via D2L.

**OTHER RELEVANT INFORMATION:****Midwestern State University Student Handbook:**

See the most recent MSU Student Handbook for a statement of the university's policy on academic dishonesty. Any other questions not specifically addressed by this syllabus are governed by the student handbook. Make sure you have a copy and are familiar with all the procedures therein. Pay close attention to the Code of Student Conduct section.

**Medical or Other Serious Problems:**

Please take time and make the effort to advise me if you have difficulties that require my attention to properly evaluate your classroom participation and activities.

**Tape Recordings and Cell Phones:**

Tape recording of lectures is permitted. You may not tape record any information or class discussion when a graded test is being reviewed. Cell phones and pagers are prohibited unless the instructor has granted permission to have them in class.

**Return of Exams: Not applicable****Grade Postings:**

Exam grades will be posted using D2L.

**Plagiarism Statement:**

“By enrolling in this course, the student expressly grants MSU a “limited right” in all intellectual property created by the student for the purpose of this course. The “limited right” shall include but shall not be limited to the right to reproduce the student’s work product in order to verify originality and authenticity, and educational purposes.”

## Lower Grades:

The instructor reserves the right to lower any student's final grade by a letter grade (i.e., A to B, D to F) for:

- (A) A negative, rude, unreasonably argumentative or inattentive attitude in class, or,
- (B) Repeatedly disrupting the class for any reason (tardiness), or,
- (C) Not showing respect for fellow classmates' questions or opinions.

## Course Content and Outline:

**Essentials of Econometrics, 3/e Damodar N. Gujarati**

### Table of Contents

Chapter 1 The Nature and Scope of Econometrics

**[Problems to be solved with SAS] – 1.6 & 1.7**

### Part I BASICS OF PROBABILITY AND STATISTICS

Chapter 2 Review of Statistics I: Probability and Probability Distributions

**[Problems to be solved with SAS] – 2.14, 2.15, 2.16, & 2.17**

Chapter 3 Characteristics of Probability Distributions

**[Problems to be solved with SAS] – 3.9, 3.10, 3.13, 3.15 & 3.16**

Chapter 4 Some Important Probability Distributions

**[Problems to be solved with SAS] – 4.10, 4.11, 4.12, 4.13, 4.16, 4.17, 4.18, 4.19 & 4.20**

Chapter 5 Statistical Inference: Estimation and Hypothesis Testing

**[Problems to be solved with SAS] – 5.7, 5.8, 5.9, 5.10, 5.11, 5.12, 5.15 & 5.20**

**Exam I - Scheduled for ~~Friday, June 12~~ - with a two-hour time limit.**

**The exam starts at 10:00am and is to be completed by 10:00pm.**

### Part II THE LINEAR REGRESSION MODEL

Chapter 6 Basic Ideas of Linear Regression: The Two-Variable Model

**[Problems to be solved with SAS] – 6.12, 6.13, 6.15, 6.16, 6.17, 6.18, 6.19 & 6.21**

Chapter 7 The Two-Variable Model: Hypothesis Testing

**[Problems to be solved with SAS] – 7.12, 7.13, 7.14, 7.15, 7.16, 7.18, 7.19, 7.20, 7.21, 7.22 & 7.23**

**Exam II - Scheduled for ~~Friday, June 19~~ - with a two-hour time limit.**

**The exam starts at 10:00am and is to be completed by 10:00pm.**

Chapter 8 Multiple Regression: Estimation and Hypothesis Testing

**[Problems to be solved with SAS] – 8.14, 8.16, 8.17, 8.18, & 8.19**

Chapter 9 Functional Forms of Regression Models

**[Problems to be solved with SAS] – 9.12, 9.13, 9.15, 9.16, 9.17, 9.18, 9.19 & 9.21**

Chapter 10 Dummy Variable Regression Models

**[Problems to be solved with SAS] – 10.11, 10.12, 10.19, 10.20 & 10.21**

**Final Exam [Exam III]- Scheduled for ~~Monday, July 1.~~**

**The exam is scheduled during class time with a two-hour time limit.**

### Part III REGRESSION ANALYSIS IN PRACTICE\*

Chapter 11 Model Selection: Criteria and Tests

Chapter 12 Multicollinearity: What Happens if Explanatory Variables are Correlated?

Chapter 13 Heteroscedasticity: What Happens if the Error Variance is Nonconstant  
Chapter 14 Autocorrelation: What Happens if Error Terms are Correlated?  
**\*These chapters are used for Research Project**

**Part IV ADVANCED TOPICS IN ECONOMETRICS\***

Chapter 15 Simultaneous Equation Models

Chapter 16 Selected Topics in Single Equation Regression Models

**APPENDIX A: STATISTICAL TABLES**

**APPENDIX B: COMPUTER OUTPUT OF EViews, MINITAB, EXCEL, AND STATA**

\*This section is not covered.

## Attachment - Research Project

Name \_\_\_\_\_

Date \_\_\_\_\_

### Econ 3543 - Econometrics Format for Answering Research Questions

- Use this page as a Cover sheet with your name, and the due date (~~June 30, 2024~~). Provide your initials on each subsequent page.
- Use Chapters 12--14 of your text to answer the questions below.
- You do not need to reference the text when providing your answers.
- This assignment is due at the beginning of class on ~~Wednesday, June 30~~.
- Be sure to write out fully each part of each Question, along with the respective **number-letter** for each question (i.e., I. a., II. c., or II. d.)
- Skip a space between each question and answer.
- This assignment can be completed either manually (in longhand), through electronic means, or some combination of the two.
- Begin each new major question (i.e., I, II, and III) on a new page. If the assignment is done manually, do not write on back.
- Answers will be graded on the following basis, with the most important criteria listed first:
  - Relevancy and thoroughness
  - Clarity and conciseness
  - Neatness and form
- Use numerical examples, along with any graphical analysis, that might be relevant.
- Bind your work together by stapling, **DO NOT DOG-EAR**.
- Do not use paper with ripped spiral edges.

#### QUESTIONS:

##### I. Multi-Collinearity:

- a. What is the nature of multicollinearity?
- b. What are its theoretical and practical consequences?
- c. How can it be detected?
- d. What remedies exist to correct for the issues it causes?

##### II. Heteroscedasticity:

- a. What is the nature heteroscedasticity?
- b. What are its theoretical and practical consequences?
- c. How can it be detected?
- d. What remedies exist to correct for the issues it causes?

##### III. Autocorrelation:

- a. What is the nature autocorrelation?
- b. What are its theoretical and practical consequences?
- c. How can it be detected?
- d. What remedies exist to correct for the issues it causes?



**ADDENDUM**  
**SAS Procedures Codes for Problems**  
**SAS Procedure Codes for Problems**  
**(only proc commands provided)**

### SAS Code for Chapter 1

```
proc gplot data=table1_2;
plot CPI*SP500='*'; plot CPI*MTB3='*'; plot SP500*MTB3='*';
symbol1 interpol=RLCLM;
proc gplot data=table1_2;
plot CPI*SP500='*'; plot CPI*MTB3='*'; plot SP500*MTB3='*';
proc sgplot data=table1_2; reg x=CPI y=SP500 / CLM CLI;
proc sgplot data=table1_2; reg x=SP500 y=MTB3 / CLM CLI;
proc sgplot data=table1_2; reg x=CPI y=MTB3 / CLM CLI;
proc print;
proc gplot data=table1_3;
plot GM_US*CPIUS='*'; plot GM_US*CPIGM='*'; plot CPIUS*CPIGM='*';
symbol1 interpol=RLCLM;
proc gplot data=table1_3;
plot GM_US*CPIUS='*'; plot GM_US*CPIGM='*'; plot CPIUS*CPIGM='*';
proc sgplot data=table1_3; reg x=CPIUS y=GM_US / CLM CLI;
proc sgplot data=table1_3; reg x=CPIGM y=GM_US / CLM CLI;
proc sgplot data=table1_3; reg x=CPIGM y=CPIUS / CLM CLI;
```

### SAS Code for Chapter 2

```
proc freq data=politics; table Party*WSJ / chisq; weight count;
proc freq data=work_status; table child*home / chisq; weight count;
proc freq data=ethnic_poor; table Ethnicity*Poverty / chisq; weight count;
```

### SAS Code for Chapter 3

```
proc means data=returns maxdec=2; var return; weight prob;
proc means data=returns_BA maxdec=2; var B A; weight prob;
proc corr data=new_fail cov plots=matrix; var Y X;
proc corr data=cpi_sp_tb cov plots=matrix; var CPI SP500 MTB3;
proc corr data=ER_DM_US cov plots=matrix; var ER CPIUS CPIGR;
```

### SAS Code for Chapter 4

```
options nodate number pageno=15;
proc sort data=clinic.stress out=work.maxrates;
by maxhr; where tolerance='I' and resthr>60;
proc print data=clinic.stress;
proc print data=work.maxrates label noobs; id name;
var resthr maxhr rechr; label rechr='Recovery HR';
proc print data=work.maxrates double; var _all_;
proc print data=clinic.admit label; var actlevel fee;
label fee='Admit Fee'; format fee dollar4. ;
proc print data=clinic.admit label; var actlevel fee;
label fee='Admit Fee'; format fee best6.2 ;
```

### SAS Code for Chapter 5

```
Z010 = PROBIT(.01); Z990=PROBIT(.99); Z020 = PROBIT(.02); Z025 = PROBIT(.025);
Z975 = PROBIT(.975); Z950=PROBIT(.950); format Z010--Z950 5.2; T025=TINV(.025,3);
T975 = TINV(.975, 3); T950 = TINV(.950, 3); T005 = TINV(.005, 14);
T995 = TINV(.995, 14); T010 = TINV(.010, 14); T025_60 = TINV(.025, 60);
T975_60 = TINV(.975, 60); T025_200 = TINV(.025, 200); T975_200 = TINV(.975, 200);
format t025--t975_200 5.2;
```

```

mu=1000; sigma=10000**.5; z1=(800-mu)/sigma; z2=(1200-mu)/sigma;
Prob_z1=probnorm(z1); Prob_z2=probnorm(z2); x=5000; z=(x-mu)/sigma;
Prob_z=1-probnorm(z); format mu--sigma dollar8.2; format z 5.2 z1--z2 5.2 ;
format prob_z 6.4 Prob_z1--Prob_z2 6.4;

```

```

data prob5_10a;
mu=1000; sigma=10000**.5; stderr=sigma/1000**.50; xbar=900;
z=(xbar-mu)/stderr; Prob_z=probnorm(z); Prob_z=probnorm(z);
format mu--xbar dollar8.2; format z 5.2 ; format prob_z 6.4 ;
data prob5_10b (drop=z prob_z); set prob5_10a;
Z95 = PROBIT(.95); L95=mu-z95*stderr; U95=mu+z95*stderr;
format L95--U95 dollar8.2; format z95 5.2 ;
data prob5_10c ; set prob5_10b;
if xbar lt L95 then decision='Reject Ho'; else decision='accept Ho';
data prob5_12a;
T025 = TINV(.025, 9); T975 = TINV(.975, 9); T950 = TINV(.95, 9);
proc print; run;
data prob5_12b; input x @@;
datalines;
8 9 6 13 11 8 12 5 4 14
proc ttest Ho=5 sides=2; var x;
proc ttest Ho=5 sides=u; var x;
data prob5_15;
T = 1-PROBT(+1.72, 24); Z = 1-PROBNORM(+2.9);
F = 1-PROBF(2.59, 3, 20); C = 1-PROBCHI(19, 30);
data prob5_20;
Xs=1.075; Ss=.5796; Xp=1.159; Sp=.6134; VARs=Ss**2; VARp=Sp**2;
F=VARp/VARs; F95 = FINV(.95, 15, 15);

```

## SAS Code for Chapter 8

```

PROC IMPORT OUT= WORK.Table6_14
            DBMS=EXCEL REPLACE;
            RANGE="Sheet1$";
            GETNAMES=YES;
data text8_5; set work.Table6_14;
label
PRICE = 'Price of clock'
AGE = 'Age of clock'
NOBIDDERS = 'Number of bidders'
proc print data=text8_5 (obs=5);
proc reg data=text8_5 all; model Price=Age ;
title 'regress Price on Age and No. of Bidders';
model Price=Age NOBIDDERS;

PROC IMPORT OUT= WORK.Table8_6
            DATAFILE= "E:\Table8-6_b.xlsx"
            DBMS=EXCEL REPLACE;
            RANGE="Sheet1$";
            GETNAMES=YES;
RUN;
data prob8_14; set work.Table8_6;
label
CM = 'child mortality (number of deaths of children under age 5 in a year per 1000
live births)'
FLR = 'female literacy rate (percent)'
PGNP = 'per capita GNP in 1980'
TFR = 'total fertility rate 1980-1985, the average number of children born to a
woman, using
            age-specific rates for a given year' ;

```

```

proc print data=prob8_14 (obs=5);
proc reg data=prob8_14 all;
title 'regress cm on flr';
model cm=flr;title 'regress cm on flr and PGNP';
model cm=flr PGNP;title 'regress cm on flr,PGNP and TFR';
model cm=flr PGNP TFR;
PROC IMPORT OUT= WORK.Table6_11
    DATAFILE= "E:\Table1-1_b.xlsx"
    DBMS=EXCEL REPLACE;
    RANGE="Sheet1$";
    GETNAMES=YES;
data prob8_18; set work.Table6_11;
label
GPA= '2003 average undergraduate GPA'
GMAT='2003 average GMAT score'
ASP= 'Average starting saraly ($)'
EMPLOYED= 'Graduates employed at graduation(%)'
TUITION='2003 out-of-state tuition and fees'
RATING= 'Recruiter assessment score (5.0 maximum)'
ACCEPTANCE='2003 acceptance rate to graduate school(%)'
proc reg data=prob8_18 all;
model ASP=GPA GMAT EMPLOYED TUITION RATING ACCEPTANCE;
proc reg data=prob8_18 all;
model ASP=GPA EMPLOYED TUITION RATING ACCEPTANCE;
PROC IMPORT OUT= WORK.Table1_1
    DATAFILE= "E:\Table1-1_b.xlsx"
    DBMS=EXCEL REPLACE;
    RANGE="Sheet1$";
    GETNAMES=YES;
proc reg data=prob8_19 all;
model CLFPR=CUNR AHE82 ;output out=two p=y_hat r=y_res;
proc univariate normal plot data=two; var y_res;
proc reg data=text8_5 all;
model Price=Age ;model Price=Age NOBIDDERS;

```

## SAS Code for Chapter 9

```

data Example9_2 ; set work.Table9_2;
l_GDP=log(GDP); l_Employment=log(Employment); l_FixedCapital=log(FIXED_CAPITAL);
proc reg data=Example9_2 all;
model l_GDP=l_Employment l_FixedCapital;

data Example9_3 (drop=Final_Demand Real_GDP Real_Energy_Price F5) ;
set work.Table9_3;Demand=Final_Demand; GDP=Real_GDP;Price=Real_Energy_Price;
l_Demand=log(Demand); l_GDP=log(GDP); l_Price=log(Price);

proc reg data=Example9_3 all;
model l_Demand=l_GDP l_price;
data Example9_4 ; set work.Table9_4;
l_USPOP=log(USPOP);
proc reg data=Example9_4 all;model l_USPOP=time;

proc reg data=Example9_4 all;model USPOP=time;
data Example9_6 ; set work.Table9_6;
label
    Y='Index-Hourly earnings'
    X='Unemployment Rate%'
    R_X='reciprical of X'
;
R_X=1/X; X_sq=X**2; proc print data=Example9_6 (obs=5);

```

```

Proc sgplot data=Example9_6 ;
reg      y=Y x=X / degree=4 legendlabel='Polynomial' ;
Proc sgplot data=Example9_6 ; pbspline y=Y X=X / ;
Proc sgplot data=Example9_6 ; loess      y=Y x=X / ;
Proc sgplot data=Example9_6 ; reg Y=Y X=X / CLM CLI;;
Proc sgplot data=Example9_6 ; reg Y=Y X=R_X / CLM CLI;;
proc reg data=Example9_6 all;model Y=R_X;
proc reg data=Example9_6 all;model Y=X X_sq;
data Example9_7 ; set work.Table9_7;
label
      Y='fee%'      X='Asset Value ($bi.)' ;R_X=1/X;
Proc sgplot data=Example9_7 ;
reg      y=Y x=X / degree=2 legendlabel='Polynomial' ;
Proc sgplot data=Example9_7 ; pbspline y=Y X=R_X / ;
Proc sgplot data=Example9_7 ; loess      y=Y x=R_X / ;
Proc sgplot data=Example9_7 ; reg Y=Y X=R_X / CLM CLI;;
Proc sgplot data=Example9_7 ; reg Y=Y X=X / CLM CLI;;
proc reg data=Example9_7 all;model Y=R_X;
data Example9_8 ; set work.Table9_8;
label Y='Cost'      X='Output' ;X_sq=X**2; X_cube=x**3;
Proc sgplot data=Example9_8 ;
reg      y=Y x=X / degree=3 legendlabel='Polynomial' ;
Proc sgplot data=Example9_8 ; pbspline y=Y X=X / ;
Proc sgplot data=Example9_8 ; loess      y=Y x=X / ;
Proc sgplot data=Example9_8 ; reg Y=Y X=X / CLM CLI;;
proc reg data=Example9_8 all;model Y=X;
proc reg data=Example9_8 all;model Y=X X_sq X_cube;
data Example9_9 ; set work.Table9_9;
label
      CIG = 'Number of cigarettes smoked (hundreds per capita)'
BLAD = 'Deaths per 100K population from bladder cancer'
LUNG = 'Deaths per 100K population from lung cancer'
KID = 'Deaths per 100K population from bladder cancer '
LEUK = 'Deaths per 100 K population from leukemia'
;
CIGSQ=CIG**2;
proc reg data=Example9_9 all;
model LUNG=CIG CIGSQ;
data Prob9_14 ; set work.Table9_13;
label
Y='CONSUMER PRICE INDEX(1980=100)'
X='MONEY SUPPLY (MARKS, IN BI), GERMANY, 1971-1987';
l_Y=log(Y); l_X=log(X);
proc reg data=Prob9_14 ;
model y=x;output out=one p=y_hat r=y_res;
proc univariate normal plot data=one; var y_res;
proc reg data=Prob9_14 ;model l_y=l_x;
output out=two p=y_hat r=y_res;
proc univariate normal plot data=two; var y_res;
proc reg data=Prob9_14 ;model l_y=x;output out=three p=y_hat r=y_res;
proc univariate normal plot data=three; var y_res;
proc reg data=Prob9_14 ;model y=l_x;output out=four p=y_hat r=y_res;
proc univariate normal plot data=four; var y_res;
data Prob9_17 ; set work.Table9_14;l_GNP=log(GNP); l_M2=log(M2);
proc reg data=Prob9_17 ;model GNP=M2;output out=one p=y_hat r=y_res;
proc univariate normal plot data=one; var y_res;
proc reg data=Prob9_17 ;model l_GNP=l_M2;output out=two p=y_hat r=y_res;
proc univariate normal plot data=two; var y_res;
title 'Regress log of GNP on M2 ' ;

```

```

proc reg data=Prob9_17 ;model l_GNP=M2;output out=three p=y_hat r=y_res;
proc univariate normal plot data=three; var y_res;

proc reg data=Prob9_17 ;model GNP=l_M2;output out=four p=y_hat r=y_res;
proc univariate normal plot data=four; var y_res;
data Prob9_22 ; set work.Table9_15;
label
Y='Annual rate of return on Y(%)'
X='Fisher Index of X(%)'
;
proc reg data=Prob9_22 ;model y=x;
proc reg data=Prob9_22 ;model y=x /noint;

```

## SAS Code for Chapter 10

```

data Example10_1 (drop=obs foodexp atincome sex); set work.Table10_2;
Y=foodexp;X=atincome;D=sex;
label
Y='Exp on food($)'
X='After-tax income'
D='1 if female, 0 if male'
;
DX=D*X;
proc reg data=Example10_1 ;model Y=D;
proc reg data=Example10_1 ;model Y=D X;
proc reg data=Example10_1 ;model Y=D DX X;
data Example10_2 ; set work.Table10_3;
label
PVT = 'percent unionized in the private sector'
RWL = '1 for right-to-work states; 0 otherwise'
;
proc reg data=Example10_2 ;model PVT=RWL;
data Example10_4 ; set work.Table10_7;
label
Psavings = 'personal savings'
DPI = 'disposable personal income'
Dummy = 'before 1982 equals 0, taking a value of 1 beginning 1982'
DummyxDPI='interaction Dummy'
;
data before82; set Example10_4;if Dummy=0;
proc reg data=before82 ;model Psavings=DPI;
data after82;set Example10_4;if dummy=1;
proc reg data=after82 ;model Psavings=DPI;
data allyrs;set Example10_4;proc reg data=allyrs;model Psavings=DPI;
data Example10_5 ; set work.Table10_9;
label
FRIG='actual frig sales ($000)'
FRIGF='forecast frig sales ($000)'
RESIDU='diff between FRIG and FRIGF'
SA'Seasonally adjusted frig sales- mean plus residual'
DUM2='2nd quarter'
DUM3='3rd quarter'
DUM4='4th Quarter'
;
if dum2=0 and dum3=0 and dum4=0 then Dum1=1;else Dum1=0;
t=_N_;
proc reg data=Example10_5;model FRIG=DUM2 DUM3 DUM4;
output out=one p=y_hat r=y_res ;
proc means data=one;var Y_hat Y_res;
data frig; set one;SA_2=1354.84 + RESIDU;symbol2 interpol=rlclm;

```

```

proc gplot data=one;plot frig*t SA*t;
proc sgplot data=one;series X=t Y=frig;
series x=t y=SA;
data Prob10_19 ; set work.Table10_12;
label
Obs='year and Qr'
YR='Year'
QR='Quarter'
NDIV='Net Dividend'
ATPROFITS='after-tax profits'
;
if QR=1 then Q1=1;else Q1=0;if QR=2 then Q2=1;else Q2=0;
if QR=3 then Q3=1;else Q3=0;if QR=4 then Q4=1;else Q4=0;
;
proc reg data=Prob10_19;
model NDIV=ATPROFITS;model NDIV=Q1 Q2 Q3;model NDIV=ATPROFITS Q1 Q2 Q3;
data Prob10_25 ; set work.Table10_13;
label
PCE='Real personal expenditure ($ billions)'
EXPDUR='Expenditure on durable goods ($ billions)'
EXPNONDUR='Expenditure on nodurable goods ($ billions)'
EXPSER='Expenditure on services ($ billions)'
DUM1='Quarter2'
DUM2='Quarter3'
DUM3='Quarter4'
;
symbol1 interpol=join;
proc gplot data=Prob10_25;plot EXPDUR*PCE EXPNONDUR*PCE EXPSER*PCE;
proc sgplot data=Prob10_25;series Y=EXPDUR X=PCE;
series Y=EXPNONDUR X=PCE;series Y=EXPSER X=PCE;
proc reg data=Prob10_25;
model EXPDUR=PCE DUM1 DUM2 DUM3;model EXPNONDUR=PCE DUM1 DUM2 DUM3;
model EXPSER=PCE DUM1 DUM2 DUM3;
data Text10_3 ; set work.Table10_4;
label
Pay ='Average Annual Salary (AAS) of public school teachers'
PPS='Per pupil spending by public authorities'
Area='1=Northeast and North Central region, 2=South, 3=West'
D1 = '1=West 0=Other'
D2 = '1=Northeast and North Central Region, 0=Other regions'
D3 = '1=South, 0=Other regions'
;
IF D2=0 and D3=0 then D1=1;else D1=0;If Area=1 then D_A1=1; else D_A1=0;
If Area=2 then D_A2=1; else D_A2=0;If Area=3 then D_A3=1; else D_A3=0;
proc reg data=text10_3 ;model Pay=D2 D3;
proc reg data=text10_3 ;model Pay=D2 D3 PPS;
data Text10_7 ; set work.Table10_10;
label
Y='If Mortgage application accepted (1) not accepted (0)'
Income='H.H. Personal Income (in$000)'
Yhat='Predicted probability that application is accepted'
;
proc reg data=Text10_7 all;model Y=Income;output out=one p=y_hat r=y_res ;

```