Course Description
Statistical and econometric methods for the analysis of large data sets to support managerial and policy decisions. Methods for organizing, accessing, and ensuring the quality of data. Estimation techniques include panel data methods, limited dependent variable models, duration models, and time series analysis. Students will develop skills in using the SAS software package to clean, organize and analyze data and complete a data analysis project.

Prerequisites: ApEc 5031 or instructor permission.

Class Schedule: Most weeks we meet on Tuesdays in the classroom and Thursdays in the computer lab (Room 50 in Coffey Hall). At the end of the semester, we will meet more often in the classroom.

Tuesdays: 10:15-11:30 am in the classroom B26, Ruttan Hall
Thursdays: 10:15-11:30 am in computer lab, Room 50, Coffey Hall

Course Objectives
The objective of this course is to integrate computers and statistical programming with analytical skills into a problem solving process capable of delivering business and policy solutions. Students completing the course should develop:

1. Skills in organizing, accessing, and ensuring the quality of data; Students will gain experience identifying and fixing errors and problems with data
2. Knowledge of specific methods of econometric and statistical analysis;
3. Skills in applying econometric and statistical methods to real world data to support managerial and policy decisions.
4. Working knowledge of writing SAS® programs to create analysis-ready data sets and conduct cross-sectional, panel, and time series analyses;
5. Written and oral skills in reporting the results of statistical analysis to support managerial and policy decisions.

Assignments
The homework assignments will focus on data management and assessment of data quality, estimation of econometric models and interpretation and writing about results. These assignments will require writing SAS programs for data management and analysis and short written reports of results. The paper assignment will involve conducting an economic analysis
using one of the larger data sets from the homework or a data set you choose (subject to
instructor approval), a presentation, and development of a research log and documentation. Class
participation includes providing peer feedback to other students on their presentations.

Writing is a critically important means by which economists convey the results of their research
and seek to influence policy. Economists write peer-reviewed journal articles, technical reports,
policy briefs, opinion pieces, blogs, books and book reviews. They also write grant proposals and
reviews of other’s work. To a large extent, economists convince each other (and non-economists)
of the validity of their work through writing. While the form and content may differ depending
on the purpose and audience, effective writing in economics is clear, concise, persuasive and
logical. Developing writing skills in this class will help you become a better economist. Thus,
while the course focus is on econometric analysis and SAS programming, the quality of your
writing will be a factor in grading many of the assignments.

**Evaluation**
Grading polices will conform to standard University guidelines. Each student’s course grade will
be based on a weighted average of grades as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework and in lab assignments (~10-12)</td>
<td>60%</td>
</tr>
<tr>
<td>Empirical project</td>
<td></td>
</tr>
<tr>
<td>Paper</td>
<td>25%</td>
</tr>
<tr>
<td>Presentation</td>
<td>5%</td>
</tr>
<tr>
<td>Data documentation and research log</td>
<td>5%</td>
</tr>
<tr>
<td>Class participation and peer evaluations</td>
<td>5%</td>
</tr>
</tbody>
</table>

*All assignments will have a due date, and points will be deducted for assignments turned in after
the due date.*

**SAS® license:** Students are encouraged to purchase a PC-SAS version 9.3 license through the
University of Minnesota for $35 for one year. SAS is available in the computer labs in Ruttan
314 and 50 Coffey. It is generally not available in other computer labs on campus.

**Moodle:** Course notes, assignments and data sets may be accessed through the course website on
Moodle. You may access Moodle through the myU portal or at [https://moodle.umn.edu/](https://moodle.umn.edu/). You
may want to bring a USB jump drive to lab to store your files.

**Text and Readings**
Students are expected to have completed the reading assignment prior to class. These books are
on reserve in the Waite library (Ruttan Hall) and in Magrath Library (St Paul campus):

-- J. Wooldridge, *Introductory Econometrics* (either 4th or 5th edition)
Magrath Library reference section and in electronic form through the University library
website. The 3rd or 4th edition is fine although some of the chapter numbers are different.)

*Additional readings may be assigned during the semester.*
Reference and resource books that you may find helpful
(Most of these books are in the Waite Library)

- *Getting Started with the SAS System*, SAS Publishing.
- R. Cody and J. Smith, *Applied Statistics and the SAS Programming Language*
- P. Spector, *SAS Programming for Researchers and Social Scientists*

The University of Minnesota Libraries provide online access to a number of useful books related to SAS and econometrics. Here are links to a few you may find helpful. Other SAS manuals are also available online through the library catalog.

Cody, R. & Pass, R. “SAS® Programming by Example”
http://proquestcombo.safaribooksonline.com/9781555446819
Cody, R. “Cody's Data Cleaning Techniques Using SAS Software”
Allison, P. “Logistic Regression Using SAS®: Theory and Application”
http://proquestcombo.safaribooksonline.com/9781580253529
Allison, P. “Survival Analysis Using SAS®: A Practical Guide”
http://proquestcombo.safaribooksonline.com/9781555442798
Allison, P. “Fixed Effects Regression Methods for Longitudinal Data Using SAS”
Burlew, M. “SAS Macro Programming Made Easy”

**APEC 5032 COURSE POLICIES**

**Class attendance is expected** and students are fully responsible for all information disseminated in class including deadlines, reading assignments, and examination dates and times. All students, regardless of either the A-F or S-N grading system, will be expected to do all work assigned in the course. You may not make commercial use of your notes of lectures or University-provided materials without the express written consent of the instructor. Class sessions may not be recorded or videoed without the express written consent of the instructor.

**Academic Integrity/Scholastic Dishonesty:** You are expected to do your own academic work and cites sources as necessary. Failing to do so is scholastic dishonesty. Scholastic dishonesty means plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering, forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis. (Student Conduct Code: http://regents.umn.edu/sites/default/files/policies/Student_Conduct_Code.pdf) If it is determined that a student has cheated, he or she may be given an "F" or an "N" for the course, and may face additional sanctions from the University. For additional information, please review University
policy and the Student Conduct Code.

**Removing reserve readings or books from Waite Library without signing them out is an example of scholastic dishonesty and is extremely inconsiderate to your classmates**

**********************************************************************

**IMPORTANT NOTE**: In this class, students are encouraged to work together on homework assignments (*unless otherwise indicated*) but are expected to write up their own answers. Asking each other questions about how to do a problem or working together to figure out how to do a problem is acceptable, while simply copying someone else’s answers is *not acceptable*. Copying someone else’s SAS program is *not acceptable* and is not going to help you learn to write SAS code. However, sharing ideas about SAS programs is okay. Using SAS programs or homework answers from students who took the class in previous years is *not acceptable under any circumstances*.

**********************************************************************

**Incompletes** are rarely given and are only granted after the student and instructor have agreed upon a timetable in a written contract for the completion of all coursework. Incompletes must be requested no later than the last day of class.

**UNIVERSITY OF MINNESOTA POLICIES**

**Student Conduct Code**

The University seeks an environment that promotes academic achievement and integrity, that is protective of free inquiry, and that serves the educational mission of the University. Similarly, the University seeks a community that is free from violence, threats, and intimidation; that is respectful of the rights, opportunities, and welfare of students, faculty, staff, and guests of the University; and that does not threaten the physical or mental health or safety of members of the University community.

As a student at the University you are expected adhere to Board of Regents Policy: *Student Conduct Code*. To review the Student Conduct Code, please see: http://regents.umn.edu/sites/default/files/policies/Student_Conduct_Code.pdf.

**Use of Personal Electronic Devices in the Classroom:**

Using personal electronic devices in the classroom setting can hinder instruction and learning, not only for the student using the device but also for other students in the class. To this end, the University establishes the right of each faculty member to determine if and how personal electronic devices are allowed to be used in the classroom. For complete information, please reference: http://policy.umn.edu/Policies/Education/Education/STUDENTRESP.html.

**Makeup Work for Legitimate Absences:**

Students will not be penalized for absence during the semester due to unavoidable or legitimate circumstances. Such circumstances include verified illness, participation in intercollegiate athletic events, subpoenas, jury duty, military service, bereavement, and religious observances. Such circumstances do not include voting in local, state, or national elections. For complete information, please see: http://policy.umn.edu/Policies/Education/Education/MAKEUPWORK.html.
Appropriate Student Use of Class Notes and Course Materials:

Taking notes is a means of recording information but more importantly of personally absorbing and integrating the educational experience. However, broadly disseminating class notes beyond the classroom community or accepting compensation for taking and distributing classroom notes undermines instructor interests in their intellectual work product while not substantially furthering instructor and student interests in effective learning. Such actions violate shared norms and standards of the academic community. For additional information, please see: http://policy.umn.edu/Policies/Education/Education/STUDENTRESP.html.

Sexual Harassment

"Sexual harassment" means unwelcome sexual advances, requests for sexual favors, and/or other verbal or physical conduct of a sexual nature. Such conduct has the purpose or effect of unreasonably interfering with an individual's work or academic performance or creating an intimidating, hostile, or offensive working or academic environment in any University activity or program. Such behavior is not acceptable in the University setting. For additional information, please consult Board of Regents Policy: http://regents.umn.edu/sites/default/files/policies/SexHarassment.pdf.

Equity, Diversity, Equal Opportunity, and Affirmative Action:

The University provides equal access to and opportunity in its programs and facilities, without regard to race, color, creed, religion, national origin, gender, age, marital status, disability, public assistance status, veteran status, sexual orientation, gender identity, or gender expression. For more information, please consult Board of Regents Policy: http://regents.umn.edu/sites/default/files/policies/Equity_Diversity_EO_AA.pdf.

Disability Accommodations:

The University of Minnesota is committed to providing equitable access to learning opportunities for all students. Disability Services (DS) is the campus office that collaborates with students who have disabilities to provide and/or arrange reasonable accommodations.

If you have, or think you may have, a disability (e.g., mental health, attentional, learning, chronic health, sensory, or physical), please contact DS at 612-626-1333 to arrange a confidential discussion regarding equitable access and reasonable accommodations.

If you are registered with DS and have a current letter requesting reasonable accommodations, please contact your instructor as early in the semester as possible to discuss how the accommodations will be applied in the course. For more information, please see the DS website, https://diversity.umn.edu/disability/.

Mental Health and Stress Management:

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance and may reduce your ability to participate in daily activities. University of Minnesota services are available to assist you. You can learn more about the broad range of confidential mental health services available on campus via the Student Mental Health Website: http://www.mentalhealth.umn.edu.
<table>
<thead>
<tr>
<th>Class #</th>
<th>Date</th>
<th>Topic</th>
<th>Readings</th>
</tr>
</thead>
</table>
| 1      | Tues. Jan.21 | Introduction to APEC 5032 and getting started in SAS                  | *Wooldridge, *Introductory Econometrics*, chapter 19  
| 2      | Thurs. Jan.23 | Lab: Introduction to SAS. Importing data into SAS, formats; data sets | *Little SAS Book, (5th edition) chapters 1 & 2  
Check out this website for helpful tips on using SAS: [http://www.ats.ucla.edu/stat/sas/modules/](http://www.ats.ucla.edu/stat/sas/modules/) |
| 3      | Tues. Jan.28 | Data management and basic analysis procedures in SAS; codebooks        | *Little SAS Book, chapter 3 & 4                                                                                                                                  |
| 6      | Thurs. Feb.6 | Lab: Data cleaning in SAS; longitudinal data                          | *Little SAS Book, chapters 9 & 11                                                                                                                                  |
| 8      | Thurs. Feb.13 | Lab: Logit and probit models in SAS; graphing in SAS                | *Little SAS Book, Chapter 8  
<table>
<thead>
<tr>
<th>Class number</th>
<th>Date</th>
<th>Topic</th>
<th>Readings</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Tues. Feb. 18</td>
<td>Estimation and Interpretation of Binary and Multinomial Choice models</td>
<td>*M. Hilmer. 2001. “A comparison of alternative specifications…” Economics of Education Review v.20 (3): 263-278. <a href="http://dx.doi.org/10.1016/S0272-7757(00)00024-8">http://dx.doi.org/10.1016/S0272-7757(00)00024-8</a></td>
</tr>
<tr>
<td>13</td>
<td>Tues. Mar. 4</td>
<td>Random and fixed effects models with panel data</td>
<td>*Wooldridge, Introductory Econometrics, chapters 13 &amp; 14, if not read earlier</td>
</tr>
<tr>
<td>16</td>
<td>Thurs. Mar. 13</td>
<td>Lab: Regression diagnostics and specification tests</td>
<td>*Wooldridge, Introductory Econometrics, Ch. 6 and section 9.1, 9.2, 9.3</td>
</tr>
<tr>
<td>Mar. 17-21</td>
<td>Spring break</td>
<td>No classes this week</td>
<td></td>
</tr>
<tr>
<td>Class #</td>
<td>Date</td>
<td>Topic</td>
<td>Readings</td>
</tr>
<tr>
<td>--------</td>
<td>-------------</td>
<td>-------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>21</td>
<td>Tues. Apr. 8</td>
<td>Intro to Time Series</td>
<td>*Wooldridge, <em>Introductory Econometrics</em>, chapters 10 &amp; 12</td>
</tr>
<tr>
<td>22</td>
<td>Thurs. Apr. 10</td>
<td>Lab: Smoothing and Extrapolation Models</td>
<td>*Pindyck and Rubinfeld, Ch. 15</td>
</tr>
<tr>
<td>23</td>
<td>Tues. Apr. 15</td>
<td>Time Series Models and ACF</td>
<td>*Pindyck and Rubinfeld, Section 16.1-16.4 and 17.1-17.5</td>
</tr>
<tr>
<td>24</td>
<td>Thurs. Apr. 17</td>
<td>Lab: ARIMA models</td>
<td>*Pindyck and Rubinfeld, Chapter 18, 19.4 &amp; 19.5</td>
</tr>
<tr>
<td>27</td>
<td>Tues. Apr. 29</td>
<td>Responsible conduct of research and data integrity</td>
<td>*Guidelines for Responsible Conduct of Research, March 2011, read sections 1-3. Available at this link: <a href="http://www.provost.pitt.edu/documents/GUIDELINES%20FOR%20ETHICAL%20PRACTICES%20IN%20RESEARCH-FINALrevised2-March%202011.pdf">online</a></td>
</tr>
<tr>
<td>28</td>
<td>Thurs. May 1</td>
<td>Student presentations</td>
<td>Class attendance required</td>
</tr>
<tr>
<td>29</td>
<td>Tues. May 6</td>
<td>Student presentations</td>
<td>Class attendance required</td>
</tr>
<tr>
<td>30</td>
<td>Thurs. May 8</td>
<td>Student presentations</td>
<td>Class attendance required</td>
</tr>
</tbody>
</table>