Economics 125 – Demographic Analysis and Forecasting, Spring 2019

Location/Time	Mandeville Center B-210; T/TH 11:00 am – 12:20 pm
Instructor	Jeff Tayman Email: jtayman@ucsd.edu
Office Location/Hours	Econ 110C Office Hours: T/TH 9:45 am – 10:45 am (Assignments 1-6)
Class Web Site	Tritoned.ucsd.edu
Graduate Assistants	Jiajun Lu jil465@ucsd.edu Office Location and Hours: SH 205; Wednesday 1:00 pm – 3:00 pm Diana Martinez djmartin@ucsd.edu No office hours (Midterm and Final Exams)

Course Objectives

This course is designed to teach you the foundations of demographic analysis and forecasting. You will learn: (1) the terminology, methods, and practical guidance needed to create, evaluate, interpret, and use forecasts; (2) fundamental demographic concepts including population size, composition, and change; (3) the measurement, and interpretation of trends and patterns in fertility, mortality, and migration; (4) key relationships between economic and demographic process; and (5) the implications of demographic changes for the social security system.

Required Readings

1. Stanley K. Smith, Jeff Tayman, & David A. Swanson (2013). *A Practitioner's Guide to State and Local Population Projections*. Dordrecht, Springer (available in hardcover or eBook). **The eBook is free for students to access as long as you use a network with a UCSD IP address (computer on campus, UCSD-PROTECTED wireless, VPN or proxy from off-campus).**

2. Articles on the Internet and course website (See page 6 of syllabus).

Academic Integrity

Students found to have violated the Policy on Integrity of Scholarship will face administrative sanctions imposed by their college Dean of Student Affairs and academic sanctions imposed by me. Administrative sanctions can range from disciplinary probation to suspension and dismissal from the university; those are not at my discretion. Academic sanctions can range from 0 points on an assignment/test to an F in the class.

If you have any questions about academic integrity policy, call (858)-822-2163 or visit the Website (http://www.ucsd.edu/current-students/_organizations/academic-integrity-office/).

Course Assessment

Problem Sets— There are 6 problem sets. All assignments should be done with an electronic spreadsheet. (Microsoft Excel is available in the computer lab). Inputs to the assignments are on the class Website in the Folder labeled **Assignment/Inputs.** The URL https://www.youtube.com/watch?v=7RCdzTpKO0A links to a 30 minute Excel tutorial.

Research Paper— A research paper is required (Details on pages 7-8 of the syllabus).

Exams— There is one mid-term exam and a final exam. The final exam is not cumulative**.** If you miss the mid-term because of a compelling and fully documented medical excuse or family emergency, your final exam will count for 46% of your grade instead of 33%. Missing the midterm for any other reason will result in zero points. **There will be no alternate date/time or location for the final exam**. A make-up final will be given in case of a fully documented medical excuse or family emergency.

Pop Quizzes— There are four pop quizzes given randomly, with no make-up provision.

Grading— You can earn a maximum of 325 points as follows: Assignments (85 points, 26%), first exam (50 points, 15%), final exam (100 points, 31%), pop quizzes (20 points, 6%), and research paper (70 points, 22%). **Any disputes about points earned must be resolved within one week after the assignment, test, or paper has been returned**.

You will receive no lower than: an (A-) with 293 points; a (B-) with 260 points; a (C-) with 228 points; and a (D) with 195 points. Depending on the distribution of the total points, the above breakpoints may be lowered.

Assessment Expectations

Assignments are due at the start of class; **assignments submitted later than 15 minutes after class starts or by email will receive a score of zero.**

You have two choices for doing the problem sets and research paper: 1) do them independently without assistance; or 2) do them as a group no larger than **6** people. Each member of the group will receive the same score and all names of the group must be typed on the submission when it is turned in. Group members with hand written names will receive a score of zero.

It is expected that the problem sets/research paper be completed on your own or as a group and in your own or the group's computations, graphs, tables, and words. You must not use the answers or spreadsheets developed by another person/group, including assignments from previous Econ 125 classes; or copy the work completed by others, including the Economics Tutor; or write the research paper with another person unless he/she is part of your group.

Any individual or group assignment that shares too many similarities with the assignment submitted by another or assignments from past Econ 125 classes will be further investigated to determine if cheating occurred. All suspected violations of academic integrity will be reported to the Academic Integrity Office according to university policy. If you do not understand these expectations please see me by the end of the second week of classes.

Course Schedule

Date	Topics	Readings
Apr. 2	Overview and Introduction	Chapter 1
Apr. 4	Fundamentals of Population Analysis	Chapter 2
Apr. 9	Mortality	Chapter 4; Population Reference Bureau (2006); Dong, Milholland, and Vijg (2016)
Apr. 11	Fertility	Chapter 5; Blake (1968); Easterlin (1978); Lutz (2007)
Apr. 16	Finish Fertility; Begin Migration	Chapter 6
Apr. 18	Migration	**Assignment 1 due**
Apr. 23	Finish Migration & Exam Review	
Apr. 25	**Exam**	
Apr. 30	Demographic Change and Social Security	Research Paper Readings **Assignment 2 due**
May 2	Cohort-Component Method	Chapters 3 and 7; Isserman (1993)
May 7	Cohort-Component Method	
May 9	Trend Extrapolation	Chapter 8 **Assignment 3 due**
May 14	Trend Extrapolation	
May 16	Economic-Demographic Models	Chapter 9; Hunt (1993) **Assignment 4 due**
May 21	Economic-Demographic Models	**Paper Due**
May 23	Special Adjustments	Chapter 10, pp. 251-272
May 28	Finish Special Adjustment; Begin Forecast Error	**Assignment 5 due** Chapter 13; Swanson and Tayman (1995)
May 30	Forecast Errors	
June 4	Finish Forecast Error; Begin Evaluating Projections	**Assignment 6 due** Chapter 12
June 6	Finish Evaluating Projections; Final Exam Review	
June 11	**Final Exam**	

Problem Sets

Assignment 1 (10 pts.)

1. Compute the doubling time using the exact method and approximation rule for selected counties in North Carolina using the 2010-2017 base period. (2 pts.)
2. Compute the projected 2040 life expectancy for Grays harbor County, Washington using the synthetic method based on life expectancy for Washington State. (1 pt.)
3. Compute the projected 2040 Grays harbor County, Washington using the targeting method for two alternatives:
    a. Assume a 100% convergence by the year 2055 (1 pt.)
    b. Assume a 75% convergence by the year 2055 (1 pt.)
4. Interpret the exact formula for doubling time for Mecklenburg and Robeson counties. (2 pts.)
5. Explain why the synthetic and targeting methods yield different life expectancy projections in 2040 for Grays Harbor County. (3 pts.)

Assignment 2 (7 pts.)

1. Compute the 2010-2015 net migration number and rates by 5-yr. age groups for Cuyahoga County, Ohio females. (5 pts.)
2. What at-risk population did you use to compute the net migration rates and why did you choose it? (2 pts.)

Assignment 3 (18 pts.)

1. Compute the 2020 projected population for Cuyahoga County, Ohio females using a net migration cohort-component model. (8 pts.)
2. Compute the 2015 to 2020 components population change for Cuyahoga County females (2 pts.)
3. For Cuyahoga County females, calculate age-specific cohort change ratios (CCR) between 2010 and 2015 and child woman ratio (CWR) for ages 0-4 in 2015. (2 pts.)
4. Create a 2020 population projection by age for Cuyahoga County females using the Hamilton-Perry (HP) method. (3 pts.)
5. What is the difference in the 2020 total female population between the HP and CCM methods? What might explain the difference or lack thereof between these the two projection methods? (1 pt.)
6. Explain results from Question 2. What is the major factor contributing to the growth in the female population of Cuyahoga County from 2015 to 2020? (2 pts.)

Problem Sets (Cont.)

Assignment 4 (20 pts.)

1. Using 2000 to 2018 as the base period, create 2060 total population projections for Seattle, Washington using two complex extrapolation methods: 1) Linear model and 2) Exponential model. Use the recode value for time, include the CF term, and ignore the smearing correction in the Exponential model (sme) (6 pts.) (Regression in Excel: http://www.wikihow.com/Run-Regression-Analysis-in-Microsoft-Excel)
2. Using 2000 to 2018 as the base period, create 2060 population projections for selected counties and balance of the state in California using five trend extrapolation methods: 1) Linear (LINE); 2) Exponential (EXPO); 3) Shift-Share (SHIFT); 4) Share of Growth (SHARE); and Constant Share (CONSTANT). (4 pts.)
3. Create a 2060 population projection for California for LINE and EXPO using the bottom-up method. (1 pt.)
4. Interpret the regression slopes from the complex Linear and Exponential Models. (2 pts.)
5. What are the key assumptions that underlie the Linear and Exponential models? (2 pts.)
6. Why was it necessary to have an independent projection for California for the SHIFT, SHARE, and CONSTANT methods? (1 pt.)
7. Describe why the 2060 projections in Question 2 vary for the California counties. Where appropriate, note specific geographic areas in the answer. (4 pts.)

Assignment 5 (10 pts.)

1. Determined the supply of labor in Boston, MA in 2030 (3 pts.)
2. Determine the demand for labor in in Boston 2030 using the Shift-Share method (3 pts.)
3. Determine the net employment related migration in Missouri from 2018 to 2030 (1 pt.)
4. Determine the net employment related migration in Missouri from 2018 to 2030, assuming the U.S. adds on average 160,700 jobs per month from 2018 and 2030 (2 pts.)
5. What other components of migration would need to be forecast to determine the total net migration for Boston from 2018 to 2030? (1 pt.)

Assignment 6 (20 pts.)

1. Control the 2035-2039 net migration forecast by age in Orange County, California to an alternate total net migration forecast, which assumes slower change due to migration (4 pts.)
2. Using 15-year-horizon 2015 population forecasts based on the extrapolation approach and cohort-component model for 39 counties in Washington, calculate algebraic and absolute percentage errors for each county. (3 pts.)
3. Calculate the following summary measures of error: MALPE, MAPE, MEDAPE, and PRE (for the MAPE and MALPE using the naïve forecast). (3 pts.)
4. Why did you choose the controlling method used in Question 1 and what was the size of the percentage adjustment? (2 pts.)
5. Evaluate the precision, bias, shape of the error distribution, and utility of the forecasts based on extrapolation and cohort component model. Which method does the best and worst? (6 pts.)
6. What would be the MALPE value for a 20-year forecast based on the extrapolation model for Washington's counties? (1 pt.)
7. What would be the MAPE value for a 20-year forecast based on the extrapolation approach for the Washington's counties? (1 pt.)

Note: Inputs for Assignment 6 are on two spreadsheet tabs.

Internet Links and Articles on Class Web Site

Mortality	1. Population Reference Bureau. 2006. The Future of Human Life Expectancy (**On class website**) 2. X. Dong, B. Milholland, & J. Vijg. 2016. Evidence for a limit to human life span. *Nature*, 538-257-259. (**On class website**)
Fertility	1. J. Blake. 1968. Are babies consumer durables?: A critique of the economic theory of reproductive motivation. *Population Studies*, 22: 5-25. **(On class website)** 2. R. Easterlin. 1978. What will 1984 be like? Socioeconomic implications of recent twists in age structure. *Demography*, 15: 397-432. **(On class website)** 3. W. Lutz. 2007**.** The Future of Human Reproduction: Will Birth Rates Recover or Continue to Fall? *Ageing Horizons*, *7*:15-21 **(On class website)**
Cohort-Component Method	A. Isserman. 1993. The right people, the right rates: Making population estimates and forecasts with an interregional cohort-component model. *Journal of the American Planning Association,* 59: 45-64. **(On class website)**
Economic-Demographic Models	G. Hunt. 1993. Equilibrium and disequilibrium in migration modeling. *Regional Studies*, 27: 341-49. **(On class website)**
Forecast Error	D. Swanson and J. Tayman. 1995. Between a rock and a hard place: the evaluation of demographic forecasts. *Population Research and Policy Review*, 14:233-249. **(On Class Website))**
Research Paper	Examples of data representation using tables, graphs and charts https://faculty.up.edu/lulay/MEStudentPage/graphexamples-how-to-do.pdf B. Bergmann. 2005. Could social security go broke? The Economist Voice, 2(1): Article 10. **(On class website**) M. Boskin. 2005. Straight talk on social security. The Economist Voice, 2(1): Article 11. **(On class website**) U.S. News. 2014. 5 Potential social security fixes. money.usnews.com/money/blogs/planning-to-retire/2014/11/14/5-potential-social-security-fixes P. Diamond and P. Orszag. 2005. Social security: The Diamond-Orszag plan. The Economist Voice, 2(1): Article 8. **(On class website**) R. Lee, M. Andersen, and S. Tuljapurkar. 2003. Stochastic forecasts of the social security trust fund. **(On Class Website)** D. Myers. 2007. Testimony before the House Committee on the Judiciary Ellis Island New York and New Jersey. **(On class website**) J. Siegel. 2002. Demographic aspects of selected public policy issues, pp 595-605 in *Applied Demography: Applications to Business Government, Law, and Public Policy*. Academic Press, San Diego, CA **(On class website)** Social Security Administration (SSA). 2018. OASDI Trustees Report (Sections I, II, and V.A, V.B, and VI.E). https://www.ssa.gov/OACT/TR/2018 R. Weaver. 2008. Bridging the Social Security Divide: Lessons from Abroad. Brooking Policy Brief # 166 http://www.brookings.edu/papers/2008/06_social_security_weaver.aspx J. Gruber. 2010. Social Security (PowerPoint Lecture) **(On class website**)

Research Paper: Topic, Questions, and Scoring

This research paper provides the "real world" opportunity to analyze and evaluate population projections and the impact that fertility, mortality, and migration assumptions can have on the future size of a population and its demographic make-up. The topic of the paper is *U.S. Demographics to the Year 2065 and the Outlook for Social Security*. I hope this will be a challenging and rewarding exercise.

The paper should not be based only on data/information from a published source that has already analyzed. You must analyze and draw conclusions from original data**,** which are national population projections prepared by the U.S. Census Bureau. They are contained in an Excel spreadsheet (US_Pop2015-2065.xls) on the class Website. The **Projections Tab** contains population by selected age groups for the launch year 2015, five horizon years (2025-2065 in 10-year time increments), and three alternatives (low, middle, and high). The **Assumptions Tab** shows the fertility, mortality and migration assumptions for each alternative. Articles on electronic reserve, the Internet, and the class website are available as resources.

The paper **must** address these questions (points are shown in parenthesis):

1. What two segments of the age distribution most influence the social security system? What measure, based solely on age groups, has been used to relate these segments? What are the strengths and weaknesses of this measure? What age groups are you using in this measure and why? (10 pts.)
2. Based on the measure defined in Question 1, how does the age distribution vary under the different projection alternatives and why? Which alternatives are the most and least favorable to the social security system and why (effects of fertility and migration)? (20 pts.)
3. Based on the measure defined in Question 1, how does the age distribution vary within the 50-year forecast horizon? What are the reasons for these trends? (5 pts.)
4. Which one of the three projection alternatives is most likely to occur (i.e., as a forecast) and why (i.e., by **numerically specifying and justifying** the total fertility rate, life expectancy, and immigration assumptions in 2065)? Instead of picking one alternative, you can also create assumptions by combining elements from the alternates or specifying and justifying assumption values not in any alternative. (15 pts.)
5. Playing the role as president, what strategies would you implement to address the social security system problem? Why would these be selected over the other strategies being considered? (10 pts.)
6. Overall Quality: organization; including an Introduction and Conclusion; spelling and grammar; professional looking graphs/tables; proper citations and bibliography; well-articulated, concise, supported, and documented arguments (10 pts.)

The URL below links to a policymaking simulation on Social Security Reform that d lets you decide which reforms you want Congress to adopt. It is a fun exercise that you might find interesting and informative.

http://www.actuary.org/content/try-your-hand-social-security-reform

Research Paper: Guidelines

DO

- Include a cover page
- A hands-on analysis of population projections based on the U.S. data provided.
- Include an Introduction to provide background information and motivation for the topic (answer the "why we should care" question) and Conclusion summarizing the implications of your findings.
- Proofread the paper carefully. Make sure the paper is well-organized (do an outline before writing word one), has proper grammar and spelling, and effectively communicates your ideas.
- Think about the reader when making tables and graphs. Are they easy to read? Is there a better, cleaner way to display the same information? Does the information help support or clarify the analysis and conclusions? Learning to do this well is an invaluable skill.
- Label and number tables and graphs properly (*see Examples of data representation using tables, graphs and charts* .pdf file); Include a proper source at the bottom, telling where the data came from; All tables and figures should be cited in the text (e.g., see Figure 1). Do not split tables and figures across pages.
- Cite all data and references completely (for Websites, this means the complete URL, the date, the organization publishing it). Consult a style manual for the proper way to cite a source.
- Give the analysis the "common-sense" test. It is very possible to make computing mistakes that yield improbable results.
- Have a friend from another class read the paper.

DON'T

- Exceed more than five double-spaced typewritten pages, excluding references, figures, and tables.
- Rely exclusively on data analyzed by others. (Information can be cited from external sources, but the paper must include the analysis of the U.S. projection data).
- Include extraneous information (verbiage, tables, and charts) that are not helpful in answering the questions, defending a position, or supporting a claim.
- Wait until the last minute to start your paper.
- Plagiarize. If the ideas, data, and findings, etc. come from other sources they must be cited and given appropriate credit.

ASK YOURSELF THESE QUESTIONS

- Is it clear from the Introduction what this paper is about?
- Does each paragraph pertain to the paper's topics?
- Do the important ideas standout clearly?
- Are more explanation, details, examples, anecdotes needed?
- Are their sweeping statements that require support?
- Do any technical terms need explanation?
- Is there needless repetition?
- Is tone consistent?
- Are any of the sentences too difficult to follow?