

Economics 125 – Demographic Analysis and Forecasting, Fall 2007

Time, Location	Center Hall, Room 216; T/TH 3:30 pm – 4:50 pm
Instructor	Jeff Tayman
Office Location/Hours	Econ. Bldg., Room 115; T/TH 2:15 pm – 3:15 pm
Email Address	jtayman@ucsd.edu
Class Web Site	webct.ucsd.edu
Teaching Assistants	Choon Wang, Sequoia Hall, Room 208; M 11:00 am – 1:00 pm Yi Zhang, Econ. Bldg., Room 119; W 1:00 pm – 3:00 pm

Course Purpose: This course is designed to teach you the foundations of demographic analysis and forecasting. You will learn the terminology, analytical tools, major forecasting methods (trend extrapolation, cohort-component, and economic-demographic models), and practical guidance needed to create, evaluate, interpret, and use forecasts. We also cover fundamental demographic concepts such as population size, distribution, composition, and components of change (fertility, mortality, and migration), relationships between economic and demographic processes, and the implications of demographic change on the social security system.

Required Reading: Stanley K. Smith, Jeff Tayman, & David A. Swanson (2001). *State and Local Population Projections: Methodology and Analysis*. New York, Kluwer Academic/Plenum Publishers and articles/Internet links on electronic reserve.

You are expected to read the assigned material prior to lecture and bring the book to class. This is an upper division course, which means you have greater responsibility for thinking beyond the assigned material and asking meaningful questions, as oppose to copying notes.

Assessment: I encourage you to collaborate with your classmates on the assignments, research paper, and preparing for exams, but the work you turn in **must be your own**. I also will not accept a late assignment or research paper.

Assignments— There are eight assignments, which are to be handed in at the beginning of class. All assignments should be done with an electronic spreadsheet (Microsoft Excel is available in the computer lab). Tables and graphs for the assignments should be properly labeled and easy to follow (e.g., do not split a table or figure over multiple pages).

Research Paper— You are required to write a paper of no more than five double-spaced typewritten pages, plus references, figures, and tables. Details on the paper are at the end of the syllabus.

Exams— There will be one in-class exam and a final exam. The final exam will only include material covered after the first exam. **I will give no late examinations without a compelling and fully documented medical excuse and will not offer an alternative date/time for the final exam.**

Pop Quizzes— There will be five brief pop quizzes given randomly throughout the quarter.

Grading— A student can earn a maximum of 400 points as follows: Assignments (100 points or 25.0%), first exam (60 points or 15.0%), final exam (120 points or 30.0%), pop quizzes (40 points or 10%) and research paper (80 points or 20.0%). I do not grade on a strict curve, but you will receive no lower than an (A-) with 360 points; no lower than a (B-) with 320 points; no lower than a (C-) with 280 points; and no lower than a (D) with 240 points. Depending on the distribution of class scores, the final breakpoints may fall below those indicated.

Course Schedule, Econ-125, Fall 2007

Date	Topics	Assignment
Sept. 27	Course Overview Introduction and Uses of Forecasts	Chapter 1
Oct. 2	Fundamentals of Population Analysis	Chapter 2 SANDAG <i>INFO</i> (2006)
Oct. 4	Mortality	Chapter 4; Rogers (1995)
Oct. 9	Fertility	Chapter 5 Demeny (1993); Easterlin (1978) Assignment 1 due
Oct. 11	No Class, Professor out of town	
Oct. 16	Finish Fertility and Migration	Chapter 6, pp. 97-118 Assignment 2 due
Oct. 18	Migration	Chapter 6, pp. 119-135
Oct. 23	Finish Migration & Exam Review	
Oct. 25	Exam	
Oct. 30	Cohort-Component Method	Chapter 3; Chapter 7, pp. 137-151; Isserman (1993) Assignment 3 due
Nov. 1	Cohort-Component Method	Chapter 7, pp. 151-160
Nov. 6	Trend Extrapolation	Chapter 8, pp. 161-175 Assignment 4 due
Nov. 8	Trend Extrapolation	Chapter 8, pp. 176-183
Nov. 13	Economic-Demographic Models	Chapter 9, pp. 185-198; Hunt (1993) Assignment 5 due
Nov. 15	Economic-Demographic Models	Chapter 9, pp. 198-214
Nov. 20	Demographic Change and Social Security	Siegel (2002); SSA (2005); Lee, et al. (2003); Calmes (2005); Gladwell (2006) Assignment 6 due
Nov. 22	No Class, Thanksgiving Holiday	
Nov. 27	Special Adjustments to Forecasts	Chapter 11, pp. 239-266
Nov. 29	Forecast Errors	Chapter 13, pp 301-326; Swanson and Tayman (1995) Assignment 7 due
Dec. 4	Forecast Errors	Chapter 13, pp. 326-341 Assignment 8 due
Dec. 6	Evaluating Projections Final Exam Review	Chapter 12 Research paper due
Dec 10	Final Exam	3:00 – 6:00 p.m.

Assignments, Econ-125, Fall 2007

Assignment 1 (5 pts.)

1. For geographic subregions in San Diego County, calculate the numeric and percent change, average annual absolute change, and geometric and exponential growth rates between 2000 and 2006. (2 pts)
2. For San Diego County, calculate the percentage distributions by age for total population in 2000 and 2030 and for male and female populations in 2000. (Hint: a distribution is the share of each age or age/sex group to the **total** population). (1 pt)
3. Draw a line graph comparing the total population distributions in 2000 and 2030. (0.5 pt)
4. Draw a line graph comparing the male and female distributions in 2000. (0.5 pt)
5. Describe the major shifts in the age composition between 2000 and 2030 and the major differences between the male and female age composition in 2000. (1 pt.)

Assignment 2 (15 pts)

1. For San Diego County, calculate age-specific birth rates (ASBR), total and general fertility rates, and the crude birth rate in 2005. (2 pts)
2. For San Diego County females, calculate the child woman ratio (CWR) for ages 0-4 in 2005. (1 pt)
3. Project the San Diego County ASBRs and total fertility rate for 2010 using the synthetic method based on projections for California (4 pts)
4. For San Diego County, calculate age-specific death rates for females and crude death rate in 2005. (2 pts)
5. Project San Diego County female survival rates from 2005 to 2010 assuming a 1% annual decrease in mortality rates. (2 pts)
6. Project San Diego County female survival rates from 2005 to 2010 assuming a 1% annual increase in survival rates. (2 pts)
7. Why is the result obtained by increasing the survival rates directly not reasonable for some age groups? (1 pt)
8. What would the 2010 San Diego County total fertility rate be using the targeting method and assuming 50% convergence to California's total fertility rate in that year? (1 pt)

Assignment 3 (15 pts)

1. For San Diego County females, calculate total net migration between 1990 and 2000 using the demographic balancing equation. (1 pt)
2. For San Diego County females, calculate net migration by age between 1990 and 2000 using the forward survival rate method. (6 pts)
3. For San Diego County females, calculate gross in- and out- migration rates by age between 1995 and 2000. (4 pts)
4. For San Diego County females, calculate age-specific cohort change ratios (CCR) between 2000 and 2005. (2 pts)
5. Based on the 2000-2005 CCRs, what is the main drawback of using the CCR (aka census survival rate) to measure survival probabilities? (1 pt)
6. What factors might explain the seemingly erratic pattern of the net migration estimates by age developed from the forward survival rate method? (1 pts)

Assignments, Econ-125, Fall 2007 (Continued)

Assignment 4 (20 pts)

1. Using the projected survival and fertility rates from Assignment 2 and 1995-2000 gross in- and out-migration rates from Assignment 3, create a 2010 population projection for San Diego County females by age using the cohort-component method (CCM). (8 pts)
2. Compute the components of the female population change from 2005 to 2010. (2 pt)
3. Using the 2000 to 2005 CCR from Assignment 3 and 2005 CWR from Assignment 2, create a 2010 population projection for San Diego County females by age using the Hamilton-Perry (HP) method. (3 pts)
4. Explain the demographic reasons for the change in the total female population between 2005 and 2010. (3 pts)
5. What is the difference in the 2010 total female population between the HP and Cohort Component projections? Why is the CCM total female population projection smaller? (4 pts)

Assignment 5 (14 pts)

1. Using 1990 to 2000 as the base period, create year 2007 population projections for each geographic subregion in San Diego County using these four extrapolation methods: 1) Linear Trend (LINE), 2) Exponential Trend (EXPO), 3) Shift-Share (SHIFT), and 4) Share of Growth (SHARE). (Note: use the bottom-up approach for creating the population projection for San Diego County for methods 1, and 2). (6 pts)
2. Which methods produce the highest and lowest projections and why might that be? (8 pts)

Assignment 6 (5 pts)

1. Estimate two regression equations that describe the relationship between employment change and net domestic migration in San Diego County between 1980 and 2006. Employment change is measured two ways relative to the time of the net migration (lagged 2-years; and not lagged). (2 pts)
2. Explain which of the temporal specifications for employment change has the strongest relationship to net domestic migration and interpret the slope from each equation. (3 pts)

Assignment 7 (11 pts)

1. Using the initial geographic subregion population projections from Assignment 5, control the Linear and Exponential Trend projections to an independent 2007 population projection for San Diego County. (3 pts)
2. Control the 1990 to 2000 female net migration estimates by age to the estimate of total female net migration derived by the demographic balancing equation, both from Assignment 3. (4 pts)
3. What is the name of the method used to control the net migration estimates by age and why did you select that particular method? (2 pts)
4. Why did the projections based on the shift-share and share-of-growth trend extrapolation methods require no controlling? (2 pts)

Assignment 8 (15 pts)

1. Using the controlled population projections by geographic subregion from Assignment 7, calculate algebraic and absolute percentage errors for each geographic subregion and trend extrapolation method. (2 pts)
2. Calculate the following summary measures of error for each trend extrapolation method: MALPE, %Pos, MAPE, MEDAPE, and PRE (for the MAPE and MALPE using a naïve forecast derived by adjusting the 2000 census adjusted to the independent 2007 population projection). (5 pts)
3. Using the summary measures of error, evaluate the precision, bias, utility, and shape of the error distribution of the individual trend methods. Which method(s) do the best? (8 pts)

Articles/Internet Links on Electronic Reserve, Econ-125, Fall 2007

Fundamentals of Population Analysis	http://www.sandag.org/uploads/publicationid/publicationid_1232_5564.pdf (SANDAG, 2006) San Diego region demographic and economic characteristics
Mortality	R. Rogers. 1995. Sociodemographic characteristics of long-lived and healthy individuals. <i>Population and Development Review</i> , 21:33-58.
Fertility	P. Demeny. 2003. Population policy dilemmas in Europe at the dawn of the twenty-first century. <i>Population and Development Review</i> , 29:1-28 R. Easterlin. 1978. What will 1984 be like? Socioeconomic implications of recent twists in age structure. <i>Demography</i> , 15: 397-432.
Cohort-Component Method	A. Isserman. 1993. The right people, the right rates: Making population estimates and forecasts with an interregional cohort-component model. <i>Journal of the American Planning Association</i> , 59: 45-64.
Economic-Demographic Models	G. Hunt. 1993. Equilibrium and disequilibrium in migration modeling. <i>Regional Studies</i> , 27: 341-49.
Forecast Error	D. Swanson and J. Tayman. 1995. Between a rock and a hard place: the evaluation of demographic forecasts. <i>Population Research and Policy Review</i> , 14:233-249
Research Paper	http://www.ssa.gov/pubs/10055.html (Social Security Administration (SSA). 2005. The future of social security) http://repositories.cdlib.org/iber/ceda/papers/2003-0005CL/ (R. Lee, M. Andersen, and S. Tuljapurkar. 2003. Stochastic forecasts of the social security trust fund) J. Siegel. 2002. Demographic aspects of selected public policy issues, Chapter 13 in <i>Applied Demography: Applications to Business Government, Law, and Public Policy</i> . Academic Press, San Diego, CA Jackie Calmes. 2005. How social security might change. <i>The Wall Street Journal</i> January 30. M. Gladwell. 2006. The risk pool: What's behind Ireland's economic miracle and GM's financial crisis. <i>The New Yorker</i> , August 28.

Research Paper, Econ-125, Fall 2007

This research paper gives you the opportunity to get hands-on experience in analyzing and evaluating 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 your paper is *U.S. Demographics to the Year 2100 and the Outlook for Social Security*. I expect you will find this to be a challenging and hopefully rewarding exercise. Good luck.

You should not base your paper on data from a published source that has already analyzed it. I want you to analyze and draw your own conclusions from original data, which are national population projections prepared by the U.S. Census Bureau. They are contained in an Excel spreadsheet (US_Pop2025-2100.xls) on the class Web site. The Projections Tab contains population by selected age groups for the launch year 2000, four horizon years (2025, 2050, 2075, and 2100), and three alternatives (low, middle, and high series) The Assumptions Tab shows the fertility, mortality and migration assumptions for each alternative. Also, five articles on electronic reserve that directly relate to this topic are available as a resource.

The key questions that your paper should address are:

1. What aspects of the age distribution most influence the social security system? How can these aspects be measured? What are the strengths and weaknesses of these measures?
2. How do these aspects vary over the 100 year forecast horizon?
3. How do these aspects vary under the different projection alternatives? Which alternatives are the most and least favorable to the social security system and why?
4. How would the demographic outlook for social security change if the retirement age was increased to 75 years in the year 2025 and held at that age until the year 2100?
5. If you had to pick one of the three projection alternatives as most likely to occur (i.e., as your forecast), which one would you pick and why (i.e. justify your total fertility rate, life expectancy, and immigration assumptions)? An option you can consider is creating your own assumptions by combining elements from the alternate scenarios.
6. If you were the president and could take only one action to address the social security system, what would that action be? Why would you select it over the other actions being considered?

Here is a list of Do's and Don't's for your research paper:

DO

- A hands-on analysis of population projections
- Include an Introduction in which you provide background information and motivate the topic (answer the "why we should care" question).
- Proofread your papers 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 that will help you throughout your career.
- Label graphs completely; Give a title that answers what/where/when; label axes; provide a legend if necessary.
- Include a proper source at the bottom of all tables and graphs, telling where the data came from.

- Cite all data and references completely (for Websites, this means the complete URL, the date, the organization publishing it). Consult a style manual if you are not sure how to cite a source.
- Give your analysis the “common-sense” test. It is very possible to make computing mistakes that yield improbable results, such as an elderly dependency ratio greater than 75.

DON'T

- Use data in an already analyzed paper. (You can cite data in a published paper, but it should not be your main source of information.)
- Write a boring paper.
- Wait until the last minute to start your paper.
- Plagiarize. I encourage you to collaborate with your classmates on this project, but the paper must be your own.