

DEMG 6090

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PSET7

Problem 1

See R code for calculations and Excel output for projections.

Problem 2

See Excel for calculations. Despite age-specific mortality and fertility rates being constant, the total population is growing older, and older age groups face higher mortality rates, therefore, the population is decreasing at a faster and faster pace in each projection.

Problem 3

See Excel.

Problem 4

About 15469828 women alive in 2015 will have died by 2030, constituting 20.0801442 percent of the population alive in 2015.

Problem 5

If age-specific fertility rates had been 20 percent higher during the projection period, each subsequent cohort after 2015 would have been larger by a factor of 1.2, leading

the number of females in the first three age groups to be greater by 20 percent. This would result in a greater weighting of younger populations and therefore a younger age structure than was previously projected.

Problem 6

If age-specific mortality rates at ages 65-69 were 5 percent lower during the projection period, this would affect the value of ${}_5L_{65}$, therefore affecting the number of individuals aged 65-69 in 2015, and that cohort's size at every age beyond 65-69, while also influencing individuals that will age into or through the 65-69 age group between 2015 and 2030.

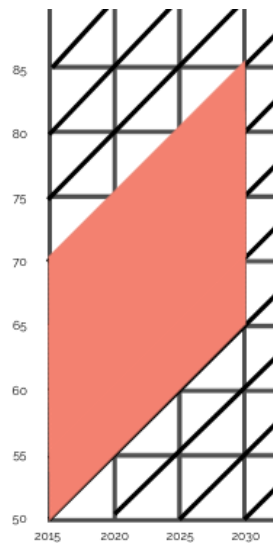


Figure 1: Lexis Diagram of Affected Age Groups

Problem 7

If 1 million women aged 20-24 permanently in-migrated to Russia on January 1, 2015, there would be a higher amount of people aged 35-39 in 2030, or depending on our assumptions, 35-44 if we assume (as we learned in class) that one-half of the immigrants

arrived at the beginning of the time period, and the other half at the end of the time period. Additionally, these women would be affected by fertility rates, so we could expect an increase in births and therefore a younger population age distribution than initially projected in 2030.

Problem 8

If we wanted to integrate males into the projection process, we would need the age distribution of males in 2015, as well as the male life table for 2010-2014. Then, we could calculate male births using the total number of births and the sex ratio at birth, and proceed with population projections as described in Box 6.1.

Problem 9

See Excel: after about 200 years, the mean annualized growth rates and population structure stabilized, becoming equivalent to what was seen in PSET6.

Problem 10

Using the Net Reproductive Rate of 0.81, we calculate the replacement-level fertility rates by dividing the fertility rates by the NRR at each age group. We find the total population of Russian females would be decreased by approximately 17 percent. See R code for long-term projections using the new fertility rate and population momentum calculation.