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Stochastic Infinite Horizon Forecasts for Social Security and Related Studies

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This study is part of a highly technical project to better project Social Security finances into the long-term future. It involves extensive and detailed modeling of the many uncertainties that will influence Social Security finances going forward, such as future birth rates, future death rates, and the future growth of wages and the economy. Since none of these factors can be predicted perfectly, it's impossible to know exactly what Social Security finances will look like in the future, or how long any particular tax and benefit structure can be sustained. What we can do is estimate a distribution of possible future birth rates, death rates and wage growth rates – and we can use these estimates to describe a range of possible future scenarios for Social Security. That's the essence of what this project is about. Based on current and past levels, trends, variations, correlations, long-range expectations, and professional opinions about these underlying factors, we are trying to model in as much detail as we can the probability distribution of possible future scenarios for Social Security finances.

This study adds to our overall project effort, first by incorporating projections about the uncertain future of net migration to and from the United States, second by exploring alternative estimation models for the factors influencing Social Security finances (such as wage growth and birth rates), and third by extending our projections from a finite horizon to one that considers the "infinite" future sustainability of the program.

Immigration. Our work on net migration highlights some of the challenges in making these projections. Given the history of immigration to the US, a number of assumptions must be made, such as whether to model immigration numbers or immigration rates, over what historical period to fit the model, whether to include a trend in the forecast, and whether to impose any central tendency or long-term target for immigration based on expert opinion. In experiments with a variety of approaches, we find that the probability distribution of our immigration forecast is not highly sensitive to these assumptions, although some approaches do lead to higher projections than others. The median values in our preferred projections suggest that the number of net immigrants (legal and illegal) drops from current levels down to about one million in 2020, and then slowly rises to 1.2 million at the end of the century. At the low end of our probability distribution (the lower 2.5% probability bound), we estimate immigration levels of about 800,000 throughout the century, after the first decade or two. At the high end (the upper 97.5% probability bound), we estimate immigration levels that start at 1.3 million and rise to 1.8 million at the end of the century. Despite this range of models and forecasts, including immigration in our models appears to make little difference to the probability distribution of the old age dependency ratio, which is the item of prime importance for the Social Security forecasts.

Improving the Time Series Models. In this part of our study, we experiment with a diversity of model specifications for wage growth and future birth rates, which are two of the key inputs for the projections. In general, these modifications result in greater future uncertainty, or a greater dispersion in the range of possible future values for wages and population. In some cases, the new models have a substantial effect

on the estimated probability distributions of the forecasted variables. However, the effects seem less important to our overall projections of Social Security finances. While there is more uncertainty in the individual variables included in the model, there is a certain cancellation when they are summed together by the projection process. A large effect on an individual series can get swamped in the aggregated uncertainty, as seems to be happening here. This is good news for the project as a whole, because it suggests that our overall Social Security projections are not as sensitive as we feared to the modeling of any single factor. One would not want to push this argument too far, of course. Ultimately, the forecasts of Social Security finances are only as good as the forecasts of variables underlying Social Security finances.

Infinite Horizon Forecasts of Social Security Sustainability. Many issues surround infinite horizon forecasts, and the whole enterprise can certainly be questioned. Nonetheless, we have found it useful simply to extend the range of our forecasts to very distant horizons. The limitation of this approach is that the uncertainty that is included in the model does not reflect the possibility of major "structural shifts" that may change completely the future path of these various factors. As a result, our models probably understate actual uncertainty, at least in the very long-term future.

In this study, we make a number of projections of Social Security finances, applying a number of estimation methods and approaches. Our basic finding is a probability distribution of Social Security finances with a median shortfall that is larger than that predicted in the 2004 Trustees Report. The Trustees Report estimates an infinite horizon open group imbalance equal of 3.5 percent of payroll. Based on our 500-year projection with our own mortality forecasts, the median level of our estimates is a shortfall of 5.15 percent of payroll. The difference most likely results from differences in the mortality projections that are incorporated in the estimation models. When compared with our 75 year projections, we also estimate about 40 percent greater "routine" uncertainty (the uncertainty we can estimate in the absence of major structural shifts) in our infinite horizon forecasts. Indeed the probability distribution of our forecast (at the 95% confidence level) ranges from a shortfall of about 1 percent of payroll to a shortfall of over 10 percent of payroll.

The full working paper is available on our website, www.nber.org/programs/ag/rrc/books&papers.html as paper NB04-01 and as NBER Working Paper #10917.

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