

Stochastic Modeling of the Dynamics of OASDI

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1. Introduction

This paper presents and discusses probabilistic features of a stochastic dynamic model of the OASDI trust fund. The model has evolved from its initial versions (Lee and Tuljapurkar 1998, Anderson, Tuljapurkar and Lee 1999), and contains a demographic projection for the US with a launch date of 1999, multivariate time series models of economic factors that impact the trust fund (productivity change, interest rate, and others), and a cohort-age-sex specific dynamic description of OASDI taxes and benefits. A key aspect of this model is that it is explicitly probabilistic in construction, and its stochastic properties are obtained by an analysis of long time series of historical data. We believe that a major strength of this modeling approach is that we can examine measures of risk associated with existing or proposed policies with regard to OASDI. It is difficult, however, to convey effectively the meaning and nature of risk in this context. For example, it is conventional to present prediction intervals for the outputs of a stochastic model, and these are easily confused with the high-medium-low outcomes of a scenario-based analysis. Our goal is to explore the demographic and fiscal dynamics of our model in a way that effectively demonstrates the volatility of the components, and of the fiscal dynamics. We use specific examples to illustrate the practical consequences of this volatility for policy measures. The results presented are a starting point in the systematic risk-analysis of elements of fiscal planning. Tuljapurkar and Lee (1999) present some elements of the latter approach.

Figure 1. Birth trajectories for S.S. scenarios I, II and III

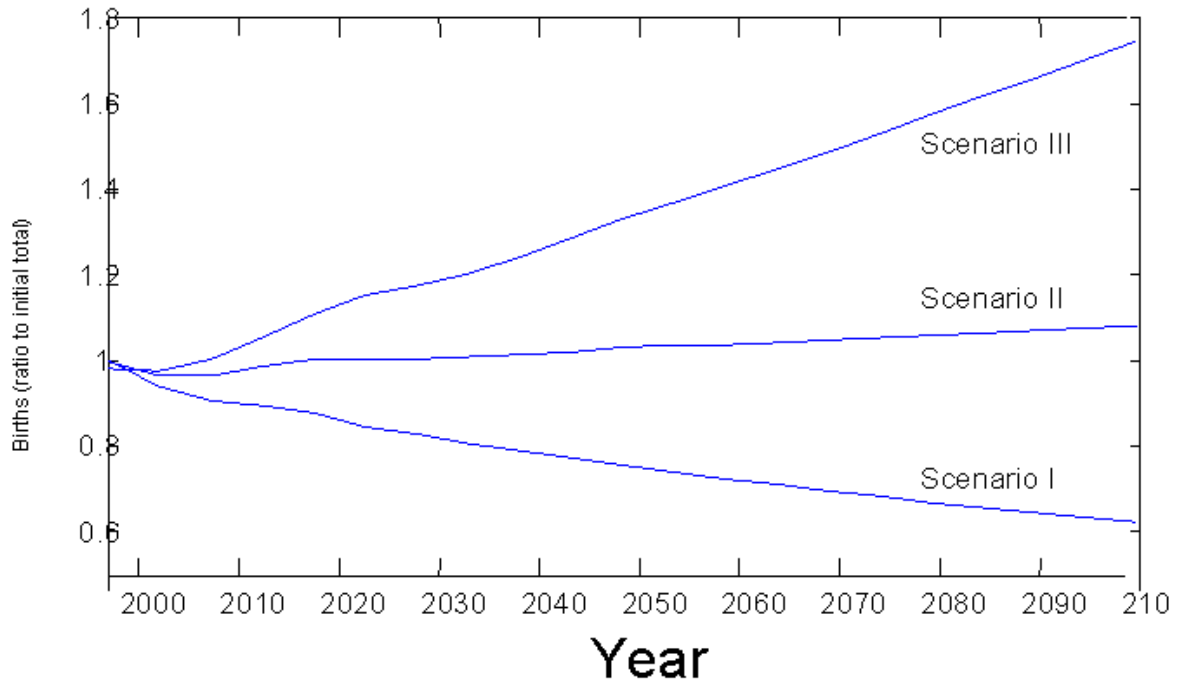


Figure 2. Stochastic birth trajectories, with 95% confidence interval

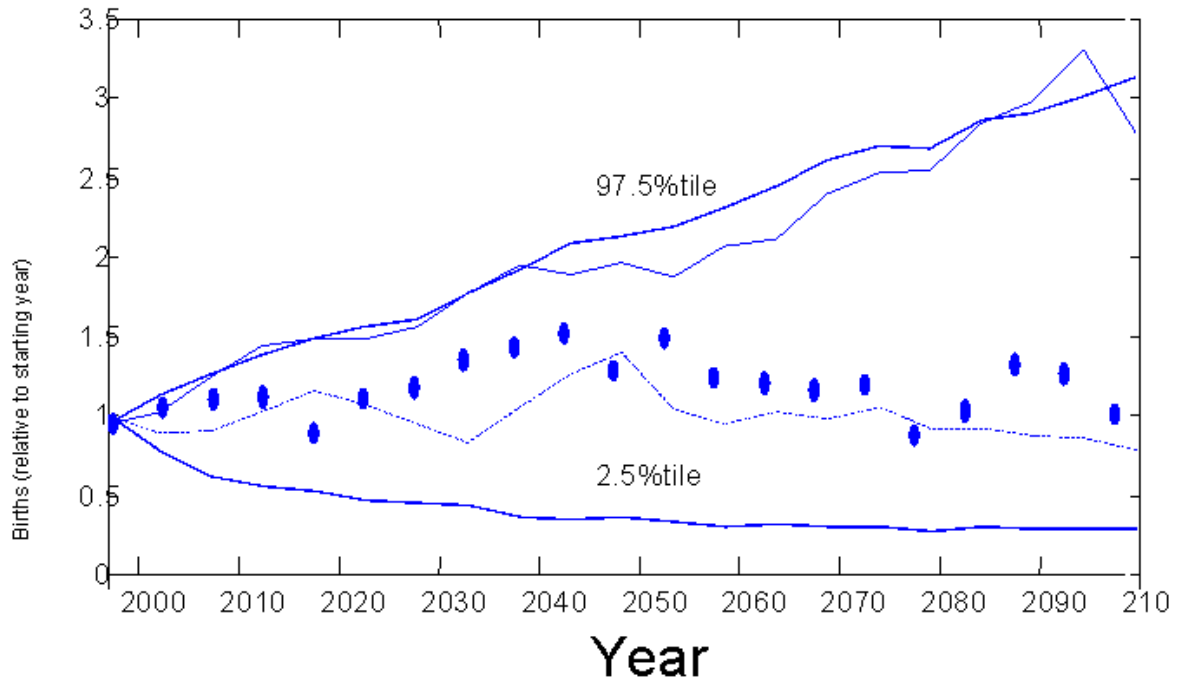


Figure 3. Histogram of the fraction of time TFR trajectories are greater than 3 or less than 1

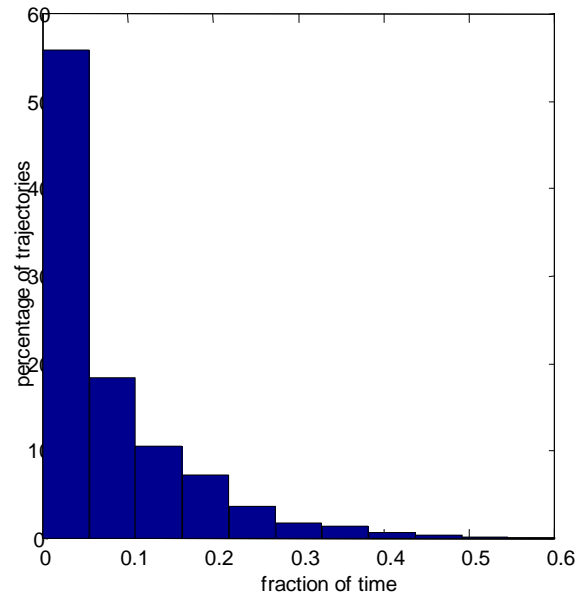
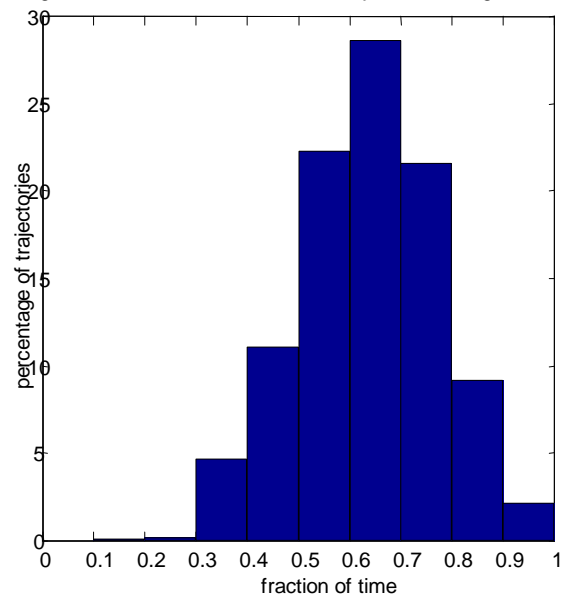
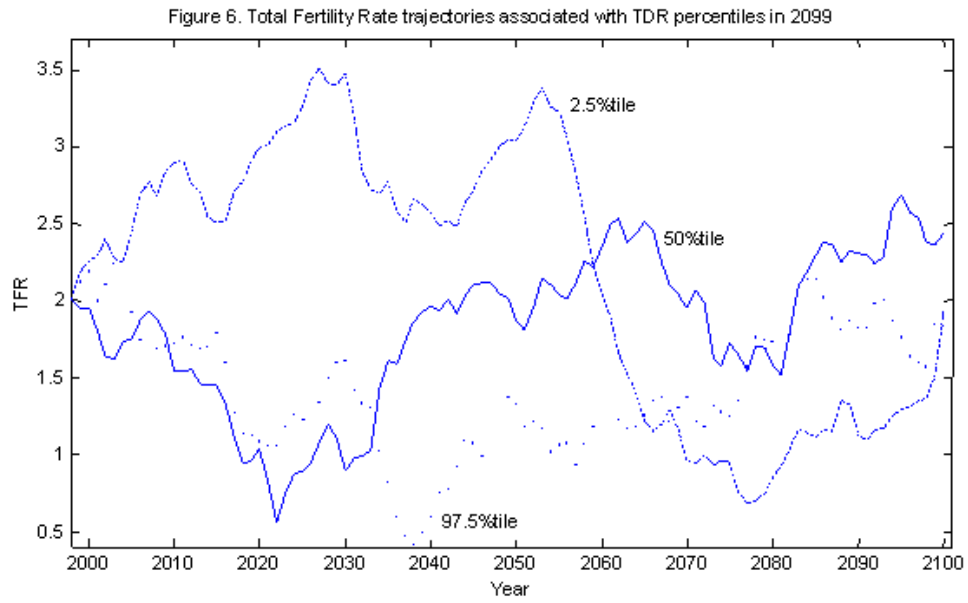
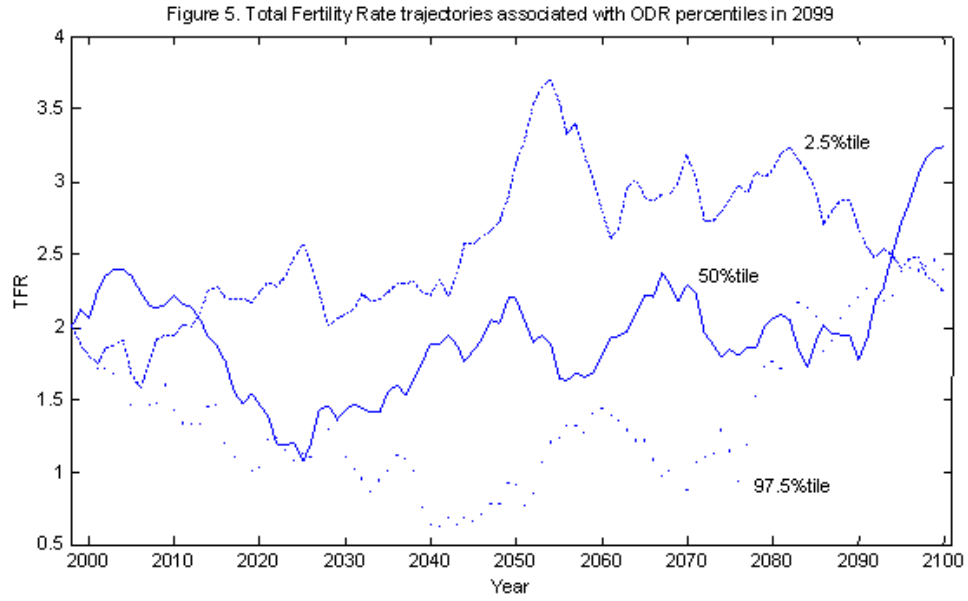


Figure 4. Histogram of the fraction of time TFR trajectories are greater than 2.2 or less than 1.7





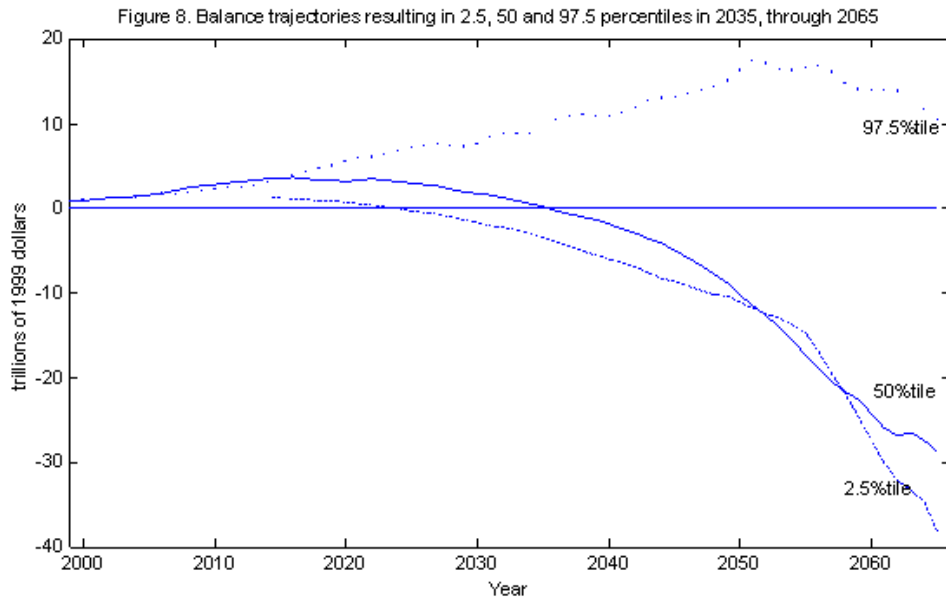
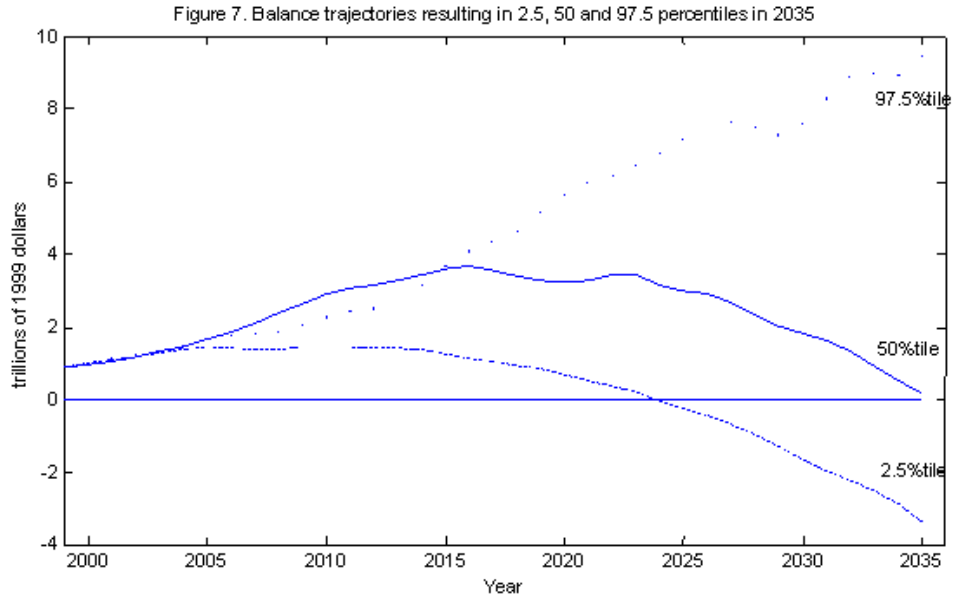


Figure 9. Balance trajectories associated with 2.5, 50 and 97.5 percentiles of ODR in 2034

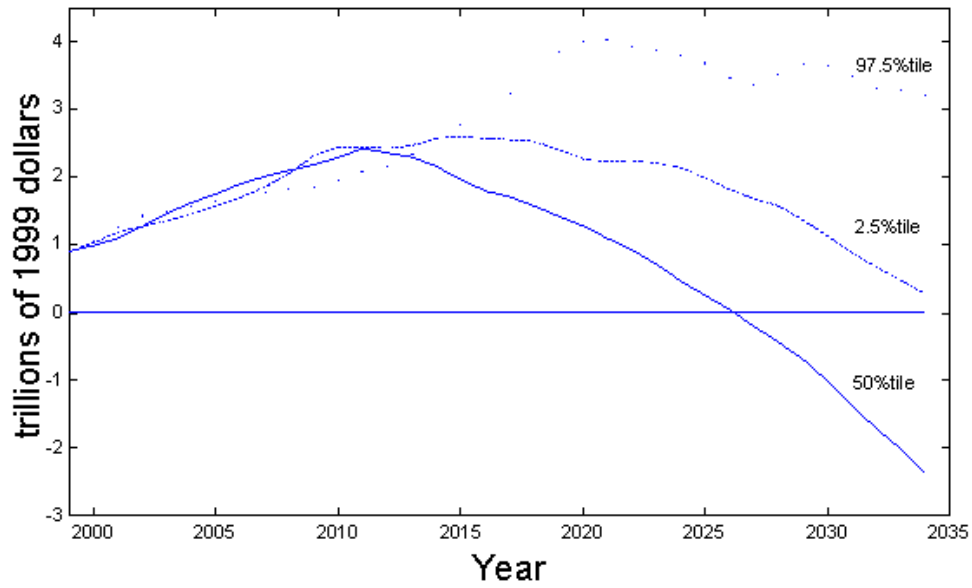


Figure 10. Deviations from mean balance by deviations from mean ODR in 2034

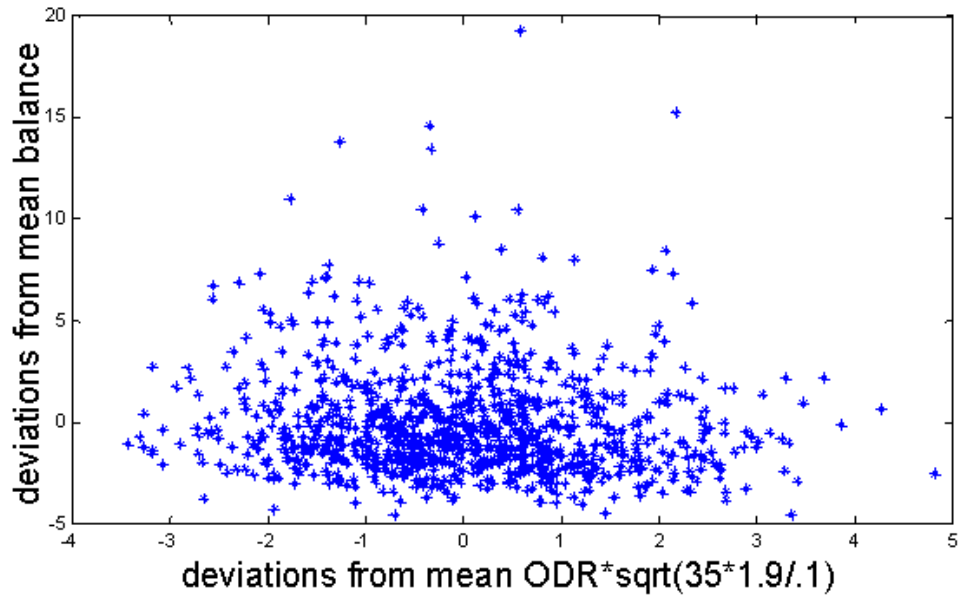


Figure 11. Cumulative interest rate trajectories resulting in 2.5, 50 and 97.5 balance percentiles in 2035

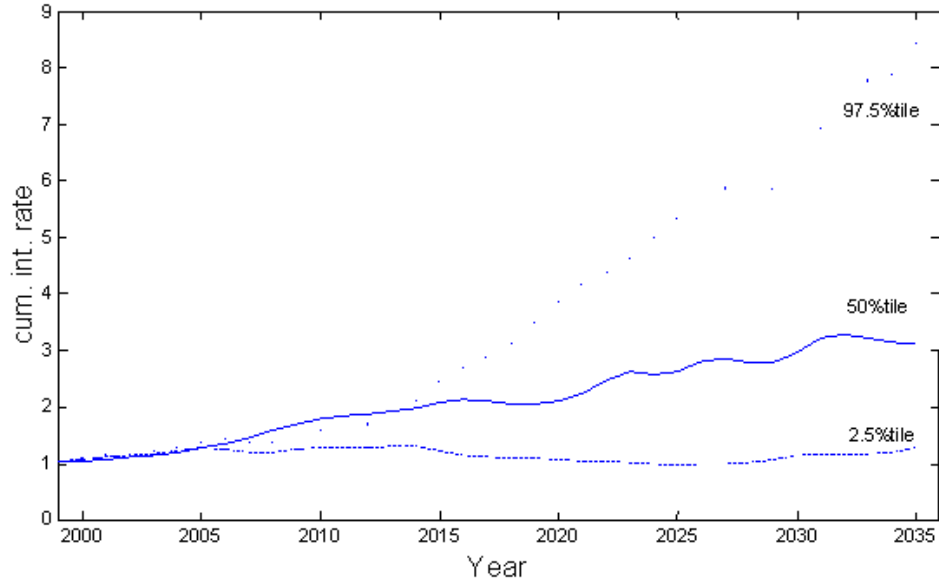
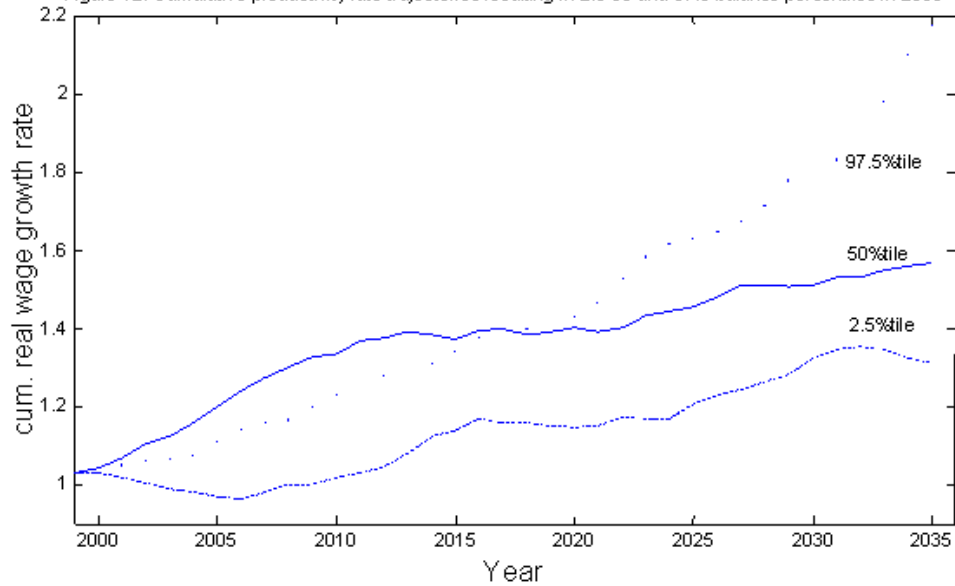
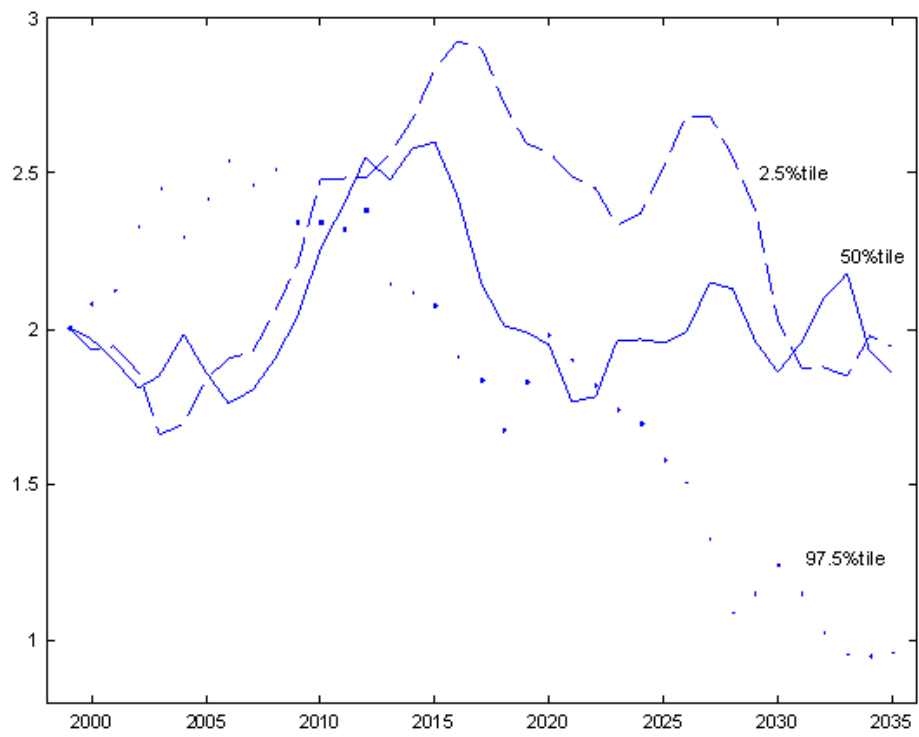


Figure 12. Cumulative productivity rate trajectories resulting in 2.5, 50 and 97.5 balance percentiles in 2035





2. References

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