CHAPTER 12. ON STOCHASTIC GENERATIONAL ACCOUNTING

JUHA M. ALHO
Department of Statistics, University of Joensuu

REIJO VANNE
Finnish Pension Alliance, Helsinki, Finland

1. Introduction

Part of the inheritance we leave to future generations is the (positive or negative) public net wealth. Depending on the country, the positive wealth may include roads, bridges, office buildings, hospitals, universities, natural parks etc. Such items resemble durable goods in that they depreciate at a relatively predictable rate.

In addition to state and municipalities, the public sector (or the *general* government) includes institutions that manage statutory pensions and unemployment and disability insurance. In Finland, most of the latter institutions are privately owned but they are included in the general government according to the national accounts standard. They own publicly traded stocks and other types of financial wealth. In some countries, such as Finland and Norway, the state also owns such assets. This part of the public wealth can be highly volatile (Vanne 2002).

On the other hand, negative wealth typically exists in the form of government bonds. They are sold to investors who appreciate low risk, low return assets, to cover government expenditures. The future real market value of such debt is relatively more predictable.

In addition to wealth, we leave to the future generations a set of economic rules including tax laws, entitlements to benefits, and rights to free or low price public services. Such rules are intended to apply to current and future generations, so any attempt at calculating the net bequest or burden we leave to future generations—in the sequel, we will speak of burden for short—should incorporate the rules. The so-called *generational accounts* (cf., Auerbach, Gokhale, and Kotlikoff 1991; Auerbach, Kotlikoff, and Leibfritz 1999) provide a possible system for the book-keeping of such future costs, and discounting their net effect to the present. In the usual approach, a deterministic view of the future population and future economy is adopted. Thus, the calculations are implicitly conditioned to the assumed future scenario. The goal of this paper is to show how uncertainty regarding the future can be incorporated into these calculations using stochastic methods. This will be

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expressed in terms of a predictive distribution. It indicates not only what the most likely burden will be, but also how uncertain it is.

A practical motivation for considering alternatives to the usual deterministic analyses is that their results can be highly volatile depending, e.g., on the current population projection and the current market value of the assets. This is illustrated with an example from Finland in Section 2. Section 3 reviews the sources of uncertainty that will be the basis of modelling in the sequel. In Section 4 some principles of standard generational accounts are reviewed. In Section 5 we will briefly describe the structure of Finnish public expenditures and the Finnish tax system, and present estimates of age-specific profiles for both. Section 6 reviews some of the empirical methods used in producing a stochastic population forecast of Finland, as well as the interpretation of the results. In Section 7 we describe statistical models for the relevant economic rates. Section 8 combines the results into a predictive distribution of the burden. Technical details about the analyses are reported elsewhere (Alho and Vanne 2006).

2. An Example of the High Volatility of the Deterministic Calculations

The so-called intertemporal public liabilities (Raffelhüschen 1999) can be defined as, IPL = (discounted future entitlements of all current and future generations) − (discounted future taxes of all current and future generations) − (current public net wealth). Attempts at estimating the IPL have lead to curious results in Finland. Estimates made in 1995 (Feist et al. 1999) showed the IPL as 253 percent of the gross domestic product (GDP), but estimates made in 2000 showed the IPL as −90 percent (Vanne 2002); i.e., a large implicit public debt was turned into a large implicit public wealth in a matter of 5 years. The seemingly incredible transformation was caused primarily by a decline in unemployment, which led to a decrease in projected future entitlements, by a rise of profits and capital income taxes, and by a phenomenal increase in the market value of information technology and other stocks held by the state and pension institutions. A year later, when the stocks had fallen in value, a similar calculation would have showed a lower—but still positive—net wealth.

Although the IPL calculations were, in both cases, arithmetically correct, the whole concept loses some of its attractiveness, if the results can suddenly change. A major reason for the volatility is that the calculations perpetuate the current conditions in a deterministic manner, ad infinitum. Since the volatility derives from the uncertainty of future developments, one should acknowledge that the results are inherently uncertain. This can be done in a probabilistic framework, in which current conditions are also perpetuated—but probabilistically, treating all future values as random variables. A realistic description of the future uncertainty is not as variable as the annual values of the relevant variables. We think of this as the major motivation of *stochastic generational accounting* to be described in this paper.

3. Sources of Uncertainty

Increases in productivity automatically increase tax revenues, earnings-related pensions, and standards of social services. Therefore, a major source of uncertainty in the IPL is the future development of productivity. A complication is that changes in tax rates and the costs of entitlements are, to some extent, predictable. In principle, this should be taken into account, if genuine predictive distributions are desired. For example, in the 1995 Finnish calculations (Feist et al. 1999) several alternative scenarios were produced that all lead to a smaller net liability than the 253 percent figure. In the most extreme scenario, it was assumed that levels of certain entitlements would be lowered, and unemployment would rapidly decrease, in the near future. In this case, the IPL was −10 percent. This still falls far short of the year 2000 figure −90 percent.

From a demographic point of view, generational accounts can be viewed as functionals of future population, as disaggregated by age and sex. Therefore, IPL calculations can be viewed as an exercise in the so-called functional forecasting (Bogue and Biehler 1979). The demographic aspect deserves emphasis, because the uncertainty of future population development is frequently underestimated. This has been emphasized by Lee and Tuljapurkar (2001), for example, in their analysis of the fiscal sustainability of the U.S. social security system. Here, we build on our earlier work on stochastic forecasting in Finland as discussed in Alho (1998). For the calculation of the functionals, we need estimates of age and sex-specific tax rates and entitlement rates. Here, we rely on our earlier work as described in Feist et al. (1999) and Vanne (2002). In addition, we will develop stochastic models for interest rates, stock returns, and labour productivity (Alho and Vanne 2006).

A topic of much debate in Finnish public life has been the government policy of reducing debt from the sale of stocks and from unexpected tax revenues when the economy has boomed. At the beginning of the year 2000, the value of government bonds (net of the bonds owned by insurance institutions that we include in general government) was 32.3 percent of the GDP of year 2000, and the value of the stocks held by the government was 91.3 percent of the GDP. A policy of reducing debt may increase the options of the government in an eventual downturn of the economy. This is not clear, however, since the decrease in debt is matched by a commensurate decrease in wealth. A point that has not been emphasized in the debate is that reducing debt in this way changes the stochastic characteristics of the government's portfolio. High volatility, high yield assets are traded to pay out low volatility debt of equal current value. We will compare the effect of these sources of uncertainty and the effect of productivity and demographics on the public liability.

4. Generational Accounting and Debt

As discussed by Kotlikoff (1999) fiscal book-keeping relies on labels that are conventional. Current spending can alternatively be viewed as decreasing the previously accumulated wealth of the government; as a "loan" that is expected to be paid back by the receiver or his/her descendants in the form of taxes, or as "borrowing" from future generations that is expected to be reimbursed in some form later. In a similar vein, family benefits, such as child allowances, could be thought of as either benefits to the child or benefits to the parent.

For an individual, an accounting of lifetime taxes and entitlements provides a net measure that is independent of labelling. For a government with a potentially infinite life span, one has to consider *all* future in- and out-payments simultaneously. Auerbach and Kotlikoff (1999) suggested that by making neutral assumptions about future tax rates and future entitlements, one could use discounting to achieve comparability of all public fiscal events. Implicit in the calculation is that the government must be able to service the possible debt at all times, but otherwise they make no assumption about the realism of the resulting economic and demographic paths. However, an assumption of intertemporal budget constraint is made. This says that, in present value, future net taxes must equal the current debt. Or, over the infinite horizon, the public sector does not make a surplus or a loss.

Although the generational accounts that are produced in this way go a long way toward avoiding the conventional aspects of current fiscal book-keeping, they do rely on a set of assumptions of their own. For example, there is no need to make comparisons of equity across current and future generations based on the intertemporal budget constraint of zero. Instead, one could determine what we would have to do to all future taxes, so that current wealth would be maintained. This could be sensible, if the public sector held a positive wealth at any given time. In general, some other level of net surplus could conceivably create more utility to the tax payers than the zero level.

5. Taxes and Public Expenditures

5.1. AGGREGATE STATISTICS

For the purposes of our analysis, the government includes the state, municipalities, and institutions managing statutory pension systems and other forms of social security, such as unemployment, disability, and health insurance. For the book-keeping of public finances, Finland applies the European System of Accounts (ESA95).

Based on the figures of the database of the Research Institute of the Finnish Economy (ETLA; http://www.etla.fi; October 9, 2001.), the public revenues in the year 2000 were, as percent of the GDP of year 2000,

Value added tax (VAT)	7.8 percent
Taxes on alcohol, cars, and tobacco	5.6 percent
Taxes on income and property	21.1 percent
Employers' social security contributions	8.9 percent
Employees' social security contributions	3.3 percent

The total revenues (excluding those deriving from wealth) were 46.7 percent. Therefore, this is also the tax rate. Note that since the GDP was 130 billion (or 130×10^9) euros, we have approximately that 1 percent is 1.3 billion euros, or 1.5 billion dollars (at the exchange rate of 2004).

The public expenditures were, correspondingly,

Business subsidies	1.5 percent
Pensions, unemployment etc.	16.5 percent
Education, social and health services	13.1 percent
Collective consumption of fixed capital	7.6 percent
Other, net of other revenues	1.8 percent

The total expenditures were 40.5 percent, so the primary balance was 46.7 percent − 40.5 percent = 6.2 percent of the GDP.

The capital income was 4.4 percent and the interest paid on public debt was 3.6 percent of the GDP, so the capital balance was approximately 0.7 percent. Therefore, the wealth increased due to the difference of revenues and expenditures, by 6.5% + 0.7% = 6.9% of the GDP. In addition to the conventional public surplus, the value of publicly owned stocks soared.

In our discussion of the IPL, the stochastic future taxes and expenditures are key processes. The capital budget enters via the initial net wealth, which is equal to the discounted value of the infinite streams of capital income and interest on bonds.

The Finnish surplus in the year 2000 was high in international comparison. Moreover, although Finland has a tradition of surpluses (due to the partial prefunding of statutory pensions), the figure in year 2000 was exceptionally high, from the Finnish perspective as well (Vanne 2002). Providing a description for the volatility of both primary and capital balances is a major motivation of our paper.

5.2. TAX, TRANSFER, AND PUBLIC SERVICE LEGISLATION

While taxes and public expenditures have a basis in legislation, they have to be suitably aggregated to allow for the statistical estimation of age–sex profiles from existing data. We provide here more details about the aggregates discussed above.

Finland has harmonized indirect taxation rules according to the European Union (EU) policies. The VAT rate varies by product, but 22 percent is a common rate. Despite reductions since 2000, taxes on alcohol, cars, and tobacco are also higher than the average in the other EU countries. (The reductions of taxes have not been taken into account in our calculations.) Indirect tax profiles by age and sex were estimated based on household surveys, the observed consumption patterns, and the indirect tax content of different products (Feist et al. 1999).

Taxes on wages and social transfers are progressive. Capital income is taxed at a flat rate of 29 percent. Personal wealth is taxed according to a low, but progressive schedule. Separate profiles for capital income and wages were estimated.

Employers and employees also contribute to a statutory earnings-related, defined benefit pension system, which is partially prefunded. They also pay for the national pension, universal health insurance, and statutory unemployment insurance that only run buffer funds.

The pension schemes provide old age pensions for all starting at the age of 65, as well as disability and survivors' benefits. There are complicated early retirement benefits that depend on the applicant's labour market status. These rules prevailing in 2000 have subsequently been modified, but this has not been taken into account in our calculations. The earnings-related pension system is mostly run by mutual pension companies that manage their assets like private investment funds.

In the ESA95 standard, education, social, and health services provided by the public sector are included under individual consumption. User fees are not included in the figures. Social services include an extensive childrens' day care system run by the municipalities.

5.3. THE AGE–SEX PROFILES OF TAXES AND EXPENDITURES

The primary balance derives from age–sex profiles of different taxes and expenditures. A multitude of statistics were used to derive the profiles by single year of age for the 10 primary balance variables mentioned in Section 5.1. They were from different calendar years during 1990–2000.

Twenty aggregates with an age–sex profile were available in the first phase of the calibration. For instance, the ESA95 category "social transfers" were divided into eight sub-aggregates, namely pensions, unemployment benefits, transfers related to children (family policy), daily allowances of health insurance, refunds of health insurance, rehabilitation benefits of health insurance, student benefits, and other social transfers.

The pension benefit profiles are from the Central Pension Security Institute and the Social Insurance Institution (2001); and all three health insurance profiles are from Social Insurance Institution (2001). The initial social and health service profiles are from the year 1998; and they were published by the Ministry of Social Affairs and Health (2001). All the other initial profiles are described in Feist et al. (1999).

The profiles for the year 2000 are given in Figure 1. The difference in taxes paid, between males and females, derives primarily from the higher labour-force participation and higher

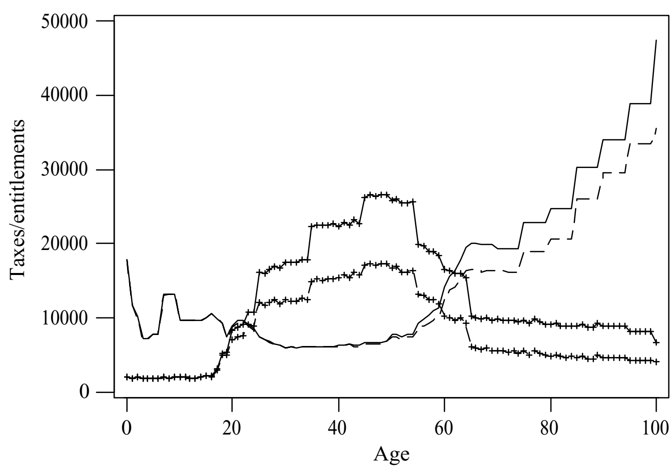

Figure 1. Taxes (+) and entitlements for males (solid) and females (dashed), in Finland in 2000.

wages of the males. This also explains the difference in entitlements, since the males receive higher earnings-based pensions.

6. A Stochastic Forecast of Finland

Population influences the value of IPL via the profiles of age-specific average rates of entitlements and taxes discussed above. Since the future population cannot be known accurately, neither can the IPL. A stochastic forecast is a method of accounting for uncertainty in a systematic way. In Alho (1998) we describe, in detail, the methods used to produce a predictive distribution of the Finnish population for 1999–2050. This forecast was extended 50 years for the present work. Here, we will summarize aspects that are relevant for the stochastic analysis of the IPL, and for the interpretation of the results.

We consider the population as disaggregated by sex and single years of age ($x = 0, 1, \ldots,$ 99, 100+). Age-specific fertility and mortality rates are forecast for each future year. Similarly, assumptions about the net number of migrants are made for every future year. The usual cohort-component book-keeping is used to derive the consequences for the population vector.

To describe the uncertainty of the future vital rates, a model of error introduced in Alho and Spencer (1997) was used. The calculations are carried out with the program PEP written at the University of Joensuu (for details, visit http://www.joensuu.fi/statistics/juha.html). The program stochastically simulates a full set of vital rates and calculates a cohort-component forecast for the population. The results were stored into a database for possible aggregation and statistical processing. In the application at hand, 1,500 simulations were used.

The point forecasts we used were essentially those of Statistics Finland. The age-specific fertility was assumed not to change over time with the total fertility rate at 1.80. Mortality was assumed to decline at a rate similar to that in the recent past so that, in 50 years, life expectancy would increase to 83.0 for males and 87.8 for females, and in 100 years it would increase to 88.2 and 91.0, respectively. Net-migration was assumed to stay at the recent past level of 4,000 per year.

The second moments for fertility and mortality were empirically determined, based on naive or baseline forecasts. In the case of total fertility, we calculated the empirical error of a forecast that assumes fertility does not change. This mimics closely the way actual forecasts of fertility have been made in the United States (Lee 1974). The data were from 1776–1995. A smoothed version of the error estimates gave the standard deviations. The estimates were adjusted for the first two decades to account for the recent low level of volatility. Cross-correlations across age were estimated using an AR(1) model. For long-term forecasting PEP has the option of keeping error variances at a fixed level from some year t^* on. In this application we used $t^* = 50$. At this point a 67 percent prediction interval for total fertility was approximately [1.3, 2.5].

In the case of mortality the procedure was the same, except that a constant rate-of-decline model was taken as the baseline forecast. We have shown earlier that this method is quite competitive with the more complex method used by the official forecasters (Alho 1990).

The data period was 1900–1994. After 50 years, a 67 percent prediction interval for life expectancy was [78.6, 87.3] for males and [84.5, 91.1] for females. After 100 years the intervals were [84.3, 91.9] and [87.7, 94.2], respectively.

The error model for migration was based on a time-series analysis of data from 1945–1995, but judgmentally calibrated. For the year 2030, a 67 percent interval was [−6,300, 14,300], for example.

For the results of the Finnish forecast, we refer the reader to Alho (1998). (An updated version appeared in Alho 2002.) Here we note merely that in the Appendix F (http://books.nap.edu/books/) of the National Research Council (2000) panel report *Beyond Six Billion*, a comparison was made between the forecast in Alho (1998) and a separate analysis, in which a prediction interval is calculated based on the analysis of the UN forecasts during 1970–1990. For the total population, the ratios of the upper end point of the 95 percent prediction interval to the median, for forecast years t, are 1.030 ($t = 10$), 1.153 ($t = 30$), and 1.402 ($t = 50$) in Alho (1998); and 1.032, 1.142, and 1.309 in the UN-forecast-based analysis. The results are close for the first 30 years. The discrepancy at $t = 50$ may be explained by the fact that the UN based analysis used recent past data for all lead times, whereas in Alho (1998) the higher volatility of the earlier years was used for longer lead times for fertility.

In summary, apart from recent fertility, the error structure we have assumed has been chosen to approximate the level of uncertainty of forecasting in the past. Its use in the IPL calculations assumes that the uncertainty of the future forecasts is of the same order of magnitude as in the past, or at least, that it is *not higher* than in the past.

7. Analysis of Interest Rates, Stock Returns, and Productivity

The uncertainty of the future economy influences the Finnish IPL via three processes. First, the value of government debt varies according to the real interest rates of government bonds. In the future, these interest rates are the same, with the exception of small liquidity related differences, all through the euro zone. Therefore, we used the German real interest from 1955–2000 as a basis for modelling. An AR(1) model was identified and estimated for the process (Alho and Vanne 2006). Second, the value of stocks held by the government varies like a large portfolio of publicly traded stocks. More than half of the stocks are foreign, and their share is expected to rise. To model this process in the short and medium term, we used the Dow–Jones index for industrial stocks from 1949–2000. We believe the U.S. index is a better guide to the future evolution of stock returns than the European or Finnish series that have developed in a more regulated environment. A random walk model with a drift (0.019) was estimated (Alho and Vanne 2006). Third, the tax rates and, hence, the entitlements should follow the productivity of labour. For this, we have a carefully constructed real GDP *per capita* growth series from Finland from 1860–2000 (Hjerppe 1989; Statistics Finland 2001). It reflects both productivity per person, labour-force participation, and unemployment rate. This series was modelled using an MA(1) process (Alho and Vanne 2006). In particular, the mean of the process was estimated as 0.022 with a standard error 0.005.

7.1. RANDOM RETURNS AND DISCOUNTING

The goal of the IPL calculations is to help anticipate the burden we leave to future generations. We incorporate uncertainty in four ways: the future stock prices are random; the future bond prices are random; the change in productivity is random; and the future population growth is random.

Our analysis tried to put the various money flows on an equal footing at 2000. The difficulty in assessing the future value of the financial assets derives from the infinite horizon we consider. A potentially useful resolution is obtained, when we realize that the results depend on the way the government portfolio is managed. We assumed that the government maintains a fixed value portfolio. That is, if the stocks increase in value (inflation adjusted), then enough are sold, so the value of the holdings does not change. Similarly, if the stocks decrease in value, more are bought to compensate for the loss in value. We assume that such purchases are financed by increasing taxes (over and beyond the tax schedules considered here). These effects on spending and taxes are excluded from the analysis.

Another problem in discounting is that, unlike a private consumer, the government does not have a particular time preference for money. In fact, by selling bonds the government provides a service to investors who want low yield, secure assets. If cash is needed, it can be raised via new taxes. On the other hand, the government is constrained by the political process not to raise taxes at will. As an alternative, by selling bonds the government can defer raising taxes indefinitely. In order to sell, the government must pay interest on the bonds to satisfy the time preference of the buyers. Therefore, a meaningful discount rate for any future income or out-payments is the expected real interest rate of bonds, in this case 0.038.

8. Predictive Distribution of the IPL

To define a random version of the IPL in a formal manner, we first represent current wealth W as the sum of the value of stocks held A, and bonds owed B, or $W = A + B$. Since both stocks and bonds are valued by discounting the money flow they generate, both A and B are random variables. Alho and Vanne (2006) derive the following expectations, $E[A] = 1.272$ and $E[B] = -0.323$, in the units of the GDP of year 2000. Note that the expected discounted income from the stocks is *higher* than their market value 0.90. Thus, $E[W] = 1.272 - 0.323 = 0.950$. Similarly, the standard deviation of W is estimated as 0.626 in the same units. The volatility of the stocks held produces 99 percent of the variance of W.

To define the discounted primary balances, let $V(x, s, t)$ be the number of people in age $x = 0, 1, \ldots, 99, 100+$), who are of sex s = F (female) or s = M (male), during year t. We assumed that the entitlements and taxes grow with productivity, from the values $S(x, s)$ and $T(x, s)$ they have at baseline $t = 2000$. For example, the discounted entitlements at time $t + u$ that are due to those of age x, who are of sex s, are of the form $V(x, s, t + u)S(x, s)\exp(-0.038u + 0.022u + Z(u))$, where 0.038 is the discount rate, 0.022 is the average growth rate of the entitlements, and $Z(u)$ is a once integrated MA(1) process of random variation of productivity around its mean. Since the mean of the productivity series had to be estimated, the mean was only assumed to be known up to the standard error (= 0.005). This induces a random component into the model, whose standard deviation at time u equals $0.005u$. Summing over x, s, and u yields the value of discounted future entitlements, or S. Replacing $S(x, s)$ by $T(x, s)$, we get the corresponding discounted taxes, or T.

Since we use a per capita measure for productivity, it is plausible that population development and productivity are approximately independent. Independence was assumed.

We can now define the random public liability as $L = S - T - W$. This random version of the IPL has a probability distribution that it inherits from S, T, and W. We can also think of this as the predictive distribution of the IPL.

We have simulated S and T based on the models described above. For technical reasons discussed in detail in Alho and Vanne (2006) we are able to report only on truncated calculations that involve the first 100 years only. We use $S^*(u)$ and $T^*(u)$ for S and T as truncated to the first u years.

In Alho and Vanne (2006) the following statistics were obtained for the evolution of the distribution of discounted primary balances $T^*(u) - S^*(u)$ at $u = 25, 50, 75, 100$,

u	Mean	Median	Q_1	Q_3	SD
25	0.70	0.69	0.59	0.80	0.16
50	0.16	0.22	–0.12	0.51	0.55
75	–0.46	–0.28	–0.93	0.19	1.03
100	–1.01	–0.70	–1.59	–0.08	1.50

Here, Q_1 and Q_3 are the first and third quartiles, respectively, and SD is the standard deviation. The distributions are skewed to the left. The medians are the most natural summary statistics of the predictive distributions. For the first quarter of the century the primary balances will increase the wealth; but after that the wealth will be depleted by approximately a half of the year 2000 GDP, each 25 years.

A more refined picture is obtained by looking at the whole predictive distribution. Consider the random public liability, as truncated at u, $L^*(u) = S^*(u) - T^*(u) - W$. The distribution is skew to the right, indicating that large liabilities are relatively more likely than corresponding levels of positive wealth. Alho and Vanne (2006) show numerically how the predictive distribution derives from its two independent components,

	Mean	Median	Q_1	Q_3	SD
$S^*(u) - T^*(u)$	1.01	0.70	0.08	1.59	1.50
$-W$	−0.95	−0.95	−1.36	0.53	0.62
$L^*(u)$	0.07	−0.18	−0.95	0.75	1.63

We see that, in terms of standard deviations, the uncertainty of the future primary balances is 2.5 times as high as the uncertainty of the current wealth, and the uncertainty of the future liability approximately equals that of the future primary balances.

Although the level of uncertainty is high, the chance that $L^*(u)$ is negative at $u = 100$, is 55 percent. In fact, the primary balances remain positive for the next 25 years, and then turn negative. At $u = 50$, the chance is still 91 percent that $L^*(u)$ is negative. That is, although the current entitlements are eventually too high for the current level of taxation, there is a good chance that it may not become a problem during the coming century, and it is not likely to become a problem in the next 50 years or so.

We have decomposed random public liability as $L^*(u) = S^*(u) - T^*(u) - W$. The wealth consists of stocks held and bonds owed, $W = A + B$. As noted above, 99 percent of the variance is related to stocks. On the other hand, under the fixed value portfolio policy, the stocks provide an expected increase of the government cash funds of 0.36. As before, the unit is the GDP of year 2000.

We have also shown that the uncertainty in discounted primary balance $T^*(u) - S^*(u)$ dominates that in W. Since we assume the independence of productivity per capita and population development, we can decompose the variance in $T^*(u) - S^*(u)$ into a component deriving from the uncertainty of future population development, and a component deriving from the uncertainty in future productivity. Alho and Vanne (2006) first estimate $\text{Var}(T^*(u) - S^*(u)) = 0.90^2$. Therefore, the remaining variance due to productivity is $1.50^2 - 0.90^2 = 1.20^2$. The share of demographics out of $\text{Var}(L^*(u))$ is $0.90^2/1.63^2$, or 30 percent. The rest is due to economics. The share of uncertain future taxes and entitlements is $1.20^2/1.63^2$, or 54 percent. The remainder, approximately 15 percent, is due to uncertainty in the initial wealth W, under the fixed value portfolio policy. (The percentages do not add up to 100 percent due to rounding and simulation error.)

9. Discussion

Our analysis of the intertemporal public liabilities shows that the current and past generations are not leaving the future generations an inheritance of debt and misery, in Finland. Current public wealth will be gradually consumed. This can be a moral problem, because the wealth has partly been generated by earlier generations, but it does not seem to be a similar problem relative to the future generations.

A central conclusion is that the primary balances offer both serious opportunities and risks for the public sector. This is simply the question of how tax policies and rules for entitlements will be formulated in the future. Adaptive mechanisms that react to demographic uncertainties (such as those suggested by Lassila and Valkonen (2001) for pension prefunding) deserve serious attention. Alho, Lassila, and Valkonen (2006) show that such policies can influence both the mean of the predictive distribution and decrease variance. Similarly, the dependence of the public portfolio on the volatility of international stock markets should be recognized, and the government should prepare for it. In contrast, with the partial exception of migration, demographics is largely outside the scope of governmental decision-making.

From the perspective of public liabilities the current policy of debt reduction has almost no effect on the uncertainty of the public liabilities. However, a reduction of debt will decrease the long-term earning opportunities of the government. Therefore, a more relevant discussion might involve investment strategies that would bring in a higher rate of return.

The analysis presented could be refined. For example, a key assumption was that the future taxes and entitlements grow in proportion to productivity. Both taxes and entitlements could be disaggregated into components for which a more refined specification would be feasible. This can involve elements of forecasting at jump-off. In addition, our analysis of the current wealth relies on a simple portfolio policy that is hardly optimal. Alternatives that optimize the portfolio subject to a low level of volatility could be considered.

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