Simulating the Blanchard Conjecture in a Multi-Period Life-Cycle Model

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Abstract

In recent writings, Olivier Blanchard has suggested that when the safe rate on government debt is less that the economy's growth rate, additional deficit-financed U.S. federal spending would come at no cost to any future generation and benefits to some. This paper studies this question in a 10-period OLG, CGE model with aggregate risk, whose safe rate averages -2% annually and growth rate is 0. It shows that welfare losses to future generations resulting from the introduction of pay-go Social Security, financed with a 15% payroll tax, are roughly 20% measured as a compensating variation relative to no policy.

Introduction

In many developed countries, short-term interest rates are now very low or negative. This unusual situation is expected to continue for some time. Since the projected nominal growth rate of these economies exceeds their safe rates, Blanchard (2019) and others have asked whether a fiscal Ponzi scheme could be Pareto efficient, i.e., raise at least one generation's expected utility without lowering any others. In related papers, Blanchard and Summers (2019) and Rachel and Summers (2019) propose using additional deficit-financed U.S. federal spending to keep government short rates from hitting the supposed zero lower bound, leaving a supposed shortfall in aggregate demand.

This paper constructs a more detailed version of Blanchard's (2019) model to re-examine his findings that successful Ponzi schemes are a distinct possibility. First, the paper's model has ten, not two overlapping generations. This is crucial, as more periods permits more intergenerational risk sharing among contemporaneous generations, which leaves less scope for Social Security to share generational risk (see Krueger and Kubler, 2016). Second, unlike in Blanchard's paper, where a large fraction of the wage is safe for computational feasibility, in our baseline model the wage is fully variable and is determined by the marginal product of labor. This is important since a safe endowment limits the main downside from Ponzi schemes – the crowding-out of capital's induced reduction in real wages. Third, while Blanchard models risk via TFP shocks only, we include two uncorrelated sources of risk – TFP shocks and iid capital depreciation shocks. This makes the consumption of the old riskier, making them natural demanders of safe bonds. Apart from these modifications, the paper's model and calibration adheres as closely as possible to Blanchard's. In particular, the model, like his, features zero growth and uses extreme

parameter values to generate an average negative safe rate, in our case negative 2 percent on an annualized basis (much lower than the 8.1 percent average annual risky rate).

We find that, when the prevailing, time-0, annual risk-free rate is negative 2 percent annually, implementing a pay-go pension Ponzi scheme financed with a 15 percent payroll tax makes all newborn generations significantly worse off. Those born in the long run are worse off by 19.9 percent, on average, in terms of their expected lifetime utility, measured as a consumption-compensating differential. Older generations alive at time 0 are better off. Specifically, the initial older generations – four-period olds through nine-period olds – experience welfare gains ranging from 0.65 percent to 4.64 percent.[1] Using a 5 percent payroll tax to finance the Ponzi scheme lowers the welfare of future newborns to 6.3 percent, on average. Making almost a half of average wages certain and again employing the 5 percent payroll tax reduces the average expected utility loss of future generations from 6.3 percent to 1.4 percent.

Understanding Welfare Losses

In our model, the average risk-free rate remains negative with the introduction of Social Security. This means that, as in Blanchard's theoretical model, Social Security, on average, provides a cheaper means of safely swapping current for future consumption compared to investing in government bonds. So, why, then, does Social Security hurt future generations in our model and not in Blanchard's? First, as mentioned above, one channel is the effect of crowding out of capital on the wages. In Blanchard's model, this effect is minimized since with wages being in large part

[1] When simulating the model with Social Security in place, we start from the same, time 0 initial condition as we employ in the model without it. Hence, the initial oldest (10-year old) generation experiences no change in welfare from the introduction of Social Security.

(50 percent, on average) fully safe due to the assumed wage endowment, the reduction in total wage compensation from crowding out is limited. In our model, crowding out is significant: the capital stock drops by 15.8 percent on average when Social Security is introduced, which translates into a 5.5 percent average drop in wages.[2] The corresponding values for Social Security at the 5 percent payroll tax level are 6.0 percent and 2.0 percent for the decline in capital and wages, respectively.

Another reason is that with Social Security, average net transfers over a newborn's lifetime are negative and account for a large fraction of average lifetime resources. In particular, in the stochastic steady state, the present value of net transfers (tax payments when working and benefits in retirement), discounted by the average risky rate, accounts for 14.3 percent (4.7 percent) of the present value of pre-tax wages with 15 percent (5 percent) payroll tax level. Finally, consumption variability when old increases by 18.8 percent (6.3 percent) with 15 percent (5 percent) Social Security relative to no policy. This is to be expected since with the pay-go benefit proportional to the wage, old-age consumption is more strongly linked to TFP risk (in bad times, the old get back less than what they put in during their working periods of life).

Simulating the Blanchard Conjecture Under Favorable Assumptions

To investigate whether the welfare losses associated with the introduction of Social Security are mitigated by following Blanchard and making wages, in large part, entirely safe, we introduce a safe wage endowment equal to 43 percent of the average wage and reduce the Social Security payroll tax to 5 percent. We calibrate the model so that the average risk-free rate is negative 2

[2] The corresponding maximum values of the drop are 18.80 percent and 6.64 percent, for capital and wages, respectively.

percent without Social Security in place and start from the initial condition featuring an annual risk-free rate of negative 2.5 percent. With this, crowding out resulting from the introduction of Social Security is much less pronounced than before: now the capital stock drops by 1.26 percent on average (compared to 5.98 percent with no wage endowment and same payroll tax level), which translates into 0.42 percent average drop in wages (compared to a 2.02 percent average drop with no wage endowment). Nevertheless, all newborn generations are hurt, although welfare losses are much smaller, averaging 1.43 percent in the long run. Thus, our model still generates long-run welfare losses from Blanchard's Ponzi scheme even when we invoke with felicitous wage-endowment assumption.

The Model and Its Calibration

The model, developed in Hasanhodzic and Kotlikoff (2018, 2019), features 10 overlapping generations with TFP and capital depreciation shocks. Each agent works full time through retirement age of 7, supplying one unit of labor, dies at age 10, and maximizes expected lifetime utility. Cohort members are identical. We use a time separable, multi-period analogue to Blanchard's utility function. Production is Cobb-Douglas, with total factor productivity given by a trend stationary AR(1) process with normal innovations. There are no adjustment costs. Firms maximize static profits. Like in Blanchard, government consumption is zero.

Households save and invest in either risky capital or one-period safe bonds. Bonds are in zero net supply, but, as shown in Green and Kotlikoff (2008), fiscal policy can be labeled in an infinite number of ways to produce whatever time path of explicit and implicit debts the government wishes to report. Such relabelings makes no difference to real outcomes. Hence, our model can

be read as including government debt or not depending on the reader's preferences. Except for risk aversion and the volatility of the stochastic rate of depreciation, the calibration is standard and follows that in the above-mentioned papers. These parameters are chosen to yield a risk-free rate of negative 2 percent annually. Specifically, in the baseline model, we set risk aversion to 16 and the volatility of depreciation rate to 3.2 times the empirically relevant estimate of Ambler and Paquet (1994). In the fixed endowment model, the values are 14 and 4 for the risk aversion and empirical volatility multiple, respectively.

Defining Welfare Gains and Losses

Each cohort's newborn's welfare gain or loss is defined as the compensating consumption differential needed, in the no-policy economy, to achieve the average expected lifetime utility that cohort enjoys under the policy. For *newborn* generation x, we first compute the factor by which its consumption needs to be multiplied in all possible states it might experience in the model with Social Security to achieve the same lifetime utility as all generations enjoy on average in the model without Social Security. For the *initial* generation x, the compensating consumption differential is the factor by which one needs to multiply x's consumption in all possible states that might arise to equate its *remaining* expected lifetime utility to that of generation x in the model without Social Security.

Conclusion

In recent writings, Olivier Blanchard has suggested that when the safe rate on government debt is less than the economy's growth rate, fiscal Ponzi schemes, such as Social Security, would come at no cost to any future generation if one measures their welfare in terms of expected lifetime

utility. Blanchard (2019) confirms this conjecture in a two-period overlapping generations model in which a large portion of the wage is safe for computational feasibility. This paper studies this question in a more detailed ten-period OLG, CGE model in which the wage is fully variable and given by the marginal product of labor. It finds that welfare losses can be enormous – as large as 20 percent – for generations born after the introduction of Social Security.

Solving a model like ours is difficult because of the well-known curse of dimensionality, but recent computational breakthroughs have made it eminently feasable. The difference between Blanchard's results and ours highlights the importance of deploying such computational advances in studying more robust and realistic models when testing conjectures about the real world. Echoing Blanchard and Weil (2001), it also demonstrates that successful Ponzi schemes are highly dependent on producing economic environments which crude models cannot possibly capture.

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