

## OPTIMAL DEBT MANGEMENT

The recent turbulent years have shifted the research attention to government debt management and optimal debt structure issues. Most of the optimal debt management theoretical literature so far has abstracted from the empirical evidence that shows that Debt Management Offices rarely buy back their debt and that they prefer to leave the outstanding instruments to mature. The motivation for this theoretical choice has been mainly because of tractability and computational simplicity.

Faraglia et al (2017) empirical analysis finds that in the past callable bonds have been extensively used from the Second World War until the '80s in the US. In particular FMOS show that in the '50s callable bonds were on average 40% of the long bond issued and in the '80s 25%. Most of the callable bonds have been called back at the first calling date available. This implies that the debt managers have actively managed the structure of debt using these instruments.

In this project we aim to study under which circumstances the government wants to buy back debt and the extent of the repurchases and extending it to the use of callable bonds.

The original project proposed two years ago for the CERF fellowship as now developed further and taken further steps in the study of optimal fiscal policy and debt management.

In the revision of Faraglia et al. (2017) we have extended our optimal fiscal policy model allowing the government to choose how much long term debt the government would like to repurchase after one period from issuance. This has been done in order to validate the no buy back assumption.

In the last months we have checked that in a model with full buyback and frictionless financial markets, actually full buy back is not always optimal. Then we introduced transaction costs to issuance and repurchases carefully calibrated to bid ask spreads in government bond rates in the US. We find that the government would want to buy back long term debt only occasionally, when debt is low and when debt is decreasing. Full buy back is then rarely optimal.

We then have provided a welfare analysis that shows that the loss in welfare associated with buy back and transaction costs is significant compared to the case of no buyback.

Moreover, we have developed a three period game with asymmetric information that shows how the government could face the shutdown of secondary markets if full repurchases are allowed and a probability of default is assumed. This result shows how reluctant government are to enter the secondary markets and how only callable bonds could incorporate the option price of repurchases. This model will be stand-alone working paper that will be developed in the next months with the title "A Short Note on Optimal Debt Management under Asymmetric Information" (July 2017).

These results are important for the further development of our theory. Now we know that under a calibrated version of the no buy back model actually the government would like to have a little freedom and occasionally buy back some of its debt. However, the no-buyback morel and the optimal buyback one are almost identical.

To get to this stage has been quite challenging from the computational point of view. The optimal buyback model adds more state variables and most importantly an extra occasionally binding constraint in the Ramsey problem that creates a lot of nonlinearities in the optimal solution. We have carefully fine-tuned our "Condensed PEA" to deal also with this problem achieving accurate solutions that can pass quite stringent accuracy tests such as the Euler Equation Error test.

In the next steps we will then allow the government to have the opportunity to buy back debt closer to maturity to mimic the callable bond structure. Once this is achieved we will turn to the data and compare our results with the empirical evidence.

The current first steps towards the full callable bond model are currently incorporated in second revision of Faraglia, Marcet, Oikonomou and Scott (2017) that has been resubmitted again to the *Review of Economic Studies*.

The extensions of Faraglia et al. (2017) are an important part of the current CERF project. Not only this has been an important step to understand the circumstances under which the model allows optimal buyback but also an opportunity to develop further the computational techniques that are necessary in case of multiple maturities and occasionally binding constraints. For all these reasons CERF support in the project has been acknowledged in the revision of the paper.

Moreover, these preliminary results have been presented this year in: Lausanne HEC (Feb 2017), St Louis Federal Reserve (March 2017), NY CUNY (April 2017), Stony Brook (April 2017), Surrey (May 2017), CEF (Society for Computational Economics, June 2017).

The current results and the general project will be presented in the next "CERF in the City" next term.

Bibliography available on Elisa Faraglia's webpage:

- "Government Debt Management: the Long and the Short of It", with A. Marcet, R. Oikonomou and A. Scott, August 2017, CEPR [DP 10281](#)
- "A Short Note on Optimal Debt Management under Asymmetric Information", with A. Marcet, R. Oikonomou and A. Scott, July 2017.