Reconciling two models of public debt and interest rates

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Background

This paper provides a careful replication and evaluation of the differences between two models of the relationship between public debt and interest rates. The American Economic Association presidential address of Olivier Blanchard (2019) provided evidence that increasing government debt in times of low interest rates could be welfare improving.

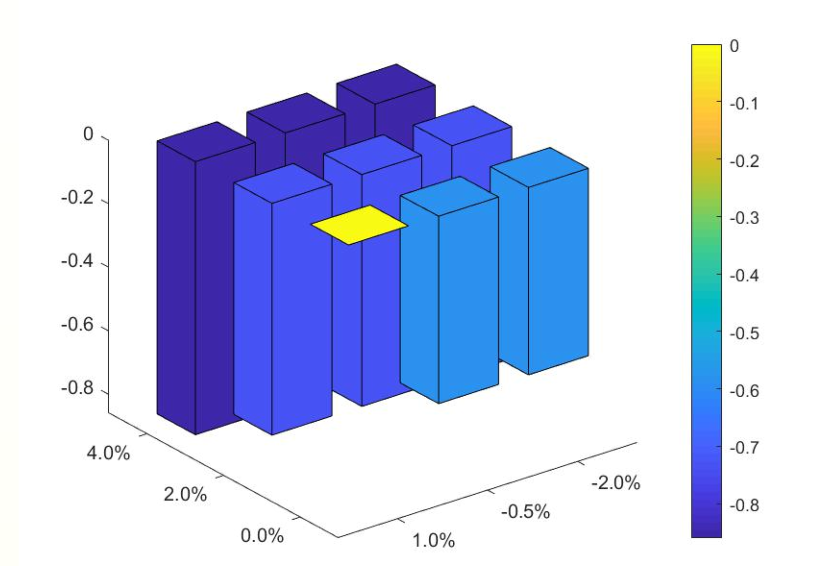
Evans (2020) recreates the Blanchard approach and finds an opposite result. Evans mentions some possibilities of what might be different in his study from Blanchard's, but he provides no direct mapping between the two studies. This paper seeks to identify the differences with the goal of providing further evidence for the relationship between public debt and interest rates.

Methods

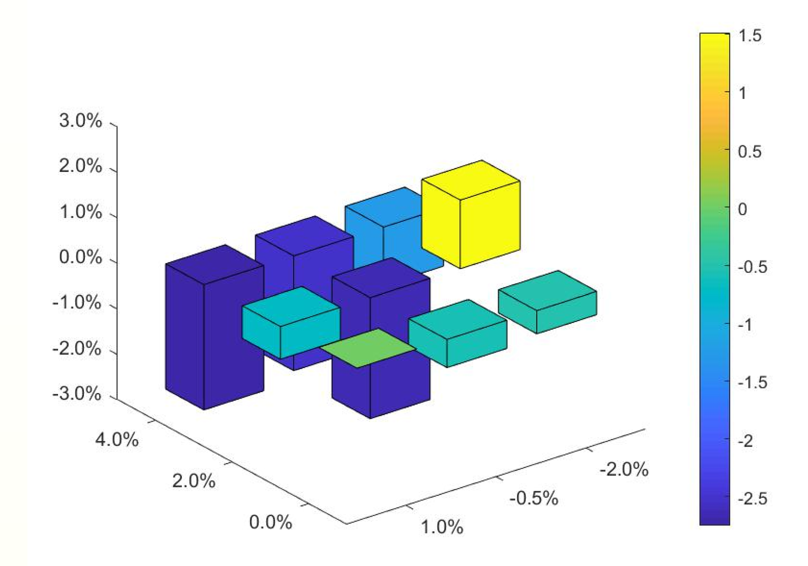
Evans (2020) replicates two models from Blanchard (2019): Figure 7, the welfare effect of a transfer of 5% of saving using linear production function, and Figure 9, the welfare effect of a transfer of 5% of saving using Cobb-Douglas production function.

For Evans (2020) code, as the major structure for linear production function and Cobb-Douglas function is the almost identical, the only differences are some equation within defined functions, I focus my comparison on the code for linear production model.

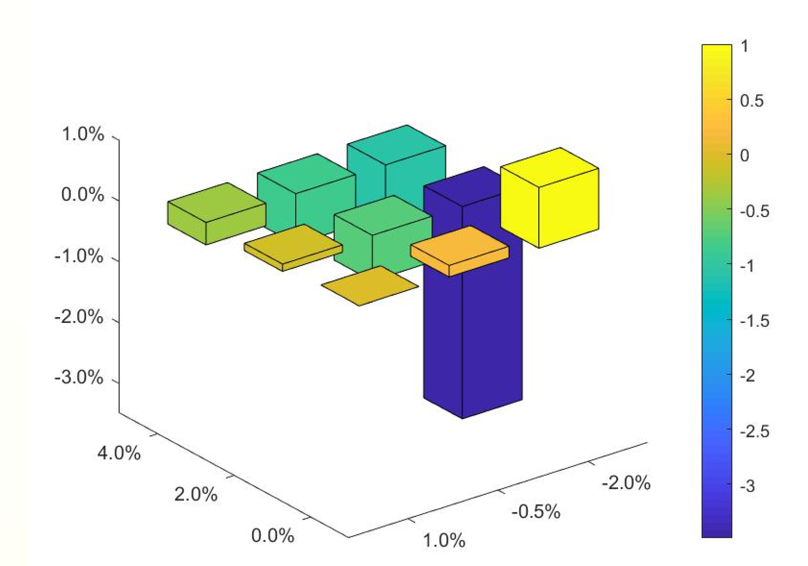
Evans 2020 Table 4



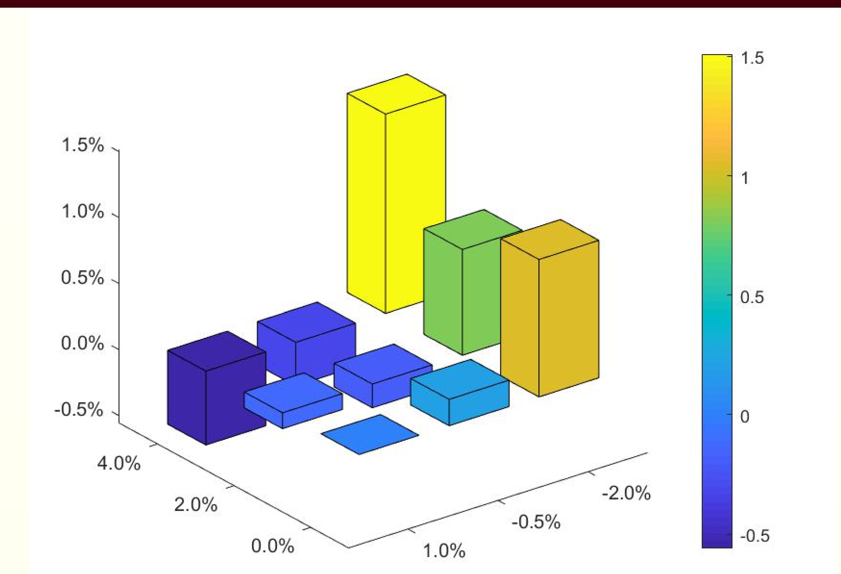
Modifications 1.1



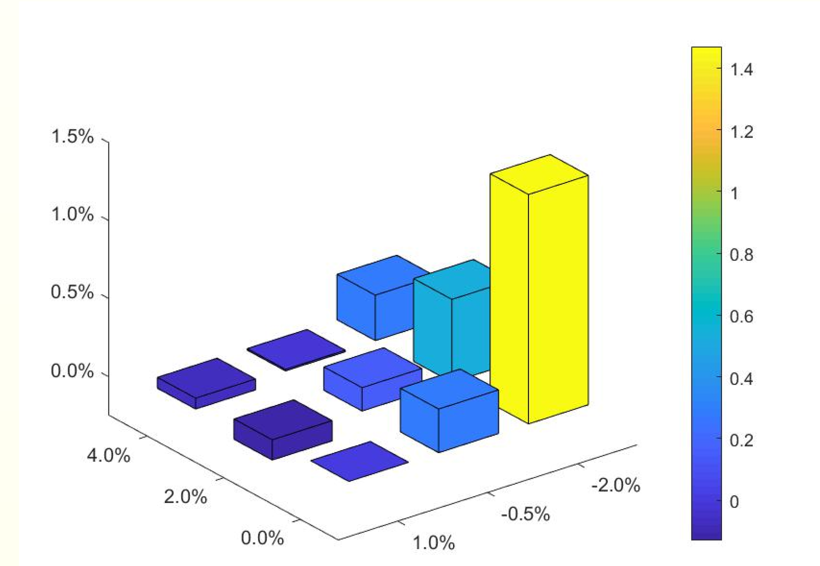
Modifications 1.2



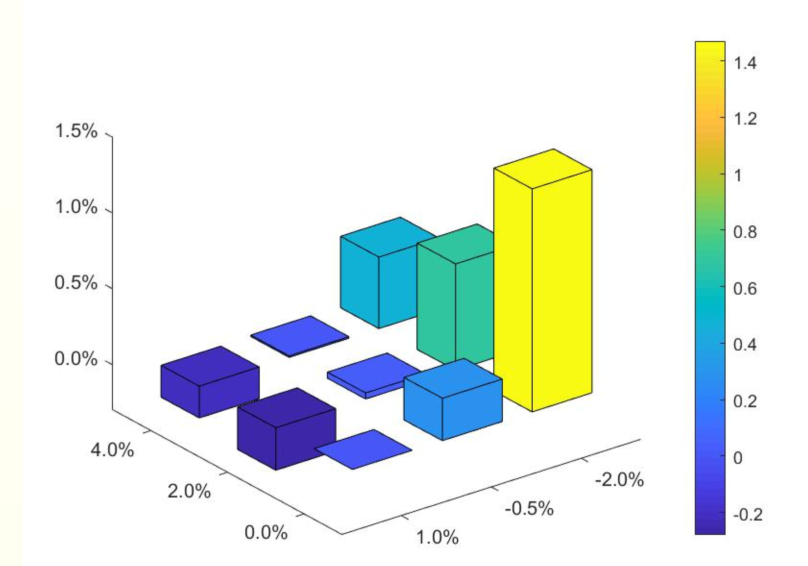
Modifications 2



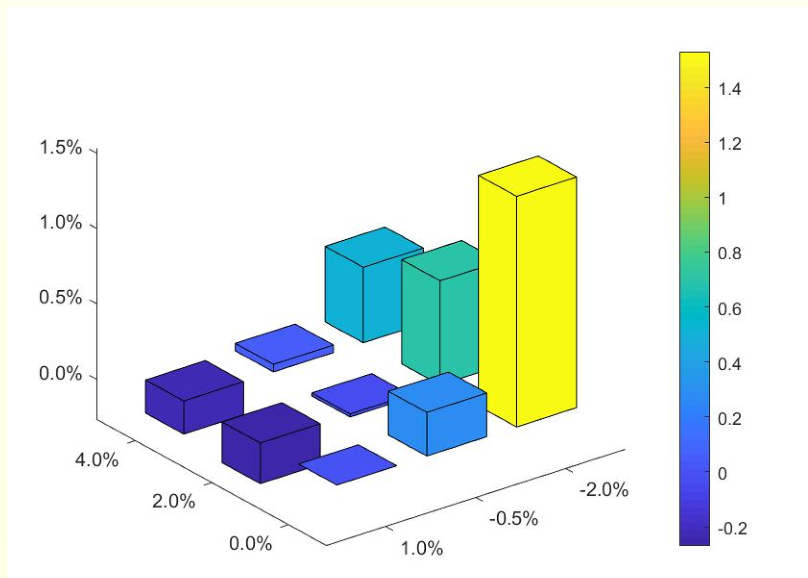
Modifications 3



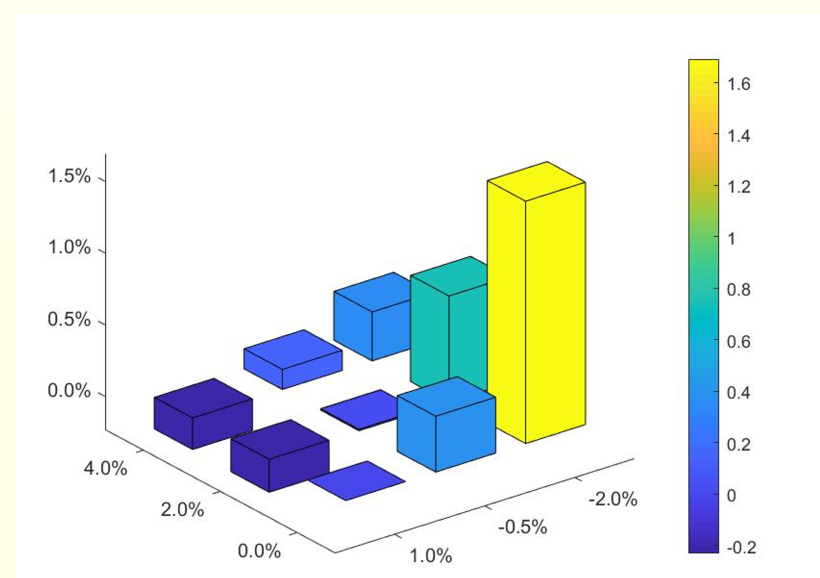
Modifications 4



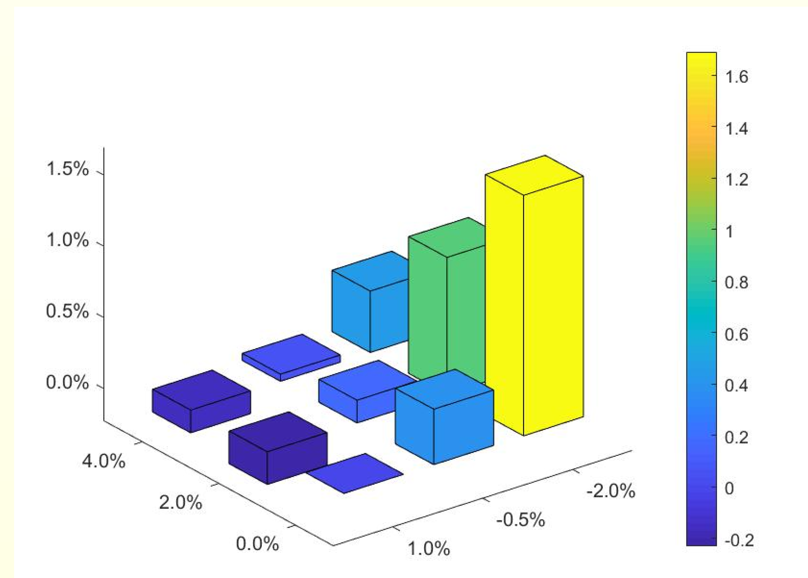
Modifications 5



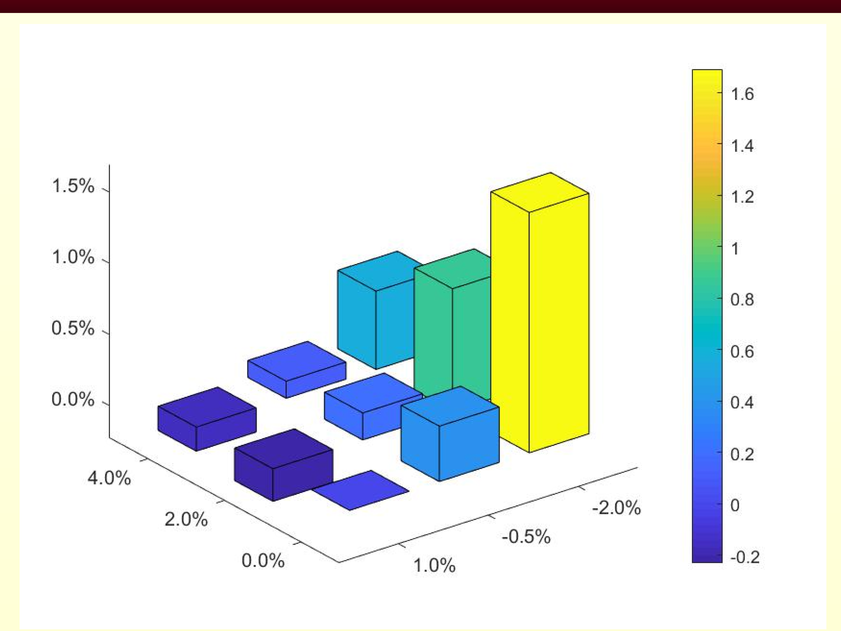
Modifications 6



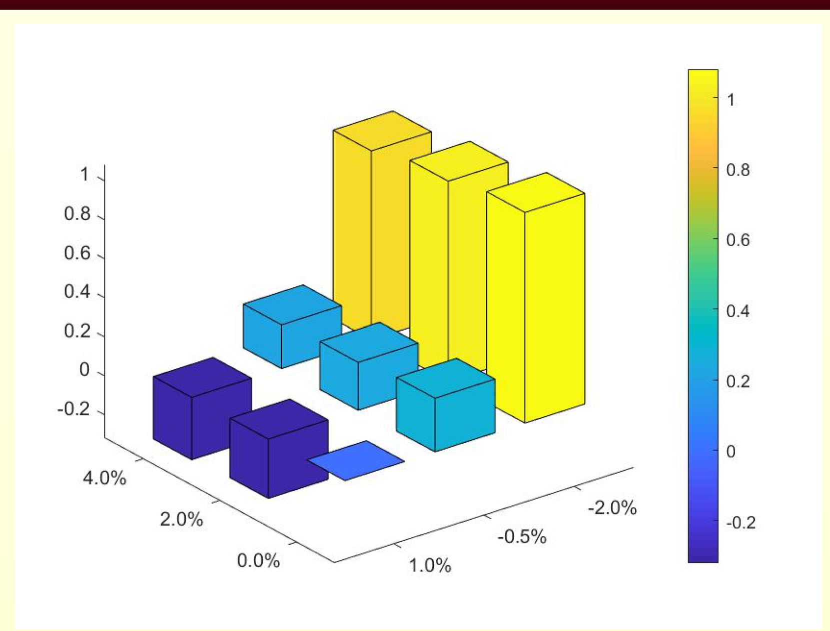
Modifications 7



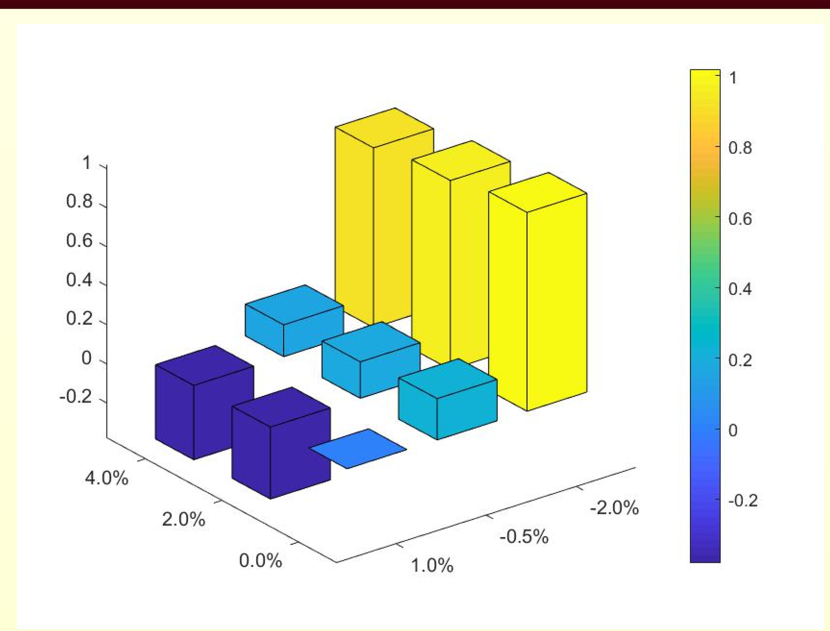
Modifications 8



Modifications 9



Blanchard 2019 Figure 7



Welfare effects of 5% intergenerational transfer

Except for the last two figures, the figure shows the percentage change in average lifetime utility.

The last two figure shows the differences in mean lifetime utility.

Conclusion

In total, I made 9 modifications to the Evans' code to match the Blanchard Python code. While most modifications are just differences in the definition of variables or in the choice of parameter values, after accumulating all modifications, the Evans model can fully replicate the Blanchard model.

Limitations

My main focus is only on the linear production model, but I presume my modification will create similar influence in the Cobb Douglas Model.

References

Acalin, Julien. Replication of Blanchard (2019).

Blanchard, Olivier, "Public Debt and Low Interest Rates," American Economic Review, 109:4, pp. 1197-1229 (April 2019)

Evans, Richard W., "Public Debt, Interest Rates, and Negative Shocks," American Economic Review (forthcoming, May 2020).

Diamond, Peter. National debt in a neoclassical growth model. American Economic Review, 55(5-1):1126–1150, December 1965.

Acknowledgements

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