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LITERATURE SURVEY, VERSION 1

Dynamics of Credit Expansions and Contractions

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1 Relation to previous work

2 Some references

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3 Sketch of an idea

I argue that our monetary flow model cannot be easily subsumed within the usual DSGE model by considering the continuous-time limit of both.

- The continuous-time limit of the usual DSGE model is considered in [12], where, as might be expected, it is shown to lead to an ordinary differential equation of standard type and low dimension (actually, eight).
- In the continuous-time limit our monetary flow model leads to a *delay-differential equation* (DDE), also called differential equations of the *retarded* type. This results from the fact that the delays in the loan array are on a larger scale from the update increment (period), and remain macroscopic when the differential limit is taken.
- In general DDEs have an infinite number of eigenvalues and lead to dynamic behavior that is inherently more complex than standard differential equations of low dimension. For example, a first-order DDE with a single delay can easily lead to oscillatory behavior. Erneux [29] provides a good introduction and survey.
- DDEs are used to model a macroeconomic system in [13], where rare poisson shocks are modeled. As they put it in their motivation, "... the simple awareness of large and rare 'Poisson jumps' leads to an adjustment of households' optimal consumption plans. One crucial difference to business cycle shocks is that an econometrician may not observe rare events for a longer period, and thus households might appear to be irrational." A similar justification can be made for the long delays that naturally result from loan contracts.

References

[1] J. Gali. *Monetary Policy, Inflation, and the Business Cycle: An Introduction to the New Keynesian Framework*. Princeton University Press, Princeton and Oxford, second edition, 2015.

[2] M.K. Brunnermeier and Y. Sannikov. A macroeconomic model with a financial sector. *The American Economic Review*, 104(2):379–421, 2014.

[3] M.K. Brunnermeier, T.M. Eisenbach, and Y. Sannikov. Macroeconomics with financial frictions: A survey. Technical report, National Bureau of Economic Research, May 2012. Working Paper 18102.

[4] G. Ordoñez. The asymmetric effects of financial frictions. Technical report, National Bureau of Economic Research, September 2012. Working Paper 18360.

[5] M. Kandil. Asymmetry in the effects of US government spending shocks: Evidence and implications. *The Quarterly Review of Economics and Finance*, 41(2):137–165, 2001.

[6] M.H. Pesaran and T. Xu. Business cycle effects of credit shocks in a DSGE model with firm defaults. Technical report, April 2016. USC-INET Research Paper No. 16-13.

[7] J. Benes, M. Kumhof, and D. Laxton. Financial crises in DSGE models: A prototype model. Technical report, April 2014. IMF Working Paper 14/57.

[8] V. Cúrdia, A. Ferrero, G.C. Ng, and A. Tambalotti. Evaluating interest rate rules in an estimated DSGE model. Technical report, August 2011. FRB of New York Staff Report no. 510.

[9] A. Justiniano and G.E. Primiceri. Measuring the equilibrium real interest rate. *Economic Perspectives*, 34(1):14–27, 2010.

[10] R. Boucekkine, O. Licandro, and C. Paul. Differential-difference equations in economics: on the numerical solution of vintage capital growth models. *Journal of Economic Dynamics and Control*, 21(2):347–362, 1997.

[11] R. Boucekkine, M. Germain, O. Licandro, and A. Magnus. Creative destruction, investment volatility, and the average age of capital. *Journal of Economic Growth*, 3(4):361–384, 1998.

[12] J. Fernández-Villaverde, O. Posch, and J.F. Rubio-Ramírez. Solving the new Keynesian model in continuous time, February 2011. University of Hamburg, mimeo.

[13] O. Posch and T. Trimborn. Numerical solution of dynamic equilibrium models under Poisson uncertainty. *Journal of Economic Dynamics and Control*, 37(12):2602–2622, 2013.

[14] J.E. Stiglitz. Towards a general theory of deep downturns. Technical report, National Bureau of Economic Research, August 2015. Working Paper 21444, available at `http://www.nber.org/papers/w21444`.

[15] T.A. Knoop. *Business Cycle Economics: Understanding Recessions and Depressions from Boom to Bust: Understanding Recessions and Depressions from Boom to Bust*. Praeger, ABC-CLIO, Santa Barbara, CA, 2015.

[16] G. Ertz and F. Portier. Money Injections in a Neoclassical Growth Model. Technical report, Université Catholique de Louvain, July 1998.

[17] G. Rocheteau, P-O. Weill, and T-N. Wong. Long-run and short-run effects of money injections. Technical report, March 2015. Available at `https://research.stlouisfed.org/conferences/summer_workshop/docs/Long-Run_and_Short-Run_Effects_of_Money_Injections.pdf`.

[18] C.J. Niggle and L.R. Wray. Two Reviews of Basil Moore: "Horizontalists and Verticalists: The Macroeconomics of Credit Money". *Journal of Economic Issues*, 23(4):1181–1189, 1989.

[19] R.E. Lucas. Nobel lecture: Monetary neutrality. *Journal of political economy*, 104(4):661–682, 1996.

[20] S. Fischer. Long-term contracts, rational expectations, and the optimal money supply rule. *The Journal of Political Economy*, pages 191–205, 1977.

[21] J.B. Taylor. Aggregate dynamics and staggered contracts. *The Journal of Political Economy*, pages 1–23, 1980.

[22] W.J. den Haan, S.W. Sumner, and G.M. Yamashiro. Bank loan portfolios and the monetary transmission mechanism. *Journal of Monetary Economics*, 54(3):904–924, 2007.

[23] E. von Böhm-Bawerk. *The Positive Theory of Capital*. Libertarian Press, South Holland, Illinois, 1959. Originally published 1889; translated by G.D. Hunke; Volume II of "Capital and Interest", in three volumes.

[24] F.A. Hayek. *Capital and Interest*. Univ. Chicago Press, Chicago, 2015. L.H. White ed., Volume XI in "The Collected Works of F.A. Hayek".

[25] F.A. Hayek. *The Pure Theory of Capital*. Routledge, New York, 2008. Originally published 1941; L.H. White ed., Volume XII in "The Collected Works of F.A. Hayek".

[26] M. Blaug. *Economic Theory in Retrospect*. Cambridge University Press, Cambridge, fifth edition, 1997.

[27] M. Sensier, D. R. Osborn, and N. Öcal. Asymmetric interest rate effects for the UK real economy. *Oxford Bulletin of Economics and Statistics*, 64(4):315–339, 2002.

[28] G. Dell'Ariccia and P. Garibaldi. Gross credit flows. *The Review of Economic Studies*, 72(3):665–685, 2005.

[29] T. Erneux. *Applied Delay Differential Equations*. Springer, New York, 2009.