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Endogenous Money – On Banking Behaviour in New and Post Keynesian Models

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Abstract

In New and Post Keynesian macroeconomic models, money supply is assumed to be endogenous. In this paper we explicitly derive the behaviour of the banking sector regarding the loan supply, bonds demand, and demand for reserves from portfolio and liquidity considerations. The process of money creation is determined by the interaction of banks, non-banks, and the central bank on the interdependend markets for reserves, loans, and bonds. Although the microeconomics of bank behaviour is modelled quite simply, interest rates as well as monetary aggregates depend on policy variables in a non-linear and non-monotonous way.

Keywords: endogenous money, loans market, bonds market, central banking

JEL Classification: E51, E44, B22

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1 Introduction

The endogeneity of money supply is a widely discussed topic, especially in New and Post Keynesian macroeconomics. It can be taken as a common conviction that individual behaviour regarding credit demand and supply as well as holding currency and deposits has an impact on the money creation process. These issues are often neglected in Neoclassical and Monetarist type models. There are, however, very different approaches how endogeneity of money originates (for an extensive review see e.g. Palley (2002), Palley (2008*b*)). New Keynesian economics (see e.g. Mankiw and Romer (1991), Romer (2000), Woodford (2003)) is dominated by the *"New Consensus"* where the exogenously determined money supply of the central bank (LM curve) is replaced by the Taylor rule (Taylor (1993)). The monetary policy targets inflation and output gap by controlling the real interest rate, while there is no explicit theory about the creation of credit and money.

In Post Keynesian economics money is endogenous by its nature (Lavoie (1992), Lavoie (2006), Rochon (1999)). There have been two distinct approaches developed which are usually denoted as the *"accomodationist"* (or horizontalist) and the *"structuralist"* (or verticalist) approach (see Moore (1988), Pollin (1991), Fontana (2004), Wray (2007), Palley (2008*a*)). Both schools have in common that the money creation process is determined by the behaviour of commercial banks and non-banks on the credit market. The process starts with credit demand, and credit creates deposits. The accomodation approach argues that an increase in credit demand leads to a need for additional reserves. In order to ensure the liquidity of the banking sector the central bank has to respond by increasing the money base and hence to accomodate the credit demand. In this view the microeconomic considerations of the commercial banking sector play a minor role. In contrast, the structuralist approach argues that commercial banks respond to an increase in credit demand with structural changes of their portfolio on the asset and the liability side. This may lead to a change in the demand for reserves and hence in the interaction with the central bank. However, there is no monotone relationship between credit demand and the response of the central bank, but complex structural effects on the interest rates and portfolio composition. While the accomodationists see the central bank's behaviour as a reflex to the non-bank public (which hence determines solely the money supply), the structuralists see a certain degree of autonomous central banking policy, hence money is endogenously generated by the interaction of the public, the central bank, and the commercial banks.

We argue, that it is important to investigate these complex interactions to understand how central bank policy impulses are conducted to the real sphere via credit and bonds market, as well as to understand how the real sphere affects the money creation process. Therefore, our approach is related to the structuralist view. We will not consider any strategic policy implications like the Taylor rule since such rules make sense only in the context of a full-fledged macroeconomic model. It is important to understand how commercial banks behave on credit, bond and reserve markets, and how they respond to changes on these markets as well as to changes in the central bank policy. As we will see, open market operations and changes in interest rates for borrowed reserves have – depending on the parametrization – complex and sometimes countervailing effects on variables like credit supply or bonds demand. Therefore, it is more reasonable to combine such a building block of the financial sector, as outlined in this paper, with a complete macroeconomic model, and then – if possible – to derive a rationale for monetary policy rules.

In contrast to most Post Keynesians who assume simple markup pricing for determining the loans interest rate, we develop a model of banking behaviour which is in some sense neoclassical: the (representative) bank has preferences regarding risk, return, and liquidity, and it manages its assets and liabilities via portfolio and Value at Risk techniques. A single commercial bank operates in competitive markets and responds to changes in market conditions as well as to changes in central bank policy. This allows for a detailed analysis of some spillover effects between credit and bonds market, the market for reserves, and the real sector (via income). Although the microeconomics of banking are portrayed in a very simplified way the results are not trivial.

The paper is organized as follows: Before developing our model, we briefly discuss two sources of endogeneity by means of two approaches in the literature. In section 2 we review the model of Bernanke and Blinder (1988) who introduce the idea how portfolio considerations of the commercial bank affect the money multiplier. Section 3 discusses the less common approach of Bofinger (2001) where changes on the credit market affects the bank's demand for central bank loans. This establishes a close relation between the interest rates on the market for credits and the market for central bank money via an optimization calculus of the commercial bank. Section 4 picks up both ideas in a consistent framework and extends them with liquidity considerations. These liquidity issues are twofold: When the bank's capital is fixed the volume of risky assets has to be restricted. On the liability side there is a risk of unperceived outflows of deposits which requires to hold a sufficient volume of liquid assets like excess reserves. All portfolio and Value at Risk decisions are calculated explicitly and exhibit nonlinear relationships between the central variables (e.g. loans (bonds) demand (supply)) and the interest rates. The money creation process is analysed in section 5. I starts with some multiplier considerations, and then develops a model of the financial sector which includes also non-bank behavior and discusses the the interdependency with the real sector of the economy. Section 6 gives a numerical example, section 7 concludes.

2 The approach by Bernanke and Blinder

In the approach by Bernanke and Blinder (1988), the commercial bank's simplified balance sheet contains reserves (R), loans (L^s), and bonds (B^b) as assets, while deposits (D) are the unique liability. There are no currencies and no central bank loans to commercial banks. The reserve requirements are rD, hence the balance sheet can be written as $E + L^s + B^b = (1-r)D$, where E are the excess reserves at the central bank with a zero interest rate. Since loans and bonds have both expected returns and a certain risk (credit failure and bonds price volatility) the commercial bank has portfolio considerations about its assets. The structure of the portfolio is given by:

$$\begin{aligned} E(i) &= \lambda_E(i)(1-r)D \\ L^s(i,\rho) &= \lambda_L(i,\rho)(1-r)D \\ B^b(i,\rho) &= (1-\lambda_E(i)-\lambda_L(i,\rho))(1-r)D \end{aligned} \tag{1}$$

where i is the interest rate of the bonds, and ρ is the interest rate of loans. Obviously λ_L depends positively on ρ, negatively on i, and vice versa for λ_B. For simplicity, Bernanke and Blinder assume that variations in ρ only affect the shares of L^s and B^b in the portolio.

The balance sheet of the central bank is given by

$$R = rD + E = rD + \lambda_E(i)(1 - r)D = (r + \lambda_E(i)(1 - r))D \qquad (2)$$

Hence the money multiplier is $m(i) = [r + \lambda_E(i)(1 - r)]^{-1}$. In contrast to the exogenous multipliers in common textbook models there is now a dependency of the multiplier on the behaviour of the commercial bank, i.e. the multiplier depends on the endogenously determined bonds interest rate i.

The equilibrium in the loans market is determined by $L^d(i, \rho, y) = L^s = \lambda_L(\rho, i)(1-r)D$. The demand for loans depends positively on i and income y, and negatively on ρ. The bonds market is not explicitely modelled in the Bernanke/Blinder approach. While the loans and the bonds market determine the money supply $D^s = m(i)R$, the money demand $D^d = D^d(i, y)$ follows the standard assumptions (positive dependency on y and negative dependency on the bonds interest rate i). Money market equilibrium is given by $D^d(i, y) = m(i)R$ which is the conventional LM curve. From these results Bernanke and Blinder construct a so-called CC curve as a substitute for the IS curve where the goods and credit markets are in equilibrium. Together with the LM curve they study the impact of monetary impulses on the real sector.

For the purpose of our paper we are not interested into the CC-LM macro model but we pick up the idea that the commercial bank's behaviour is driven by portfolio considerations, which have important implications for the loans market and the money market. The mechanistic exogenous money multiplier is modified to an endogenous money multiplier, based on the behaviour in the loans market and on portfolio considerations of the commercial bank. There are, however, some shortcomings which deserve an extension of the framework (for further critical remarks see Bajec and Graf Lambsdorff (2006)).

First, there are no central bank loans to the commercial bank, even though the interest rate policy plays a prominent role in central banking. Changes in the central banks interest rate ρ_c for refinancing commercial banks is an important component of monetary policy. If we allow central bank credits L_c with interest rate ρ_c, the commercial bank has not only to decide on the portfolio structure of a given volume, but also on the volume itself.

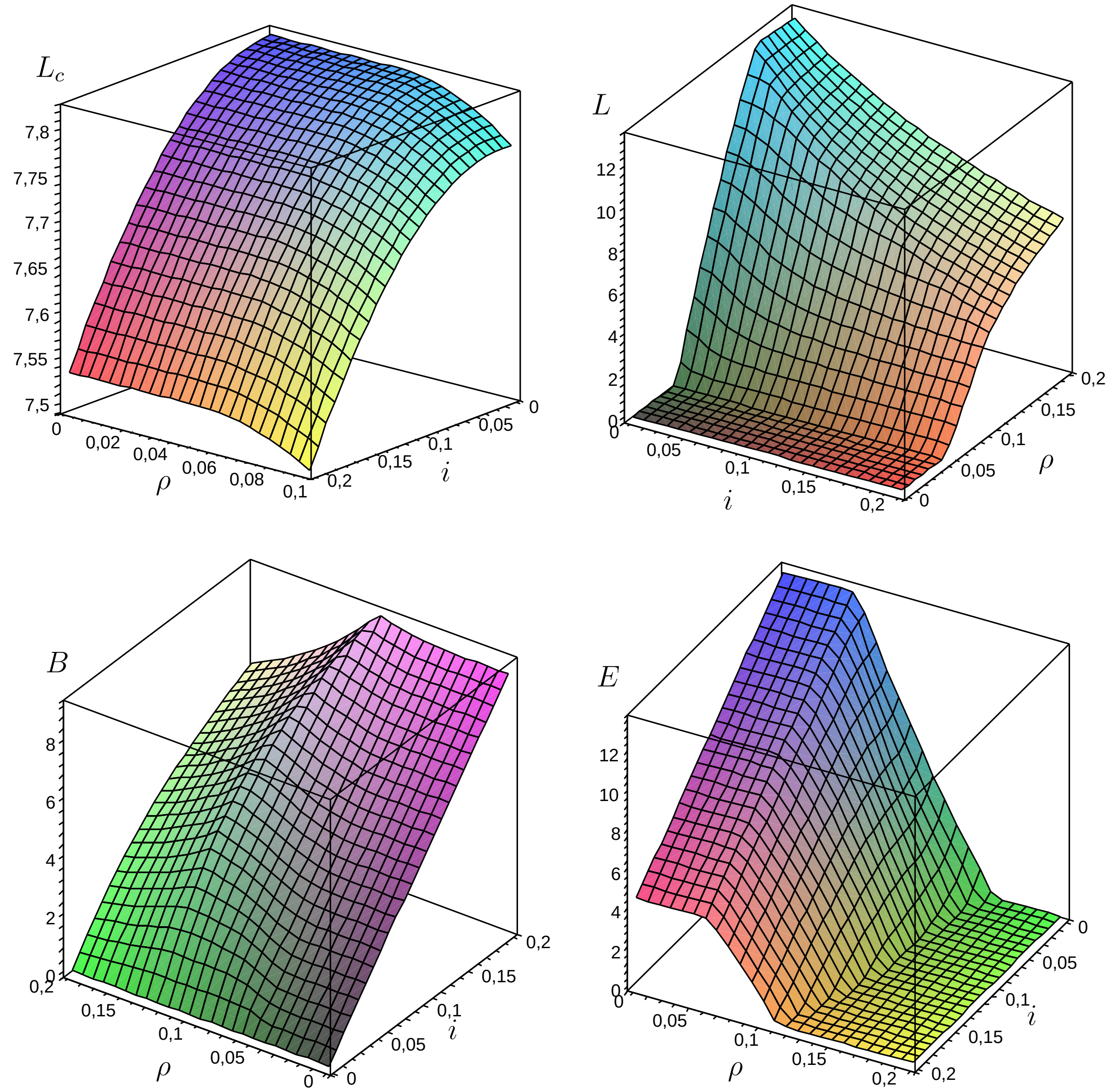

Figure 4: *Behavioral functions: Reserve demand L_c, credit supply L, bonds demand B, excess reserve demand E (with fixed deposits D)*

Appendix

The uncertain value of the portfolio is given by $\tilde{V} = V + \lambda V r$. The utility of the uncertain wealth is givven by a CRRA utility function: $u(\tilde{V}) = \tilde{V}^{(1-\theta)}/(1-\theta)$. It is not trivial to compute directly the expected utility $E[u(\tilde{V})]$, so we calculate the risk premium ψ and maximize the utility of the security equivalent:

$$\max_{\lambda_R \in [0,1]} u(V - \psi) = E[u(\tilde{V})]$$

Since $E[\lambda_R V r] = \lambda_R V \mu_R$ and $Var[\lambda_R V r] = \lambda_R^2 V^2 \sigma_R^2$ it is well known from literature that the risk premium is approximate

$$\begin{aligned} \psi &\approx -\frac{1}{2}\frac{u''(V)}{u'(V)}\lambda_R^2 V^2 \sigma_R^2 - \lambda_R V \mu_R \\ &= \frac{1}{2}\theta \lambda_R^2 V \sigma_R^2 - \lambda_R V \mu_R \end{aligned}$$

Inserting ψ into the utility function yields

$$u = \frac{(V(1 + \lambda_R \mu_R - \frac{1}{2}\theta \lambda_R^2 \sigma_R^2))^{(1-\theta)}}{1-\theta} \tag{32}$$

Maximizing this expression with respect to λ_R leads to the well known portfolio result:

$$\lambda_R = \min\left\{\frac{\mu_R}{\theta \sigma_R^2}, 1\right\}$$

which is independend from the invested portfolio volume V.