Theoretical and Applied Economics
Volume XXIV (2017), No. 1(610), Spring, pp. 261-266

A formal look at the negative interbank rate

Gerasimos T. SOLDATOS
American University of Athens, Greece
soldgera@yahoo.com

Abstract. *This paper develops a simple theoretical model regarding the policy means of negative interbank rate against recession. It is found out that the adoption of such a rate does not differ much from a scheme of full-reserve banking. That is, this paper adds the negative interbank rate to those means aiming at zero bank profit to the extent that such is also the aim of the 100% reserve rule. And, to the extent that recession forms an equilibrium phenomenon, this policymaking is necessarily destabilizing towards some full-employment state of affairs, but the transition is not found to be smooth depending on how the elasticities of loan demand and deposit supply react.*

Keywords: Negative interbank rate, Full-reserve banking, Elasticities of loan demand and deposit supply.

JEL Classification: E31, E43, E44.

1. Introduction

There has been much discussion in the financial press in connection with the June and September 2014 drive of European Central Bank's policy interest rate applied on its deposit facility below zero. Also, certain major central banks in Europe have adopted negative policy rates to chastise bank liquidity that is not loaned out. Policymakers have gone an extra mile further "by (i) introducing negative deposit rates (-0.2 per cent) (ii) announcing cheap long term loans targeted towards credit growth and (iii) launching a sovereign bond buying programme… having much to do with the trend towards negative Euribor rates" (Filip, 2015). All, in response to global recession having made some to propose as a remedy the use of even "gift money" (Soldatos, 2015). But, all again, are interrelated if one judges from Buiter's (2009) "three ways to overcome the zero lower bound": Increase the money people hold to spend (Humphrey 2015). And, in so far as the interbank market particularly is concerned, policy shocks in the desirable direction can influence positively both the financial sector and the real sector of the economy given that this market is the main funding source of banks in loan creation. Figure 1 depicts the contribution of the negative Euribor to the supply of loans to the private sector.

Figure 1

Source: TradingEconomics.com

There has been much empirical work on these developments. Nevertheless, no formal discussion of the negative interbank rate as a policy means *per se* has been offered so far at least to this author's knowledge. Formal, from the viewpoint of theoretical modeling, this is what this short paper attempts in the next section. There do exist models involving the interbank rate à la Poole (1968) where profit maximizing banks choose the amount of interbank loans, and monetary policy may be disrupted if not all banks can have access to the interbank market (Vari, 2015). This paper takes the interbank rate to be exogenously set by the policymaker, and finds out that a regime of negative interbank rate does not differ much from a scheme of full-reserve banking. The model is fairly simple but it does uncover this important feature of the current policymaking based on real interest rate considerations, because: "Indeed, in standard models, only the real interest rate and spreads between real interest rates matter. Thus, in most respects, negative interest rate

policy is conventional" (Kimball, 2015, R5). And, to the extent that global recession forms an equilibrium phenomenon, this policymaking is necessarily destabilizing towards some full-employment state of affairs, but the transition is not found to be smooth depending on how the elasticities of loan demand and deposit supply react. Section 3 concludes with some remarks on the merits of negative interbank rate and the need to investigate systematically its connection with the business cycle.

2. The analysis

Consider an all-private sector economy, banks, firms, and consumers, who have instituted some authority to be intervening in the interbank market whenever is needed. Let:

$$L = \lambda D = \frac{1-h}{h} D \tag{1}$$

where L and D denote loans to the firms and deposits from consumers, respectively, h is the reserve ratio, and λ is thereby the credit multiplier. And, let bank profit be:

$$\Pi = [r_L(L) - r]L + [r(1-h) - r_D(D)]D \tag{2}$$

or in view of (1):

$$\Pi = \{[r_L(\lambda D) - r]\lambda + [r(1-h) - r_D(D)]\}D \tag{2'}$$

where r_L and r_D are the lending and deposit interest rates, while r is the interbank rate. Under perfect competition, profit is zero, which yields from $(2')$:

$$r = \frac{r_D + \lambda r_L}{1-h-\lambda} = -\frac{r_D h + r_L(1-h)}{(1-h)^2} < 0 \tag{3}$$

These are nominal quantities. Letting p denote the inflation rate, (3) may be rewritten as follows:

$$\rho + p = -\frac{(\rho_D + p)h + (\rho_L + p)(1-h)}{(1-h)^2} = -\frac{\rho_D h + \rho_L(1-h)}{(1-h)^2} \tag{3'}$$

Hence, under a $\rho = 0$, $(3')$ gives the rate of disinflation accompanying it, which disinflation would be greater under a positive ρ, but less under a negative one. It turns out that $p = 0$ iff:

$$\rho^* = -\frac{\rho_D h + \rho_L(1-h)}{(1-h)^2} \tag{4}$$

Therefore, a negative interbank rate, punishing excess liquidity, would be growth promoting under price stability if (4) was satisfied. And, it would also be promoting a quasi-competitive banking, since *real* $\Pi = 0$, which would be the case under a 100% reserve rule. It "forces" presumably lending up to the point banks cover in real terms only their opportunity cost.

But, is price stability desirable? To answer this question let us see what $p = 0$ implies for bank pricing policy. Assume again nominal quantities and that the demand for loans and supply of deposits are given for simplicity (see e.g. Varelas, 2016) by:

$$L = A r_L^{-\varepsilon} \tag{5}$$

and

$$D = \Gamma r_D^{\mu} \tag{6}$$

where $\varepsilon > 1$ is the price elasticity of the demand for loans and $\mu < 1$ is the supply elasticity of deposits while A and Γ are positive numbers capturing the impact of bank regulation on bank productivity regarding L and D, respectively; regulation enhancing or diminishing bank productivity directly depending on whether these numbers exceed the unit or not. The assumption that $\varepsilon > 1$ reflects profit maximization under conditions of market power while if $\mu > 1$, an increasing r_D would be accompanied by exponentially increasing deposits. Solving (5) and (6) for the corresponding interest rate, inserting the solutions in (2) and maximizing it next with respect to L and D, one obtains from the first-order conditions that:

$$r = \frac{r_D(\varepsilon - 1)}{\varepsilon} \tag{7}$$

and

$$r = \frac{r_L(1 + \mu)}{\mu(1 - h)} \tag{8}$$

Equating (7) and (8) yields in turn that:

$$r_L = r_D \frac{\mu(\varepsilon - 1)(1 - h)}{\varepsilon(1 + \mu)} \tag{9}$$

and hence, that in real quantities:

$$\rho_L + p = (\rho_D + p)\frac{\mu(\varepsilon - 1)(1 - h)}{\varepsilon(1 + \mu)} \Rightarrow$$

$$\rho_L = \rho_D \frac{\mu(\varepsilon - 1)(1 - h)}{\varepsilon(1 + \mu)} - p\frac{\mu(1 - h) + \varepsilon(1 + \mu h)}{\varepsilon(1 + \mu)} \tag{10}$$

Under (4), $p = 0$; setting it in (10), the spread $(\rho_L - \rho_D)$ turns out to be higher than that without policy intervention, simply because setting $p = 0$ in (5) and (6) too, the demand for loans increases whereas the supply of deposits decreases. There appears to be a lot of credit rationing which could be relaxed if ρ was greater absolutely than the right-hand side of (4), since then $p > 0$ and the spread $(\rho_L - \rho_D)$ would become by (10) smaller. Indeed, if one reflects on that turning ρ negative is one more policy instrument against persistent recessionary trends, inflation rather than price stability is desirable.

Nevertheless (4) prompts a disequilibrium in the market of loanable funds, because equating (5) and (6), one obtains that:

$$r_D^{\mu} r_L^{\varepsilon} = \frac{A}{\Gamma}$$

and by virtue of (9):

$$r_D = \left(\frac{A}{\Gamma}\right)^{\frac{1}{\mu+\varepsilon}} \left[\frac{\varepsilon(1 + \mu)}{\mu(\varepsilon - 1)(1 - h)}\right]^{\frac{\varepsilon}{\mu+\varepsilon}}$$

and

$$r_L = \left(\frac{A}{\Gamma}\right)^{\frac{1}{\mu+\varepsilon}} \left[\frac{\varepsilon(1+\mu)}{\mu(\varepsilon-1)(1-h)}\right]^{-\frac{\mu}{\mu+\varepsilon}}$$

whose ratio is equal to one. At equilibrium, these two rates and subsequently the real ones are equal and (10) is satisfied when:

$$p = \frac{\mu(\varepsilon-1)(1-h) - \varepsilon(1+\mu)}{\mu(1-h) + \varepsilon(1+\mu h)} = -1$$

which disinflation is exactly what the policymaker wants to fight and induces the policy of $|\rho| > [\rho_D h + \rho_L(1-h)]/(1-h)^2$. The equilibrium is presumably recessionary and the policymaker disturbs it towards the full-employment one.

The transition may not be smooth, because if not anything else, it influences elasticities ε and μ. Consider, for instance, the following version of the Kaldor model:

$$L = Ar_L^{-\varepsilon} = I = \Delta K \tag{11}$$

$$D = \Gamma r_D^{\mu} = S \tag{12}$$

$$\Delta Y = q(I - S) \tag{13}$$

where I and S are investment and saving, respectively, ΔY and ΔK are the change in total output and physical capital, and q is a speed of adjustment coefficient. Inserting (11) and (12) in (13) and utilizing (3) yields:

$$\Delta Y = q\{Ar_L^{-\varepsilon} + \Gamma[r(1-h)^2 + \lambda r_L]^{\mu}\} \tag{13'}$$

from which one obtains:

$$\frac{\partial \Delta Y}{\partial \varepsilon} = -\frac{qAlnr_L}{r_L^{\varepsilon}} > 0$$

given that $0 < r_L < 1$ and hence, $lnr_L < 0$,
and

$$\frac{\partial \Delta Y}{\partial \mu} = q\Gamma[r(1-h)^2 + \lambda r_L]^{\mu} ln[r(1-h)^2 + \lambda r_L] > 0$$

An increase in either elasticity raises the rate of output change, which increase is expected to be the case when moving away from a contraction. Moreover, note that $\partial \Delta Y/\partial A$ and $\partial \Delta Y/\partial \Gamma$ are both positive, which implies that the policy authority may always use the regulatory environment surrounding deposits and lending to accelerate output growth.

3. Concluding remarks

The negative interbank lending rate is indeed a "good" policy means against prolonged contraction. Under adverse economic circumstances, Acharya and Merrouche (2012) find that bank liquidity affects overnight inter-bank rates, in both secured and unsecured markets; it is an effect that is absent under normal circumstances. And, precautionary hoardings by some settlement banks raise lending rates, engendering the spread of systemic risk operating through interbank rates unless this rate is lowered by the policymaker; much

more so when "a crisis causes a disparity in the liquidity held among banks" (Freixas et al. 2011, p. 2656). Nevertheless, "institutional features interacting with negative rates… make negative interest rate policy unconventional" (Kimball, 2015, R5), which is what the proposed manipulation of parameters A and Γ above, is supposed to address.

Finally, the full-reserve character of a negative interbank rate should be emphasized. As Soldatos and Varelas (2014) have shown, the purpose of a 100% reserve ratio is to nullify commercial bank seigniorage, and to the extent this seigniorage is identified with positive bank profit, there can be other means to zero bank profit beyond the full reserve rule. This paper adds the negative interbank rate to those means. Indeed, to fight a prolonged recession, the instability added by the financial system in general has to be taken away, this was the primary reason the full-reserve rule was proposed, and this is to what a negative interbank rate aims *inter alia*. Nevertheless, neither the negative interbank rate nor full-reserve banking are panacea against instability once the matter of maturity mismatching of liabilities and assets (borrowing short and lending long) is addressed as the Austrian Business Cycles Theory does (see e.g. Bagus, 2010).

References

Acharya, Viral, V. and Ouarda, M., 2012. Precautionary Hoarding of Liquidity and Inter-Bank Markets: Evidence from the Sub-prime Crisis, CEPR Discussion Papers 8859 <http://pages.stern.nyu.edu/~sternfin/vacharya/public_html/acharya_merrouche.pdf>

Bagus, P., 2010. Austrian Business Cycle Theory: Are 100 Percent Reserves Sufficient to Prevent a Business Cycle?, *Libertarian Papers*, 2(2), pp. 1-18.

Buiter, W.H., 2009. Negative Nominal Interest Rates: Three Ways to Overcome the Zero Lower Bound, *NBER Working Paper* 15118 <http://eprints.lse.ac.uk/29297/1/Negative_ Nominal_Interest_Rates.pdf>

Freixas, X., Antoine, M. and Skeie, D., 2011. Bank Liquidity, Interbank Markets, and Monetary Policy, *Review of Financial Studies*, 24(8), pp. 2656-2692.

Humphrey, D., 2015. Negative Interest Rates and the Demand for Cash, CEPR Working Paper <http://cepr.org/sites/default/files/Humphrey%20article.pdf>

Kimball, M.S., 2015. Negative Interest Rate Policy as Conventional Monetary Policy, *National Institute Economic Review*, 234(1), R5-R14.

Poole, W., 1968. Commercial Bank Reserve Management in a Stochastic Model: Implications for Monetary Policy, *Journal of Finance*, 23(5), pp. 769-791.

Filip, R., 2015. What Does a Negative Interbank Lending Rate Tell Us, Times of Malta, May 26 <http://www.timesofmalta.com/articles/view/20150526/business-market-analysis/what-does-a-negative-interbank-lending-rate-tell-us.569807>

Soldatos, G.T., 2015. Global Recession: A Money Gift Cure Possibly, *American Journal of Economics, Finance and Management*, 1(5), pp. 574-578.

Soldatos, G.T. and Varelas, E., 2014. A Letter on Full-Reserve Banking and Friedman's Rule in Chicago Tradition, *Kredit und Kapital/Credit and Capital Markets*, 47(4), pp. 677-687.

Varelas, E., 2016. Quantity versus Price Bank Competition and Macroeconomic Performance given Bank Concentration, forthcoming in: *Review of Economics*, 67(1).

Vari, M., 2015. Implementing Monetary Policy in a Fragmented Monetary Union, CEPREMAP Document de travail 1516 <http://www.cepremap.fr/depot/docweb/ docweb1516.pdf>