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Money, banking, and monetary policy ☆

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ABSTRACT

An important function of banks is to issue liabilities, like demand deposits, that are relatively safe and liquid. We introduce a risk of theft and a safe-keeping role for banks into modern monetary theory. This provides a general equilibrium framework for analyzing banking in historical and contemporary contexts. The model can generate the concurrent circulation of cash and bank liabilities as media of exchange, or inside and outside money. It also yields novel policy implications. For example, negative nominal interest rates are feasible, and for some parameters optimal; for other parameters, strictly positive nominal rates are optimal.

> Genuine banks are distinguished from other kinds of financial intermediaries by the readily transferable or 'spendable' nature of their IOUs, which allows those IOUs to serve as a means of exchange, that is, money. … Commercial bank money today consists mainly of deposit balances that can be transferred either by means of paper orders known as checks or electronically using plastic 'debit' cards. George Selgin, *Banking*.

1. Introduction

Banks perform many functions in modern economies, but one very important function is to issue liabilities, like demand deposits, that are relatively safe and also liquid. Putting money in the bank obviously reduces the risk that it will get lost or stolen without excessively hindering its use as a means of payment. Moreover, using something other than cash reduces other risks, since one may be able to stop payment with a check or credit card, for example, if a purchase turns out to be flawed or fraudulent. While these points may be obvious, this does not mean they are uninteresting or unimportant for our understanding of money and banking. Yet they have been all but ignored in the literature.[1]

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[1] Gorton and Winton (2003) survey mainstream banking theory; it has nothing to say about media of exchange, let alone the relation between cash and bank liabilities in this role. Monetary theory along the lines of Kiyotaki and Wright (1989) determines media of exchange endogenously, but usually

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In a previous attempt to rectify this situation (He et al., 2005), we introduced a risk of theft into a micro-founded model of monetary exchange based on search theory. This allowed us to study the role of banks as institutions that provide safekeeping plus liquidity in a setting where there is an endogenous role for a means of payment in the first place. A drawback with that analysis, however, is that we used a rather crude physical environment. As in all simple first-generation search models, we adopted the assumption that money is indivisible and agents can only hold at most 1 unit. While this is unsatisfying for a number of reasons, perhaps the main limitation is that it is impossible to discuss many aspects of monetary policy, especially the effect of inflation or nominal interest rates on the use of currency and bank liabilities in payments.

The goal of this project is to continue the integration of banking and monetary theory by reconsidering these ideas in a more recent generation of search models where agents can hold any amount of money. This allows us to go well beyond the earlier work, especially concerning policy and the effects of inflation or nominal interest rates, and provides a general equilibrium framework in which to formalize venerable ideas about how banks evolved historically. Although we do not dwell on history here, it may be helpful to review the story told in standard reference books: "The direct ancestors of modern banks were … the goldsmiths. At first the goldsmiths accepted deposits merely for *safe keeping*; but early in the 17th century their deposit receipts were *circulating in place of money*." (Encyclopedia Britannica 1954, vol. 3, p. 41, emphasis added).[2] This is precisely how banks operate and how consumers use them in the model.

While this history is fascinating, there are also contemporary issues for which our analysis is relevant. In terms of policy, an improved understanding of the design and implementation of modern payment systems may arise when we better understand simple situations like the one studied here. In terms of empirical work, research surveyed by Boyd and Champ (2003), for example, describes many findings concerning relations between inflation or interest rates and financial markets, including the banking sector. We do not attempt to address these observations directly, but we think our framework provides a step in the right direction, in that if one is to make sense of such empirical results, especially those concerning monetary policy, it might be useful to have a framework that better integrates banks and other financial institutions into monetary theory.

The rest of the paper is summarized as follows. In Section 2 we present basic assumptions. In Section 3 we study the case with exogenous risk of theft and no banks to show how the value of money depends on this risk. We show that it is possible in equilibrium to have negative nominal interest rates, although there is a lower bound. In fact, in this model it is optimal to go to the lower bound, which means deflation in excess of the Friedman Rule $i = 0$. In Section 4 we endogenize the risk associated with cash, still with no banks. In this version of the model, depending on parameters, it may or may not be possible to have negative nominal rates, but it will never be optimal: the optimal interest rate is either $i = 0$ or $i > 0$. The reason that some inflation in excess of the Friedman Rule may be optimal is that in equilibrium it reduces the risk associated with cash.

In Section 5 we introduce banks with exogenous theft. We show that generically agents either put all or none of their money in the bank, so we cannot get the concurrent circulation of multiple means of payment: bank liabilities drive cash out of circulation (or vice versa) when their operating costs are small (big). The optimal policy is $i < 0$ with banks and exogenous theft. In Section 6 we endogenize both theft and banking. Now we can generate concurrent circulation of multiple means of payment. We find in this version of the model the optimal policy is either $i < 0$ or $i > 0$. This is interesting because usually the Friedman Rule is extremely robust: $i = 0$ is optimal in a wide variety of models. In Section 7 we conclude.

Before proceeding, we comment further on the applicability of these ideas. The fact that mainstream banking theory mainly ignores payments and banks' role in the provision of convenient, efficient, and safe instruments that facilitate this process might mean people who work in this tradition will not recognize many of the issues or the tools here, but this is no reason to dismiss the approach. In any monetary economy, or payment system, generally, safety is a real concern and

(*footnote continued*)
has nothing that resembles banks. Papers that try to integrate banks into modern monetary economics include Cavalcanti and Wallace (1999a, b); Cavalcanti et al. (1999, 2005); Andolfatto and Nosal (2003); Wallace (2005); Berentsen et al. (2005); Li (2007); Chiu and Meh (2007); Camera and Ruscitti (2007); Camera and Bencivenga (2007) (some papers in a different tradition are cited in He et al. (2005)). Like us, Kahn et al. (2005) and Kahn and Roberds (2005) discuss safety issues, but take the opposite point of view by assuming the use of cash *reduces* risk by minimizing exposure to dangers like identity theft; this is a fine point, but it is also clear that walking around with large quantities of cash is risky. Related work studies counterfeiting (for example, Monnet, 2005; Nosal and Wallace, 2007). Finally, there is a literature that studies payments in the IO tradition, quite different from monetary theory (see Hunt, 2003 or Bolt and Chakravorti, 2007 and references therein).

[2] Similarly, "By the restoration of Charles II in 1660, London's goldsmiths had emerged as a network of bankers… Some were little more than pawnbrokers while others were full service bankers. The story of their system, however, builds on the financial services goldsmiths offered as fractional reserve, note-issuing bankers. In the 17th century, notes, orders, and bills (collectively called demandable debt) acted as media of exchange that spared the costs of moving, protecting and assaying specie." (Quinn, 1997, p. 411–12). "The crucial innovations in English banking history seem to have been mainly the work of the goldsmith bankers in the middle decades of the seventeenth century. They accepted deposits both on current and time accounts from merchants and landowners; they made loans and discounted bills; above all they learnt to issue promissory notes and made their deposits transferable by 'drawn note' or cheque." (Joslin, 1954, p. 168). Safekeeping was also crucial for earlier episodes in banking history, going back to the Templars (Weatherford, 1997; Sanello, 2003), but goldsmiths seem to be the first bankers whose liabilities circulated as media of exchange. Previously, payments typically involved transferring funds from one account to another and "generally required the presence at the bank of both payer and payee" (Kohn, 1999).