International Review of Economics and Finance 46 (2016) 87–99

Contents lists available at ScienceDirect

International Review of Economics and Finance

journal homepage: www.elsevier.com/locate/iref

Credit, banking, liquidity shortfall, and monetary policy

Hyung Sun Choi [a,*], Manjong Lee [b]

[a] Department of Economics, Kyung Hee University, 26 Kyunghee-daero, Dongdaemun-gu, Seoul 02447, South Korea
[b] Department of Economics, Korea University, Seoul, South Korea

ARTICLE INFO

Article history:
Received 21 April 2016
Received in revised form
23 August 2016
Accepted 24 August 2016
Available online 26 August 2016

JEL classification:
E42
E44
E50

Keywords:
Cash
Credit
Banking
Reserves
Monetary policy
Liquidity shortfall

ABSTRACT

A simple monetary model is constructed to explore dynamic interactions among the choice of means of payment, bank's reserves, a liquidity shortfall, and monetary policy. In the presence of credit-transaction cost shocks, a bank that issues credit can face a liquidity shortfall as its ex-ante reserves fall short of liquidity demand. In equilibrium, credit payments and collections by a bank are balanced with each other and hence bank's ex-post reserve holdings crucially depend on the demand for cash. The likelihood of a liquidity shortfall increases with credit-transaction costs due to larger cash withdrawals. When the government increases money growth, both the demand for cash and the likelihood of a liquidity shortfall increase.

1. Introduction

The objective of this paper is to explore the effects of the endogenous choice between cash and costly one-period credit on banks' reserves and potential liquidity shortfall. In the presence of credit-transaction cost shocks, credit can affect liquidity demand in the goods market and a bank that issues credit can face a liquidity shortfall as it exhausts its reserves. In the real world, a bank as a credit-card issuer indeed confronts reserve fluctuations against cash withdrawal and credit settlement. In order to keep reserves stable and to maximize its return on investment, a bank needs to understand the ingredients that affect the demand for credit and how their impacts on reserve holdings vary according to credit-settlement arrangement.

Existing models of banks' reserves and liquidity shortfall include Champ,Smith, & Williamson (1996), Smith (2002), and Bianchi and Bigio (2014). Champ et al. (1996) explore the relationship between banks' reserves and banking crises in an overlapping generations model in which banks can issue banknotes to prevent bank panics. In Smith (2002), a higher inflation rate increases the nominal interest rate and the probability of bank panics by depleting reserves. Then, Bianchi and Bigio (2014) develop a dynamic model to study interactions between monetary policy and the liquidity management of banks against shocks to the banking system. Some of issues including bank's reserves, the supply of credit, and the demand

* Corresponding author.
E-mail address: hyungsunchoi@khu.ac.kr (H.S. Choi).

http://dx.doi.org/10.1016/j.iref.2016.08.006
1059-0560/

for cash are quite relevant. However, Smith (2002) and Bianchi and Bigio (2014) do not have multiple means of payment for consumers and hence cannot provide an explanation of the interaction between the choice of payment instrument and the risk of a liquidity shortage.

Previous studies of payments systems include Freeman (1996), Kahn, McAndrews, & Roberds (2003) and Williamson (2009). Kahn et al. (2003) study the incentives of strategic default in a net settlement system by comparing it with the gross settlement system with and without 'delivery-versus-payment'. Williamson (2009) studies the persistent real effects of monetary policy in a cash-credit economy. He explores a rich array of monetary policy implications, including those of open market operations, daylight overdrafts, reserves, and overnight lending and borrowing. However, in his model, credit is within-period IOU and the intertemporal effect of the interest rate is not considered.

Meanwhile, most previous studies on the endogenous choice of payment instruments such as Ireland (1994), Lacker and Schreft (1996), Aiyagari, Braun, & Eckstein (1998), and Freeman and Kydland (2000) pay little attention to the interactions across the choice of payment instrument, banks' reserves, and potential liquidity shortfall.

This paper presents a monetary model which captures the dynamic interactions among the choice between cash and one-period credit as a means of payment, banks' reserves, and a liquidity shortfall. Our model is built on Freeman and Kydland (2000) and Choi (2015) with some elements taken from Smith (2002). There is a bank that accepts deposits from households and issues credit to them. At the beginning of each period, the financial market opens and the bank decides its portfolio allocation between one-period nominal government bonds and reserves. After the financial market closes, the bank opens and the credit-transaction cost shock is realized. Notice that the bank chooses its reserves before the realization of this shock and, given this context, we refer to them as ex-ante reserves. The bank offers a one-period savings account with positive interest. The household then chooses how much to hold as cash for subsequent transactions and how much to deposit into the savings account. In the goods market, a worker produces consumption goods and a shopper purchases them with either cash or credit. A credit purchase incurs two costs, a fixed transaction cost and a borrowing cost, which is similar to the credit-cost structure adopted in Liu et al. (2015). At the end of a period, a bank makes all netting arrangements of credit with households.

The main implications of our model are as follows. In the presence of credit-transaction cost shocks, credit renders a bank vulnerable to the potential risk of a liquidity shortage. Specifically, credit payment and collection by a bank are balanced with each other in equilibrium and hence her reserve holdings measured at the end of a period (ex-post reserves) crucially depend on the demand for cash in the goods market. Now if a high credit-transaction cost is realized, the demand for credit declines and the demand for cash increases causing ex-ante reserves to fall short of the liquidity demand for households (negative ex-post reserves). This implies that the likelihood of a liquidity shortfall increases with the credit-transaction cost.

In addition, if the government increases the money growth rate, a bank would hold a greater amount of ex-ante reserves against cash withdrawals and hence its investment in interest-bearing assets would decrease. As a consequence, the demand for cash increases, which implies that the likelihood of a liquidity shortfall eventually increases with the money growth rate. Furthermore, a lower return from savings due to a higher growth rate of money suggests lower consumption. However, credit transaction cost decreases with the money growth rate because of less frequent credit transactions.

The remainder of the paper is organized as follows. Section 2 describes the baseline environment and the equilibrium definition is given in Section 3. Section 4 studies the equilibrium dynamics of the model. The effects of credit-transaction cost shock and monetary policy are discussed in Sections 5 and 6. Section 7 concludes the paper.

2. Model

2.1. Household

Time is discrete and indexed by $t = 0, 1, 2, \ldots$. There is a continuum of infinitely lived representative households of unit mass and a continuum of consumption goods indexed by $i \in [0, 1]$. Each household consists of a worker and a shopper. A worker can produce one unit of good with one unit of labor. The household cannot consume its own good and so a shopper purchases consumption goods with either cash or one-period credit from the workers of other households.

The representative household has preferences given by

$$U(\{c_t(i), s_t\}_{t=0}^{\infty}) = \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left(u\left[\min_i \left(\frac{c_t(i)}{2i} \right) \right] - v(s_t) - \Theta_t \right) \tag{1}$$

where $\mathbb{E}_0$ is the expectation operator conditional on information in period 0, β is the discount factor, $c_t(i)$ is the perishable consumption goods purchased at market i, and $v(s_t)$ is the disutility caused to the worker by supplying s_t units of labor. Assume that $u(\cdot)$ is twice continuously differentiable and strictly concave with $u'(0) = \infty$, $\lim_{c \to 0} cu(c) = 0$, and $\sigma = -cu''(c)/u'(c) \in (0, 1)$.[1] Also, assume that $v(\cdot)$ is twice continuously differentiable and strictly convex with

[1] Given the coefficient of relative risk aversion being less than one, the substitution effect dominates the income effect for an increase in the rate of