Journal of Macroeconomics 37 (2013) 53–67

Contents lists available at SciVerse ScienceDirect

Journal of Macroeconomics

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

Bank balance sheet dynamics under a regulatory liquidity-coverage-ratio constraint ☆

Lakshmi Balasubramanyan [a,*], David D. VanHoose [b]

[a] Federal Reserve Bank of Cleveland, Cleveland, OH 441010, United States

[b] Department of Economics, Hankamer School of Business, Baylor University, Box 98003, One Bear Place, Waco, TX 76798, United States

ARTICLE INFO

Article history:
Received 24 June 2012
Accepted 14 March 2013
Available online 3 May 2013

JEL classification:
G21

Keywords:
Liquidity-coverage-ratio
Intertemporal bank model
Balance sheet dynamics

ABSTRACT

The Basel III standards include a liquidity-coverage-ratio (LCR) constraint that creates an intertemporal link between contemporaneous bank balance-sheet choices and lagged deposits. Assessing the effects of an LCR constraint for banks' optimal deposit and loan choices requires an intertemporal framework. Our analysis of a dynamic banking model shows that imposing an LCR constraint generally has theoretically ambiguous effects on the stability of banks' optimal dynamic balance-sheet paths. Even in special cases, such as a situation in which regulators prohibit banks from applying securities to fulfill the LCR constraint or in which banks simultaneously confront risk-based capital regulation while facing rigidities in their equity capital positions, optimal bank deposit paths exhibit increased intertemporal persistence but become more responsive to shocks to market interest rates.

1. Introduction

A component of the Basel III standards that is slated for adoption later this decade is a liquidity-coverage-ratio (LCR) constraint. This regulatory constraint will require banks to hold a "stock of high-quality liquidity assets" sufficient to at least cover "total net cash outflows over the next 30 calendar days" (Bank for International Settlements, 2010). Under the terms of the requirement currently outlined under Basel III, the ratio of qualifying assets must be at least 100% of the 30-day net cash outflow. Although a basic framework has been established for determining how an LCR constraint will be applied, specific details regarding computation of the numerator and denominator of the ratio have yet to be determined. Indeed, recent press reports [see, for instance McGrane (2012), Borak (2012), Enrich (2012), and Enrich and McGrane (2012)] suggest the possibility of continuing discretionary regulatory adjustments in definitions of the statutory LCR constraint as the requirement is phased in during the next few years.

Under the terms of the basic framework, however, it is clear that the numerator of the liquidity-coverage ratio will consist of cash reserves and an allowable portion of banks' security portfolio—essentially a specified set of low-risk and unencumbered securities judged to be readily marketable without resort to "fire sales" during periods of financial stress. Although the wording of the Basel agreement implies that the denominator of the liquidity-coverage ratio aimed to be consistent with a forward-looking liquidity requirement, a careful reading of the proposed regulations (BIS, 2010) indicates that in fact the

☆ Views expressed in this paper are not intended to express those held by the Board of Governors of the Federal Reserve System or of any officials of the Federal Reserve Bank of Cleveland.

* Corresponding author. Tel.: +1 8142377904.
E-mail addresses: Lakshmi.Balasubramanyan@clev.frb.org, Lakshmi.Bala.H@gmail.com (L. Balasubramanyan), David_VanHoose@baylor.edu (D.D. VanHoose).

0164-0704/$ - see front matter © 2013 Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.jmacro.2013.03.003

determination of a 30-day liquidity requirement will be based retroactively on outflows observed in prior periods. Thus, the denominator of a bank's current LCR requirement realistically will be based primarily on deposit outflows observed during a preceding interval.

The dependence of the contemporaneous period's LCR requirement on deposit outflows during the preceding period suggests a dynamic aspect of the Basel III LCR regulation that has not yet received attention from researchers. The objective of this paper is to explore fundamental implications of the intertemporal link that application of an LCR constraint will create for banks' optimal dynamic paths of deposits and loans. Toward this end, the analysis that follows builds on the work on dynamic models of bank behavior developed initially by Goodfriend (1983), Cosimano (1987, 1988), Cosimano and Van Huyck (1989), and extended since by Elyasiani et al. (1995), Hülsewig et al. (2006) and Kopecky and VanHoose (2012). Within a model of the behavior of perfectly competitive banks facing costs of intertemporal adjustment of deposits and loans, we consider the effects on optimal balance-sheet adjustments of the introduction of an LCR constraint in which both reserves and a portion of securities appear in the numerator of a liquidity coverage ratio and in which the denominator of the constraint depends on deposit outflows observed in the prior period.

As discussed by Baltensperger (1980), models of banks' deposit outflows indicate that the key determinant of their magnitudes during a given interval is the stock of deposits issued that period. This relationship suggests that a typical bank's observed liquidity-coverage ratio depends on the stock of deposits at the bank during the prior period, which in turn implies that an LCR constraint introduces a source of intertemporal balance-sheet dynamics presently absent from a bank's decision-making process. To highlight how this occurs, we begin the paper by introducing a simple dynamic model in which portfolio separation holds, as in Sealey (1985), so that each bank's optimal deposit and loan paths are independent. Introduction of an LCR constraint in which a portion of banks' securities portfolios can be applied toward meeting the requirement, we find, generally tends to cause portfolio separation to break down. A consequence is interdependence of dynamic deposit and loan decisions that previously had been separable.

Indeed, the resulting general solutions for the deposit and loan paths with both reserves and securities being admissible to satisfy an LCR constraint are quite complicated. The solutions for these balance-sheet paths are not readily amenable to tractable analysis regarding effects of alterations in the LCR requirement or in the allowed portion of a bank's securities portfolio. Nevertheless, we are able to obtain more concrete results regarding effects of regulatory variations in the LCR constraint in the context of special cases of the model that maintain portfolio separation and, hence, independence of the bank's selection of optimal intertemporal deposit and loan paths. For instance, when only reserves may be applied to satisfy an LCR requirement, portfolio separation continues to apply. Either an exogenous increase in average net deposit outflows each period or a regulatory tightening of the liquidity constraint causes a bank's optimal deposit path to exhibit less intertemporal variability but causes the bank's current deposit choice to respond more strongly to changes in the spread between the security rate and deposit rate generated by external market shocks. This result suggests that even imposing the most basic, cash-only LCR constraint has mixed effects on a bank's deposit stability.

In the case in which regulators allow banks as well to apply a portion of securities to satisfying the LCR requirement, we can obtain solutions readily amenable to analysis for a special case in which banks' equity positions are assumed fixed over the horizon relevant to the model and in which banks are also bound by a Basel-style risk-based capital requirement linking loans to capital. In the more general of these special cases, policy variations in the portion of a bank's security portfolio that can be applied toward satisfying the LCR constraint are theoretically ambiguous. Even for a special case in which the marginal resource cost of adjusting reserves within each period approaches a constant value, the balance-sheet-stability effect of varying the share of allowable securities is ambiguous. A bank's optimal deposit path again becomes more persistent while becoming more sensitive to variations in the security rate generated by market shocks. Indeed, in this special case, as the share of securities that banks may direct toward satisfying the LCR constraint increases, banks essentially become more nearly bifurcated institutions. Each bank directs its share of deposits to lending levels constrained by a risk-based capital ratio and otherwise behaves essentially like a money market mutual fund, varying issuance of deposits that are more elastic to changes in the security rate, with customer preferences ultimately determining the scale of its securities portfolio.

We present and analyze our basic dynamic banking model without and with an LCR constraint in the following section. Section 3 provides the analysis that yields the policy implications that we are able to identify as applicable to the above-referenced special cases of the model. Section 4 summarizes our essential conclusions, discusses qualifications, and offers suggestions for future research.

2. The banking model without and with a required liquidity coverage ratio

Our analysis of the effects of a required LCR constraint is conducted within context of the following framework. An individual bank's profits at time $t+j$ are given by

$$\pi_{t+j} = r^s_{t+j}S_{t+j} + r^l_{t+j}L_{t+j} - r^d_{t+j}D_{t+j} - \frac{\phi_1}{2}(L_{t+j})^2 - \frac{\phi_2}{2}(L_{t+j} - L_{t+j-1})^2 - \frac{\theta_1}{2}(D_{t+j})^2 - \frac{\theta_2}{2}(D_{t+j} - D_{t+j-1})^2 - \frac{\Gamma}{2}(R_{t+j})^2 \tag{1}$$

where $S_{t+j} \equiv$ securities, $L_{t+j} \equiv$ loans, $R_{t+j} \equiv$ reserves, $D_{t+j} \equiv$ deposits, $r^k_{t+j} \equiv$ market interest rate on asset $k = S$, L and D. All parameters are positive constants.

The profit function in (1) indicates that the bank incurs both quadratic intra period resource costs and quadratic intertemporal adjustment costs for deposit and loans. The bank incurs no quadratic intertemporal resource costs for reserves.