European Economic Review 97 (2017) 108–130

Contents lists available at ScienceDirect

European Economic Review

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

Liquidity shocks, business cycles and asset prices☆

Saki Bigio*, Andrés Schneider

Department of Economics, UCLA, 8283 Bunche Hall, Los Angeles, CA 90095, United States

ARTICLE INFO

Article history:
Received 22 March 2017
Accepted 15 May 2017
Available online 15 June 2017

JEL Classification:
E22
E32
E44
G12

Keywords:
Business cycles
Investment
Asset prices
Liquidity

ABSTRACT

In the aftermath of the Great Recession, macro models that feature financing constraints have attracted increasing attention. Among these, Kiyotaki et al. (2012) is a prominent example. In this paper, we investigate whether the liquidity shocks and financial frictions proposed by Kiyotaki et al. (2012) can improve the asset pricing predictions of the frictionless RBC model. We study the quantitative business cycle and asset pricing properties in an economy in which agents feature recursive preferences, are subject to a liquidity constraint, and suffer liquidity shocks. We find that the model predicts highly nonlinear time variation and levels of risk premia, which are driven by endogenous fluctuations in equity prices. However, the model fails to account for a basic fact: Periods of scarce liquidity are associated with high asset prices and low expected returns.

1. Introduction

In the aftermath of the Great Recession, there has been increased interest by academics and policy makers in macro models that feature financing constraints. Kiyotaki and Moore (2012) model (hereafter KM) of collateral constraints and liquidity shocks is a leading example. The main idea is that liquidity shocks constrain the fraction of assets that may be traded in a given period. These changes in liquidity can lead to fluctuations in aggregate activity and asset prices by tightening firms' ability to pledge collateral. Numerous studies have followed KM's lead (see Ajello, 2016; Bigio, 2015; Del Negro et al., 2016; Kurlat, 2013; Venkateswaran and Wright, 2014).

In this paper, we study the quantitative properties of liquidity shocks in a real business cycle (RBC) framework, focusing on asset pricing properties and business cycle implications. To accomplish this, we use a stripped-down version of KM, characterize the equilibrium, and study the effects of liquidity shocks via global nonlinear analysis.

Our main findings are that liquidity shocks: (i) improve quantitative prediction of the levels and volatility of equity premiums relative to the frictionless RBC; (ii) predict highly nonlinear dynamics for premiums akin to models that feature balance sheet dynamics; (iii) have negligible effects on the risk-free rate; (iv) improve the relative volatility of investment to output growth rate; (v) on impact, have mild effects on the levels of investment and output; and (vi) produce counterfactual dynamics for the correlation between liquidity and the equity premium—i.e., periods of abundant liquidity are associated with higher expected returns. Lastly, after we decompose expected returns into a liquidity component and a market component, we find that the liquidity component does not account for a large share of the total premium. We demonstrate,

☆ We are very grateful to the editor, Eric Leeper, and two anonymous referees for very helpful comments and feedback.

* Corresponding author.
E-mail addresses: sbigio@econ.ucla.edu (S. Bigio), anschneider@ucla.edu (A. Schneider).

http://dx.doi.org/10.1016/j.euroecorev.2017.05.004
0014-2921/

in detail, why liquidity shocks fail to account for the basic fact that in tranquil times—which are typically associated with abundance in liquidity—expected excess returns are high.

The main mechanism in the KM framework is as follows. Investment has two characteristics that cause liquidity to become a source of business cycles. First, access to investment projects is limited to a fraction of the population, which means that resources must be reallocated from agents who do not possess these opportunities to those who do. Such reallocation requires a credible promise to deliver investment projects, which in turn requires collateral. Without collateral (or, in the model, less liquidity), that process is interrupted. Second, repayment cannot be guaranteed. This characteristic requires that investment be financed, in part, internally (investment requires a down payment). The combination of these two features creates gains from trading existing assets, and doing so enables agents to obtain internal funds to relax external financing constraints. Liquidity shocks interrupt the amount of trade, which affects the supply side of credit. In other words, periods of low liquidity are associated with a contraction in the supply schedule of claims to investment projects. When liquidity shocks are sufficiently large, they drive aggregate investment below its frictionless level. As a result, these shocks also drive a wedge between the price of capital and its replacement cost, which is a measure of inefficiently low investment.

From an asset pricing perspective, we highlight the fact that the model predicts highly nonlinear dynamics for risk premiums, together with sensible endogenous time variation. It also predicts higher levels of premiums relative to those implied by the frictionless benchmark. In other words, the expected change in the price of equity is very sensitive to liquidity shocks. These elements of the model can significantly improve quantitative asset pricing predictions relative to the frictionless RBC setup.

The KM framework faces some challenges that we underscore throughout the paper. From a business cycle perspective, liquidity shocks produce countercyclical consumption—it increases in the recession triggered by a liquidity shock. However, the quantitative effect of this shock on macro variables is small overall: on impact, a major liquidity dry-out produces a decrease in output of -0.1% from its mean. Regarding asset prices and returns, the model predicts lower expected returns during periods of scarce liquidity. Thus, the model is counterfactual in the sense that tranquil times (those of abundant liquidity) are associated with high expected returns. Our results complement and reinforce other findings in the KM literature (i.e., Shi, 2015), but our focus on asset pricing offers further insight into the KM's implications for risk premiums dynamics.

We next provide a brief review of the literature.

Literature. Our paper is directly related to the literature that follows the KM model. Del Negro et al. (2016) is an example of this strand. A central element of that paper is the introduction of nominal rigidities and a monetary policy that is subject to a zero lower bound. Our paper complements theirs in the sense that we observe that without additional features, liquidity shocks cannot account for the dynamics of premiums and macro quantities. More precisely, we observe that liquidity shocks can improve frictionless predictions and come closer to the observed evidence, although this is not enough. In addition, our focus on risk premium dynamics emphasizes a central counterfactual element embedded in the KM constraint: in periods of abundant liquidity, expected excess returns are high. Lastly, our paper differs from Del Negro et al.'s because we study the behavior of the model globally, whereas theirs is restricted to a log-linearized version of the model.

Shi (2015) proposed a model similar to ours, with a key difference in the analysis. In our paper, the labor supply schedule is fixed; liquidity shocks reduce capital accumulation, and this contracts labor demand. Thus, wages and hours decline in recessions. In contrast, Shi (2015) uses a "single family" framework with strong leisure-consumption complementarities. As in our setup, liquidity shocks lead to declines in the investment–consumption ratio. With leisure-consumption complementarities, labor supply contracts when liquidity shocks increase consumption. As a result, although liquidity shocks trigger strong reductions in hours, they also produce counterfactual movements in wages. In addition, our main focus is on asset prices and risk premium dynamics. We use recursive preferences (Epstein and Zin, 1989), and we calibrate both the elasticity of intertemporal substitution and the risk-aversion coefficient, as in the leading papers in the asset pricing literature. As noted by Shi (2015), our results also suggest a relatively higher unconditional level of the equity premium, but we extend the analysis to study its behavior across the state space.

Recent literature in macroeconomics has also predicted highly non-linear risk premium dynamics, driven by fluctuations in agents' balance sheets in models with financial frictions (Brunnermeier and Sannikov, 2014 and He and Krishnamurthy, 2013 are prominent examples). Our results are in this vein, but with the crucial distinction that in our framework, endogenous fluctuations in expected returns are driven purely by occasionally binding constraints. This is because, as in KM, we assume that investment opportunities are i.i.d., and therefore we do not have to keep track of investor's balance sheets in the state vector.

The paper contains four sections. In Section 2, we present the model, characterize the solution, and discuss the intuition behind the effects. We explore the quantitative predictions of the model in Section 3, and Section 4 concludes.

2. Model

We begin by describing a version of the KM model, abstracting from fiat money. We consider an infinite-horizon economy in which time is discrete and denoted by $t = 0, 1, \ldots$. There are two populations, entrepreneurs and workers, each with unit measure. The former do not work, but invest in physical capital, while the latter do not invest but supply labor. In each period, entrepreneurs are randomly assigned to one of two types: investors or savers, labeled by superscripts i and s.