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Liquidity, assets and business cycles ☆

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ABSTRACT

The objective here is to evaluate the quantitative importance of financial frictions in business cycles. The analysis shows that a negative financial shock can cause aggregate investment, employment and consumption to fall with output. Despite this realistic comovement among macro quantities, a negative financial shock generates an equity price boom as the shock tightens firms' financing constraint. This counterfactual response of the equity price is robust to a wide range of variations in how financial frictions are modeled and whether financial shocks affect asset liquidity or firms' collateral constraints. Some possible resolutions to this puzzle are discussed.

1. Introduction

The financial crisis in 2008 has brought financial frictions to the forefront of policy debate and academic research. The severe shortage of liquid assets during the height of the crisis prompted the US government to inject a massive amount of liquidity into the asset market, in various forms of bailouts and quantitative easing. There is little doubt that the liquidity shortage in that crisis was caused by changes in economic fundamentals. Specifically, the realization that many asset-backed securities had much lower qualities and much higher default risks than previously thought triggered a flight of funds from those securities to safer and more liquid assets. Despite this critical role of the fundamentals, the crisis has raised a more general question about the role of asset market liquidity: Can exogenous shocks to such liquidity be an important cause of the business cycle?

An affirmative answer to this question is the basis of the following hypothesis that will be referred to as the *liquidity shock hypothesis*. A sudden drop in asset market liquidity, which may not necessarily be related to changes in economic fundamentals, causes the equity price to fall. The lower equity price reduces the funds for investment that a firm can raise by issuing equity and/or using equity as collateral on borrowing. Thus, investment falls, output falls and an economic recession starts. The objective of this paper is to formulate a model to evaluate this hypothesis quantitatively.

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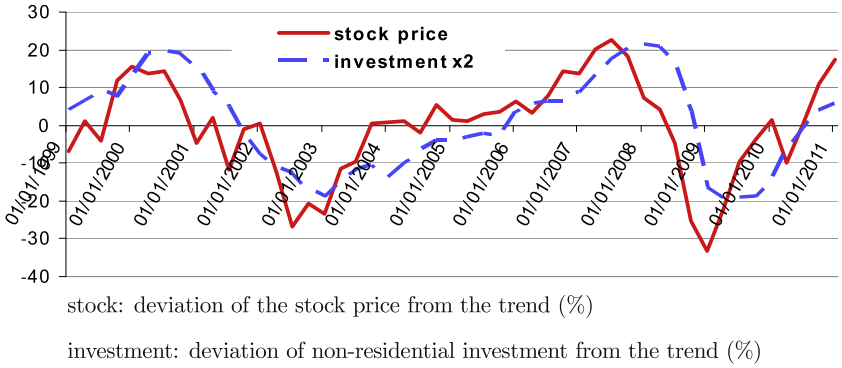

Fig. 1. Deviations of stock price and investment from the trend (%). Stock: deviation of the stock price from the trend (%). Investment: deviation of non-residential investment from the trend (%).

The liquidity shock hypothesis has become popular in macroeconomic analyses (e.g., Kiyotaki and Moore, 2012; Jermann and Quadrini, 2012). The intuitive appeal of the hypothesis comes partly from the link between investment and asset prices, which accords well with recent business cycles. Fig. 1 depicts the time series of a broad stock price index and non-residential investment in the US from 1999 to 2011. The series are percentage deviations of the quarterly data from the trend.[1] It is clear that investment and the stock price move closely together. More importantly, the stock price leads investment by one to two quarters in the business cycle. This lead-lag structure suggests that shocks might affect investment through asset prices.

Besides its intuitive appeal, the liquidity shock hypothesis has immediate policy implications. If asset liquidity is a cause of the business cycle, then a government can attenuate the cycle by supplying liquid assets counter-cyclically. In particular, by injecting liquidity to support asset prices in a recession, a government can prevent business investment from deteriorating precipitously, thereby stabilizing the economy. Such interventions are warranted when exogenous shocks to asset liquidity are the source of fluctuations.

Given its intuitive appeal and immediate policy implications, the liquidity shock hypothesis should be evaluated formally and clearly. For concreteness, this paper focuses on the version of the hypothesis modeled by Kiyotaki and Moore (2012, *KM*, henceforth). It will be shown later that the main result of this model holds in a much broader class of models that emphasize the financing constraint on investment. KM place two equity-market frictions at the center. One is the difficulty to issue new equity: a firm can issue new equity on at most a fraction $\theta \in (0,1)$ of investment. Another friction is the lack of resaleability of equity; that is, only a fraction $\phi \in (0,1)$ of existing equity can be resold in any given period. KM model a liquidity shock as an exogenous and unexpected change in ϕ.

I reformulate the KM model by assuming that each household consists of many members who perform different tasks in the market. While retaining the two equity market frictions in KM, this large-household construct simplifies the analysis significantly. It allows the use of a representative household which leads to straightforward aggregation of macro variables. The formulation leads to a recursive competitive equilibrium that is tractable in a stochastic and dynamic environment. Moreover, the formulation makes it relatively easy to incorporate both the equity liquidity constraint and a collateral constraint, thus allowing me to evaluate the liquidity shock hypothesis with a broad class of financial shocks.[2]

After calibrating to the US data, the model shows that a negative liquidity shock can cause aggregate investment, employment and consumption to fall with output. This positive comovement among macro quantities is a robust feature in the US data. The positive comovement between employment and consumption after a liquidity shock contrasts with the finding in KM. Despite the realistic comovement among macro quantities, a negative liquidity shock generates an asset price boom, which is opposite to what has been observed in recessions. This result casts doubt on the liquidity shock hypothesis.

The counterfactual response of the equity price to liquidity shocks is not unique to KM or to the particular form of the liquidity shock. Rather, it is a general feature of many models where equity is important for financing investment. To demonstrate this generality, debt finance is added to KM to capture the role of existing equity as collateral for a firm's borrowing. Specifically, the amount that a firm can borrow is proportional to the value of the firm's holdings of resaleable assets at the end of a period. Popularized by Kiyotaki and Moore (1997) and Jermann and Quadrini (2012), such a collateral

[1] The stock price index is the Wilshire 5000 price full cap index (Wilshire Associates Incorporated, also available at the Federal Reserve Data Center). This is an index of the market value of all stocks actively traded in the US, weighted by market capitalization. The designation "full cap" signifies a float adjusted market capitalization that includes shares of stocks not considered available to ordinary investors. The data is available on the daily basis, but the series used here is the price of the last trading day in each quarter. Investment is private nonresidential fixed investment, which is available at the US Department of Commerce: Bureau of Economic Analysis. The variables in Fig. 1 are quarterly data deflated with the GDP deflator, with the first quarter of year 2005 as the base period. They are filtered through the Hodrick–Prescott filter with a parameter 1600. I have multiplied the deviation of investment from its trend by 2.

[2] A similar household structure has been used in monetary theory by Shi (1997). In a related environment, Lucas (1990) uses a two-member household structure to facilitate aggregation.