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Stock liquidity and the Taylor rule[☆]

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ABSTRACT

This paper examines how stock market liquidity and commonality in liquidity are impacted by real-time output gap and inflation, as these macroeconomic variables have been shown to be the main drivers of monetary policy according to the Taylor rule. We show that an increase in the output gap and inflation lowers stock liquidity and increases commonality in liquidity, since it points to a contractionary monetary policy and is likely to lead to a decline in the liquidity providers' funding liquidity. This effect is larger for stocks with low market capitalization and low liquidity.

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1. Introduction

Finance literature has shown the significant effect of stock liquidity on asset pricing. Amihud and Mendelson (1986) and many subsequent researchers document that illiquid stocks generally have higher expected returns. After Chordia et al. (2000), Hasbrouck and Seppi (2001), and Huberman and Halka (2001) document the existence of commonality in liquidity, the role of liquidity variation on stock returns has garnered much attention. Acharya and Pedersen (2005) find three liquidity risks. One of them is the co-movement of stock liquidity with market liquidity: for an investor to hold stocks whose liquidity decreases when market liquidity contracts, he or she needs to be compensated by a return premium. Pastor and Stambaugh (2003) show that market liquidity is an important state variable for asset pricing and that investors are willing to hold the stocks that have a positive return when the market experiences a negative liquidity shock.

Empirical evidence indicates that both asset liquidity and commonality in liquidity are substantially influenced by macroeconomic fundamentals. Goyenko and Ukhov (2009) find that monetary policy influences both stock liquidity and bond liquidity. Jensen and Moorman (2010) show that business condition variables are related to the inter-temporal variation component in the liquidity premium. Chordia et al. (2001) show that macroeconomic announcements influence liquidity in the U.S. stock market.

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To the best of our knowledge, no paper has previously attempted to provide evidence for the reaction of stock liquidity and commonality in liquidity to business condition variables via the Taylor rule (the dominant method for evaluating monetary policy[1]). We fill the gap by studying the empirical effect of the inflation and output gaps on the time-varying stock liquidity and commonality in liquidity by extending the model of Brunnermeier and Pedersen (2009). Output gap and inflation gap naturally arise as the two Taylor rule fundamentals if the Federal Reserve's loss function is based on deviation of inflation and output from their respective targets (Molodtsova et al., 2008).

Our result on Taylor rule fundamentals and liquidity is relevant to Næs et al. (2011) which find that stock market liquidity includes predictive information for economic growth. We instead shift the focus to the other direction. We examine how macroeconomic fundamentals such as output gap and inflation affect liquidity. Furthermore, the output gap is defined as the difference between actual output and potential output, which is different from real GDP growth. Real GDP growth was extensively studied in Næs et al. (2011).

According to Brunnermeier and Pedersen (2009), liquidity providers' funding liquidity and financial constraints affect stock liquidity and commonality in liquidity from the perspective of liquidity supply. They suggest that a negative funding liquidity shock to market makers can restrict their ability to provide stock liquidity and potentially result in liquidity shortages. Furthermore, when a capital constraint binds liquidity providers, the majority of the stocks in the market suffer a loss of liquidity, which can lead to more co-movement of liquidity. Monetary policies are likely to affect funding availability for those main liquidity providers. Chordia et al. (2005) find a noteworthy effect of the federal funds rate surprise on stock liquidity. Brennan et al. (2012) also apply the TED spread (the difference between the interest rates on interbank loans and on short-term U.S. government debt) as a measure of funding liquidity and find that it is closely related to illiquidity for both the buy-side and sell-side.

Although ongoing literature is still under debate, starting with Taylor (1993), the Taylor rule has become a prevailing method for evaluating monetary policy (Asso et al., 2010; Kahn et al., 2012; Orphanides, 2003; Taylor, 2012). Even the monetary policy during the Greenspan's era can be empirically explained by the Taylor rule (Clarida et al., 2000; Rudebusch, 2006). Furthermore, according to the Federal Reserve Act, the Board of Governors and the Federal Open Market Committee should dampen the business cycle and stabilize the economy. Specifically, they need to promote “maximum employment, stable prices, and moderate long-term interest rates”. Since the last goal can be achieved automatically by decreasing inflation, the Federal Reserve's “dual mandate” makes the Taylor rule a good guide for monetary policy.

Several recent papers extend asset pricing models by Taylor-type monetary policy rules to explain the dynamic behavior of exchange rates. Engel and West (2006), Mark (2009), Molodtsova et al. (2008), and Molodtsova and Papell (2009) examine the empirical performance of Taylor rule-based exchange rate models and find that the Taylor rule variables can explain exchange rate behavior both in-sample and out-of-sample. We use a similar method to extend the model of Brunnermeier and Pedersen (2009) by substituting the Taylor rule fundamentals for funding liquidity. Using an extensive set of measures of stock liquidity and controlling for firm characteristics that are potentially related to stock liquidity, we show that when the output gap and inflation rise, market liquidity worsens. Moreover, a rise in the output gap and inflation raises commonality in liquidity. The result is consistent with the idea of Brunnermeier and Pedersen (2009) that funding liquidity impacts stock market liquidity: when the Taylor rule fundamentals indicate a contractionary monetary policy, the liquidity providers' funding liquidity is likely to drop, which may drive down stock liquidity and increase commonality in liquidity.

Although it makes sense to evaluate the dynamics of stock liquidity using real-time macroeconomic data, which reflects information available to stock market participants when they form their expectations, most of the previous literature uses revised data. We fill this gap by using the real-time inflation and output gaps to precisely utilize the information available to investors in the stock market and to avoid forward-looking bias. This method was advocated by Orphanides (2001), who pioneers the Taylor rule estimation, and by many recent papers, such as Garratt et al. (2009) and Rosa (2011), which also emphasize the importance of using real-time data. The estimated output gap depends on one's measure of potential output. The linear output gap and quadratic output gap can be calculated as the percentage deviation of the actual output from a linear time trend and quadratic time trend, respectively. Alternatively, following Blinder and Reis (2005), we measure the output gap as the unemployment rate assuming that the natural rate of unemployment is constant over time.

The rest of the paper consists of four sections. Section 2 extends the model of Brunnermeier and Pedersen (2009) by the Taylor rule and proposes it as a plausible explanation for the empirical evidence of stock liquidity and Taylor rule fundamentals found in later sections. Section 3 describes the data sources and different measurements for stock market liquidity and the output gap. Section 4 provides evidence for the Taylor rule's influence on stock market liquidity, liquidity of individual stocks, liquidity of portfolios, and commonality in liquidity. Section 5 concludes.

2. Economic reasoning

The theoretical model of Brunnermeier and Pedersen (2009) finds that a drop in funding liquidity can decrease asset liquidity and increase commonality in liquidity. Several empirical literatures including Hameed et al. (2010), Comerton-Forde et al. (2010), and Coughenour and Saad (2004) report the supporting evidence about the effect of funding liquidity on stock liquidity.

A monetary policy shock may influence the funding availability to market makers in specialist firms, hedge funds, and investment banks—the potential liquidity providers.[2] Specifically, when contractionary monetary policy raises the federal funds rate, it may decrease the incentive and ability for market makers to provide liquidity.

$$IL_{i,t} = \alpha + \beta ffr_t + \varepsilon_{i,t} \tag{1}$$

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[1] See Kahn et al. (2012) for discussions about the Taylor rule and its influence on monetary policy around the world.

[2] Perotti and Rindi (2010) also investigate the role of market makers as information providers in the Italian Stock Exchange.

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