



Liquidity in the repo market[☆]

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ABSTRACT

This paper examines liquidity in the Swiss franc repurchase (repo) market and assesses its determinants using a proprietary dataset ranging from 2006 to 2016. I find that repo market liquidity has a distinct intraday pattern, with low liquidity in early and late trading hours. Moreover, repo market liquidity is negatively affected by stress in the global financial system and the end of the minimum reserve requirement period if central bank reserves are scarce. Furthermore, I show that with excess central bank reserves in the financial system, quoted volumes in the interbank market become imbalanced towards more cash provider quotes relative to cash taker quotes, and the trading volume declines. By estimating liquidity in an interbank repo market and explaining its drivers, this paper contributes to the ongoing debate on repo market functioning.

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1. Introduction

Banks commonly use repurchase (repo) markets to smooth liquidity shocks. Although these markets are of great importance for the financial system (Fecht et al., 2011), little is known about the underlying liquidity (in the financial economics sense of the word) of these markets. As in the repo market central bank reserves (reserves), often called liquidity, are exchanged against collateral, the repo market can be considered liquid if a bank can borrow or lend reserves at any time, at a low cost, and without moving interest rates (see, for instance, Black (1971) and Kyle (1985)).

This paper contributes to the literature by describing liquidity and identifying its key determinants in the Swiss franc (CHF) overnight repo market, where reserves are exchanged against the collateral basket, which is also used by the Swiss National Bank (SNB) in its monetary policy operations.¹ The analysis I conduct is unique, as it is based on the entire quote book as well as all trades from the prevailing electronic trading platform, ranging from 2006 to 2016. Consequently, it allows an intraday analysis of market liquidity prior to, during, and after the financial crisis as well as in a positive and a negative interest rate environment. Moreover, by analyzing how reserves exceeding banks' minimum reserve requirements (excess reserves) affect liquidity in the interbank market, the paper contributes to a better understanding of how unconventional monetary policy affects interbank markets.

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¹ Studying the liquidity characteristics of repo markets is of particular interest in the overnight maturity, as banks satisfy their short-run liquidity needs predominantly in this maturity. Banks with excess reserves (e.g., from client inflows) typically lend, whereas banks with a need for liquidity (e.g., from client outflows) typically borrow reserves.

I capture liquidity in the CHF repo market by standard measures of transaction costs and price impacts. On the one hand, transaction costs are measured by the quoted bid-offer spread as well as the effective spread, which is based on actual transactions. On the other hand, price impacts are approximated by changes in quoted mid-rates following a repo trade and the volatility of repo trade rates. To describe the more general market activity, I calculate the size of the cash taker quote volume, the cash provider quote volume, and the trade volume.

The key stylized facts of repo market liquidity can be summarized as follows. First, I show that repo market liquidity has a distinct intraday pattern, with low liquidity in the early and late trading hours. Second, the measures reveal that at the peak of the financial crisis, liquidity in the CHF repo market was subdued. For example, in October 2008, the bid-offer spread reached levels of above 100 basis points (bps); about 50% of the interest rate level at that time) compared to an average bid-offer spread of about 7 bps prior to the financial crisis. Third, with the extraordinary liquidity injections by the SNB in the months after the financial crisis, liquidity indicators returned back to pre-crisis levels relatively quickly. Fourth, with excess reserves in the financial system after the financial crisis, the structure of the interbank market changed considerably. Quoted volumes became imbalanced towards more cash providers, and the trade volume declined substantially. This is because with excess reserves, banks have no or little need to trade reserves in the interbank market anymore. Along with this, fewer market liquidity indicators can be calculated, as only a few banks act as cash takers in the repo market.

To identify the key determinants of market liquidity, I run different regression specifications using market liquidity indicators on a daily and an intraday frequency. The regression results indicate that market liquidity indicators are affected by the SNB's monetary policy framework. In this regard, I find that market liquidity is reduced at the end of the minimum reserve requirement period before the financial crisis, i.e., in the period where reserves are scarce. Moreover, when interest rates trade close to the SNB's deposit rate, price impact indicators are low, as there is little uncertainty about overnight repo rates. This is due to the fact, that all market participants in the CHF repo market have a sight deposit account at the SNB and that depositing excess reserves at the central bank is an available outside option for all banks. Moreover, I find that when the SNB fully allotted all bids submitted by banks in daily fixed-rate repo auctions (i.e., fixed-rate full allotment policy) during and after the financial crisis, transaction costs and price impact indicators were reduced, indicating that the SNB's policy not only ensured banks access to central bank money but also improved market liquidity in the interbank market. Additionally, a negative risk sentiment in the global financial system affects liquidity in the CHF repo market negatively. If market participants are more risk-averse, they place fewer and more conservative quotes in the interbank market, and market liquidity declines.

Monitoring and understanding the determinants of repo market liquidity is important for central banks and regulators for the following reasons. First, decreasing liquidity in repo markets deteriorates banks' funding conditions. This, in turn, may trigger illiquidity in other financial market segments (see [Nyborg and Östberg \(2014\)](#) and [Rupprecht et al. \(2016\)](#)) and ultimately affects the real economy. Consequently, liquidity in repo markets signals vulnerabilities in the financial system, and liquidity measures can be used as indicators for financial stability risks ([Committee on the Global Financial System, 2017](#)).² Second, repo rates are of importance for the transmission of monetary policy and the determination of the yield curve. When liquidity in repo markets evaporates, banks' insurance against sudden liquidity shocks becomes costlier and interbank repo rates increase ("liquidity premium"; see [Amihud and Mendelson \(1986\)](#)). Consequently, the liquidity premium in repo markets affects the transmission of monetary policy and central banks may need to take this premium into account to establish the desired monetary conditions. Third, my analysis shows that for the definition and the design of robust benchmark interest rates, regulators need to consider that trading activity is subdued and cash taker quotes are rather rare in an environment with excess reserves. Thus, to calculate reliable benchmarks, it is important to consider all available quotes and trades and to not apply quote and trade filters that are too strict.

The remainder of this paper is structured as follows. Section 2 gives an overview of the literature, while Section 3 describes the institutional framework of the CHF repo market. Section 4 defines the liquidity measures. The determinants of market liquidity are empirically analyzed in Section 5. Finally, Section 6 concludes.

2. Literature

This paper can be incorporated into three strains of literature.

Market liquidity in money markets. Although repo markets are of great importance for the financial system, to the best of my knowledge, liquidity in the repo market has been analyzed only by [Dunne et al. \(2011\)](#), and few studies exist on liquidity in unsecured markets. [Dunne et al. \(2011\)](#) provide a description of different market liquidity indicators for the euro (EUR) repo market between 2006 and 2009 using trade and quote data from the BrokerTec trading platform. The authors illustrate that bid-offer spreads increased dramatically with the outbreak of the financial crisis but returned to pre-crisis levels relatively shortly afterwards. Moreover, [Dunne et al. \(2011\)](#) examine how changes in European Central Bank (ECB) open market operations during the financial crisis affected market liquidity of the interbank repo market. Most importantly, they find that the conditions in the interbank market mirror the outcomes in ECB operations and that liquidity in the interbank market improves after more favorable ECB auction outcomes.

Based on trade and quote data from the e-Mid trading platform, [Brunetti et al. \(2011\)](#), [Beaupain and Durré \(2013, 2016\)](#) analyze liquidity in the unsecured market for EUR liquidity. [Brunetti et al. \(2011\)](#) illustrate that the main refinancing

² For example, deteriorating repo market liquidity is considered a financial stability risk by the [Bank of England \(2015\)](#).

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