



# Whither the liquidity effect: The impact of Federal Reserve open market operations in recent years

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## ABSTRACT

Previous research indicated that the daily liquidity effect, or the change in the federal funds rate associated with an exogenous change in Fed balances, varies with several factors including the day of the maintenance period. In this paper, we examine data from 1998 to 2007, the recent period of increased Federal Reserve transparency before the financial crisis, and find that the liquidity effect stabilized across days of the maintenance period. We conclude that the liquidity effect may be a function of the uncertainty about banks' end-of-day balances, as well as pure maintenance period effects. Moreover, we find that increased transparency led to a larger liquidity effect on the days prior to an FOMC meeting.

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## 1. Introduction

Whether short-term interest rates change in response to a change in the money supply is a perennially debated issue. Identifying this phenomenon, known as the “liquidity effect,” is central to understanding the Federal Reserve's ability to implement monetary policy in the reserves regime that prevailed prior to late 2008. Previous literature has discussed two types of liquidity effects, long-range and daily. Evidence of the former has been mixed: over monthly and yearly horizons, some researchers have shown that short-term interest rates respond to a change in the money supply (Bernanke and Mihov, 1998), while others do not find such an effect (Leeper and Gordon, 1992). The differences in the estimated liquidity effects stem from different specifications, sample periods, and measures of the money supply, suggesting that if a long-range liquidity effect does exist, it is not necessarily econometrically robust or stable through time. Indeed, more recently, Carpenter and Demiralp (2008) provide evidence of a liquidity effect at a monthly frequency, using a more relevant measure of the money supply – balances held at the Federal Reserve – for such an exercise. Consistent with this more relevant definition of the money supply, evidence of a daily liquidity effect has been found repeatedly and robustly: on a daily frequency, the effective federal funds rate moves lower in response to unexpected increases in the supply of Fed balances. Research by Hamilton (1997), Hamilton (1998), Thornton (2001), and Carpenter and Demiralp (2006a) indicates that this daily liquidity effect varies according to the day of the maintenance period, becoming particularly pronounced on settlement Wednesday, the last day on which banks can satisfy their reserve requirements.

Significant changes in the structure of the market for Federal Reserve balances over the decade that elapsed from the period examined in these previous studies to 2007 may have affected the magnitude and the nature of the daily liquidity effect. Hilton (2005) points to four operations-related changes: the re-introduction of lagged reserve accounting in 1998, ongoing

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modernization in banking and account monitoring technology, increasingly frequent fine tuning operations, and improved forecasting by the Federal Reserve staff.

In addition, the Federal Reserve has been increasingly transparent in its communication of monetary policy over the past two decades. Starting with indications of the intended policy rate and bias in the late 1980s, continuing with the explicit announcement of changes in the target federal funds rate in 1995 and extended with the release of a statement after every meeting, the Federal Reserve has provided ever-clearer signals of its outlook.<sup>1</sup> As a result, market participants have been able to anticipate more precisely changes in the target federal funds rate. There may be implications of this anticipation in the slope of the demand curve leading up to FOMC meetings: banks may attempt to minimize total funding costs over a maintenance period, thereby reallocating demand across days on either side of the anticipated rate change.

This paper examines the liquidity effect using more recent data than previous studies and advances the literature in several dimensions. First, using data from 1995 to 2007, we demonstrate that the liquidity effect attenuated considerably, and we identify a break following the re-introduction of lagged reserve requirements in 1998. Second, we find that the liquidity effect is systematically stronger on high-payment-flow days, and that these days do not necessarily correspond to the standard set of calendar days typically presumed to be high-payment-flow days. Third, we find that the liquidity effect intensifies well in advance of an FOMC meeting at which an increase in the target federal funds rate is anticipated, particularly when the FOMC meeting falls late in the 2-week reserve maintenance period.

Our main results are as follows. In contrast to research using data from earlier periods, we find that the liquidity effect is roughly constant across the days of the maintenance period, except on the last day of the maintenance period. Furthermore, in all cases, the liquidity effect has attenuated markedly through time. We conjecture that improved reserve management and increased transparency in monetary policy likely contributed to the diminished liquidity effect.

These results have a few policy implications. First, the results suggest that the technical innovations in reserves management have allowed banks to better monitor their reserve positions. Similar to previous work, we do find a statistically significant difference on settlement day; however, the magnitude of this difference is quite small compared to that estimated on data from earlier periods. Second, the results are consistent with the idea that funds market behavior during the period of increased transparency had been better anchored around the target rate and had been associated with fewer large deviations of the funds rate from the target rate. During this period, depository institutions had come to expect funds to trade close to the target rate, and thus did not generally have as dramatic reactions to forecast misses as may have occurred in the earlier period. Moreover, there may have been broad expectations that the trading desk (“the Desk”) at the Federal Reserve Bank of New York will successfully offset these misses in later days of the maintenance period by adding or draining balances accordingly, diminishing the incentive for institutions to react materially to balance shortfalls or excesses on most days of the maintenance period.

In September 2008, the Federal Reserve implemented several measures to provide liquidity to financial markets. These measures were not completely offset by corresponding reductions in the Federal Reserve’s assets and, as a result, excess reserve balances reached very high levels. Under these conditions, the Federal Reserve’s approach to monetary policy implementation differed from that described in this paper. However, this paper is important, as the measures taken to provide additional liquidity are currently described as temporary. Moreover, tools to substantially reduce the volume of reserves, including large-scale reverse repurchase agreements and a term deposit facility, are now being developed and considered.<sup>2</sup>

The remainder of the paper proceeds as follows. Section 2 describes the primary features of monetary policy implementation during the period under review. Section 3 discusses our analytical framework. Sections 4 and 5 present our estimation framework and results. Section 6 offers concluding remarks.

## 2. Background

Traditionally, the Federal Reserve implemented monetary policy by conducting open market operations to align the supply of balances held by depository institutions at Reserve Banks with demand for those balances so that federal funds trade around the target rate set by the Federal Open Market Committee (FOMC). Because the Desk adjusted supply in part to address day-to-day changes in demand, there is a classic simultaneity problem when estimating the slope of the demand curve. For this reason, this paper follows the work of Hamilton (1996, 1997) and Carpenter and Demiralp (2006a,b) in using the change in the federal funds rate associated with an unanticipated change in the supply of balances held at the Federal Reserve to trace out the demand curve. In order to provide background for the subsequent analysis, this section reviews the main components of supply and demand for fed balances.

Demand for balances by depository institutions (DIs) at the Federal Reserve is generated by the need to satisfy reserve requirements, to cover clearing needs, and to provide a cushion against unexpected reserve balance or clearing needs.

<sup>1</sup> The FOMC has changed its post-meeting statements over time. For many years, the FOMC did not release any statement after its meetings. After the February 4, 1994 FOMC meeting, the Chairman of the Federal Reserve released a statement that described intended changes in the “degree of pressure on reserve conditions.” At the May 1994 FOMC meeting, the statement structure was revised and declared that the “Board approved an increase in the discount rate,” included an explicit number for this rate, and, in addition, stated that the rate increase “should be allowed to show through completely into interest rates in reserve markets.” This structure remained until July 1995, when an explicit target for the federal funds rate was announced. During that period, no statement was released after meetings without rate changes. Starting in May 1999, a statement was released after each meeting, regardless of whether a rate change occurred. Most recently, starting with the October, 2007, FOMC meeting, economic projections for each of the FOMC participants were released in the minutes for the meeting.

<sup>2</sup> These tools are mentioned in the Minutes to the Federal Open Market Committee’s meeting on August 11–12, 2009, available at <http://www.federalreserve.gov/newsevents/press/monetary/20090902a.htm>.

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