



Monetary policy implementation and the federal funds rate

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ABSTRACT

This paper investigates how the implementation of monetary policy affects the dynamics and the volatility of the federal funds rate. Since the early 1980s, the most important changes in the Fed's conduct of monetary policy refer to the role of the federal funds rate target and the reserve requirement system. We show that the improved communication and transparency regarding the federal funds rate target has significantly increased the Fed's influence on the federal funds rate since 1994. By contrast, the declining role of required reserves in the US has contributed to higher federal funds rate volatility. Our results suggest that the introduction of remunerated required reserves will further enhance the controllability of the federal funds rate.

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1. Introduction

Overnight money markets are the key channel through which monetary policy is executed. Overnight rates, such as the US federal funds rate, are the operational targets of monetary policy that signal the policy-intended interest rate level. Since the 1980s, many central banks, including the Federal Reserve (Fed), have redesigned their monetary policy instruments to ensure that the overnight rate closely follows the central bank's key policy rate and that its volatility remains well contained.¹ The current paper examines how major developments in the monetary framework of the Fed have influenced the dynamics and the volatility of the federal funds rate.

For the US the most obvious changes in monetary policy implementation refer to the increasing role of the federal funds rate target. Before February 1994, the Fed's interest target rate was more or less implicit and had to be inferred by the public from the Fed's open market operations; see Thornton (2006). Since then, changes in the federal funds target rate have been announced and explained immediately after the Fed's interest rate decision. The

introduction of a balance of risk statement in 2000 might have further improved the communication and transparency of monetary policy, see Ehrmann and Fratzscher (2007). Furthermore, the role of required reserves has changed over time. During the 1990s sweep account programs could have significantly undermined the reserve base in the US, and thus the ability of required reserves to act as an interest rate smoothing liquidity buffer, see e.g. Woodford (2000). With a view to the recently introduced practice of remunerated reserves, our second focus is, therefore, on the role of required reserves for the volatility of the federal funds rate.

Our paper essentially relates to three groups of papers. First, it adds to the growing literature on the volatility and the dynamics of overnight interest rates. Following the seminal paper by Hamilton (1996), recent examples include Bartolini and Prati (2006) and Pérez Quirós and Rodríguez Mendizábal (2006). Both contributions show that the central bank's operational framework influences the behavior of overnight rates. Second, it is related to the recent literature on central bank communication, see Blinder et al. (2008). In particular, Swanson (2006) and Lange et al. (2003) strongly suggest that a higher transparency has improved the predictability of the federal funds rate. Third, the literature has become increasingly interested in the role of required reserves in the money market. While the findings by Carpenter and Demiralp (2006) suggest that, in general, high levels of reserve balances mitigate intramaintenance period effects of liquidity supply shocks on the federal funds rate, Demiralp and Farley (2005) argue that the Fed and the banking system has adapted well to the particular

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¹ See Bindseil and Nyborg (2007) for a recent overview of central banks' monetary policy implementation.

decline in reserves of the mid-1990s. The aim of the current paper is to combine these different aspects of the former literature and to investigate them simultaneously in one model.

In line with the empirical literature, we adopt the EGARCH-framework to model the mean and the time-varying volatility of the daily federal funds rate. In order to capture probably important long-run equilibrium relations governing the federal funds rate dynamics, we specify the mean equation of the EGARCH model as an error-correction equation where the federal funds rate adjusts to two interest rate spreads. In accordance with the expectations theory of the term structure, the federal funds rate (i) may respond to the *term spread*, defined as the spread between the three month Treasury bill rate and the federal funds rate ($i3 - i$). Following models of the European overnight rate suggested by Benito et al. (2007) and Nautz and Offermanns (2007), we additionally account for the *policy spread* ($i - i^*$) as a second error-correction term governing federal funds rate dynamics. We use this framework to test whether the adjustment to deviations from its target and thus the controllability of the federal funds rate depends on the importance and transparency of the federal funds rate target.

Changes in monetary policy implementation may also affect the volatility of the federal funds rate. In particular, evidence provided by Hilton (2005) suggests that high reserve requirements stabilize the federal funds rate. Demiralp and Farley (2005), however, argue that the relationship between required reserves and interest rate volatility need not be negative if the Fed reacts to lower required reserves by expanding the liquidity supply management. In order to test whether required reserves contribute to lower interest rate volatility, we include a normalized measure of required reserves in the volatility equation of the federal funds rate.

Our results clearly indicate that improved communication and transparency of monetary policy decisions significantly enforce the adjustment of the federal funds rate to its target. Therefore, a well-communicated implementation of monetary policy enhances the Fed's control over the federal funds rate. In the same vein, results from the volatility equation show that the introduction of the balance of risks assessment in January 2000 has further contributed to stabilizing the federal funds rate. Controlling for the improved communication by the Fed reveals that the declining trend in required reserves has increased the interest rate volatility in the US.

The remainder of the paper is structured as follows: Section 2 introduces the interest rate data and reviews the increasing role of the federal funds rate target in US monetary policy implementation. Section 3 describes the development of reserve requirements and their possible impact on the volatility of the federal funds rate. Section 4 presents the empirical model designed to test the implications derived in Sections 2 and 3 regarding the effects of monetary policy implementation on the dynamics and the volatility of the federal funds rate. Section 5 summarizes our main results and provides some concluding remarks.

2. The increasing importance of the federal funds target rate in the implementation of monetary policy

2.1. The communication of the federal funds target rate

During the 1980s the Fed increasingly made use of an interest rate target in the formulation of its monetary policy decisions. In the corresponding literature, there is some ambiguity as to the exact date when the Fed began targeting the federal funds rate. Hamilton and Jordà (2002) date the beginning of the explicit interest rate targeting at the end of the 1980s. Thornton (2006) interprets the FOMC verbatim transcripts and concludes that the Fed has

already targeted the federal funds rate from 1982 onwards. Following Hamilton (1996), our sample period starts in March 1984. This allows us to consistently base the empirical analysis on a time period with a reserve maintenance period length of 2 weeks.

Central banks have paid increasing attention to the communication of monetary policy decisions since the 1990s, see Blinder et al. (2008). This is also true for the Fed, whose disclosure practice reflects a growing transparency with respect to the communication of the federal funds target rate. Until January 1994, the target rate was rather implicit and had to be inferred from the open market operations. In fact, FOMC decisions on target rate changes were released only after the subsequent FOMC meeting. In February 1994, a second period of communication policy began with the announcement of monetary policy decisions immediately after an FOMC meeting. A further extension in the communication of interest rate decisions in January 2000 marked the beginning of a third regime of the Fed's communication policy. Since then, FOMC-statements have regularly contained a forward-looking component. The so-called balance of risks assessment gives an evaluation if the Fed sees the risks for the economy to be biased towards an economic slowdown (easing bias), towards higher inflationary pressure (tightening bias) or if both risks are supposed to be balanced (neutral assessment). Despite the fact that the statement is not meant to give a binding direction for the immediate next step of monetary policy, the market uses it to form expectations about the near future, see Rasche and Thornton (2002). According to Ehrmann and Fratzscher (2007), the publication of the forward-looking component in the FOMC statement has significantly contributed to a better anticipation of interest rate decisions.²

We account for the implications of the three regimes of monetary policy communication on the dynamics and volatility of the federal funds rate as follows. First, we test whether the adjustment of the federal funds rate to the target rate changes with the new disclosure policy, i.e. we allow for different adjustment dynamics of the federal funds rate before and after February 1994. In line with Demiralp and Jordà (2002), if the immediate publication of the target rate eased the perception of the monetary policy stance by the market, the adjustment of the federal funds rate to the target rate should have accelerated. Moreover, changes in the communication policy may have influenced the reversion of the federal funds rate to the term spread. In particular, if the outlook for monetary policy facilitated the formation of interest rate expectations since 2000, Treasury bill rates might have become a clearer focal point for market expectations about future federal funds rates. As a result of the Fed's improved communication concerning the future interest rate path, the reaction of the federal funds rate to the term spread might have become stronger.

Following Carpenter and Demiralp (2006), we control for anticipated and unanticipated target rate changes. To calculate the surprise component of target rate changes $\Delta i_t^{*,u}$, we adopt the approach introduced by Kuttner (2001). He infers expected and unexpected changes from 30-day federal fund future rates. A future contract of day t refers to the average federal funds rate over a period of 30 days, starting on day $t + 1$. The surprise of an interest rate change as of day t is therefore embodied in the difference of future rates between day t and $t - 1$. More precisely, Kuttner proposes a formula, which includes a scaling factor related to the number of days in a month:

$$\Delta i_t^{*,u} = \frac{m}{m-t} (f_{s,t}^0 - f_{s,t-1}^0), \quad (1)$$

where $f_{s,t}^0$ is the spot-month futures rate of month s on day t and m

² The role of the Fed's communication for the stability of market interest rates has been emphasized by, e.g. Kuttner (2001) and Lee (2006).

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