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Monetary Policy Implementation and Overnight Rate Persistence

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Abstract

Overnight money market rates are the predominant operational target of monetary policy. As a consequence, central banks have redesigned the implementation of monetary policy to keep the deviations of the overnight rate from the key policy rate small and short-lived. This paper uses fractional integration techniques to explore how the operational framework of four major central banks affects the persistence of overnight rates. Our results suggest that a well-communicated and transparent interest rate target of the central bank is a particularly important condition for a low degree of overnight rate persistence.

Keywords: Controllability and Persistence of Interest Rates; Operational Framework of Central Banks; Long Memory and Fractional Integration;

JEL classification: E52, C22

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1 Introduction

Overnight money market rates play a crucial role for signalling the intended interest rate level and the stance of monetary policy. In recent years, central banks 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. Mean and variance of the *policy spreads*, i.e. the deviation of the overnight rate from its policy-intended level, are often seen as indicators for the effectiveness of monetary policy implementation.

This paper argues that controllability of the overnight rate additionally requires that the *persistence* of the policy spread remains sufficiently low. If the persistence of the policy spread is too high, the lasting impact of shocks would impede the signalling role of the overnight rate and the central bank's control over interest rates.[1] Recently, Cassola (2007) and Hassler and Nautz (2008) showed that the policy spread of the European Central Bank exhibits long memory implying that the central bank's control of the overnight rate is weaker than expected.

The current paper sheds more light on the role of the monetary policy design for the persistence of overnight rates. We explore how institutional differences in monetary policy implementation are reflected in the persistence of policy spreads. To that aim, we consider the policy spreads of the U.S. Federal Reserve, the European Central Bank, the Bank of England, and the Swiss National Bank where the reserve requirement system, standing facilities, open market operations and the implementation of the policy rate feature notable differences.

Our paper adds to the growing literature on the role of monetary pol-

[1] Following Ho (2008, p10), "persistent deviations from the policy target, especially if not explainable by purely technical factors, may risk being interpreted as either an unintended failure to achieve the announced policy stance or an intended deviation from it". From 2005 until the start of the liquidity crisis in summer 2007, a puzzling widening of the ECB's EONIA spread of only a few basis points has been a concern of policy makers, see e.g. European Central Bank (2006). According to the ECB, the increased spread was not intended and it is still unclear why it happened and whether this upward trend will continue, see e.g. Linzert and Schmidt (2008).

icy implementation for the behavior of interest rates. Following the seminal paper by Hamilton (1996), most contributions adopt the (E)GARCH framework to analyze e.g. cross-country differences in overnight rate volatility (Bartolini and Prati (2006)) or its transmission along the yield curve (Colarossi and Zaghini (2007), Nautz and Offermanns (2008)). Moreover, Pérez Quirós and Rodriguéz Mendizábal (2006) show that the introduction of the ECB's symmetrical interest rate corridor has significant effects for overnight rate dynamics. Thornton (2006) and Nautz and Schmidt (2009) discuss the role of operating procedures for the Fed's policy spread.

In all these contributions on the dynamics and volatility of overnight rates, the policy spread is assumed to be integrated of order zero (I(0)) and the possibility of long memory is neglected. However, ignoring long memory may imply an underestimation of the persistence of shocks and adversely affect estimation results, see Sun (2006). Since the focus of our attention is on the persistence of overnight rates, we apply fractional integration techniques to allow for the presence of long memory in the policy spreads of central banks.[2]

Our results indicate that there are partially offsetting effects of a central bank's monetary framework on the persistence of the policy spread. Nevertheless, the evidence obtained for different central banks and monetary policy implementation regimes suggests that a well-communicated and transparent interest target plays a particular role for keeping the persistence of the policy spread sufficiently low.

The remainder of the paper is organized as follows. Section 2 briefly recalls the features of long memory models for measuring the persistence of time series. Section 3 discusses how the operational framework of a central bank could be related to the persistence of the policy spread. Section 4 introduces the data and presents the empirical results. Section 5 contains some concluding remarks.

[2]Fractional integration techniques have been applied in various economic contexts. Recent examples include the changing persistence of inflation (Kumar and Okimoto (2007)), unemployment rates (Caporale and Gil-Alana (2007)), and foreign exchange rates (Cheung and Lai (2001)).

2 Long Memory Models

2.1 Fractional Integration and Persistence

If a central bank considers the overnight rate as operational target of monetary policy, its deviations from the policy rate should be short-lived and stationary. Restricting the attention to I(0) and I(1) processes, empirical contributions on the dynamics of overnight rates typically conclude that policy spreads are integrated of order zero (I(0)). In fact, assuming a non-stationary I(1) policy spread would imply that the central bank lost any control over its operational target. However, recent evidence on the ECB's policy spreads indicate that the central bank's impact on the overnight rate might be weaker than expected. In particular, Hassler and Nautz (2008) and Cassola (2007) found that the Eonia spread is stationary but exhibits long memory with a fractional order of integration $d \approx 0.25$. Long-memory behavior in policy spreads implies that there is a long range dependence between the overnight rate and the policy rate which cannot be captured by I(0) processes like e.g. standard short memory ARMA models.

Let y be fractionally integrated of order d such that it can be transformed into an $I(0)$ process s by fractional differencing[3] of order d,

$$(1-L)^d y_t = s_t \ . \tag{1}$$

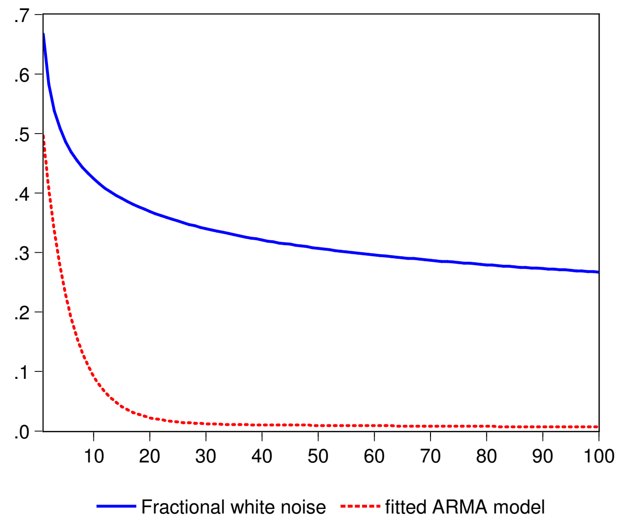
If s is white noise, y is called a fractional white noise process. In order to demonstrate the features of long-memory in a policy spread and to illustrate the consequences of wrongly ignoring it, we fitted a short-memory ARMA(p,q)-model to a simulated fractional white noise series. Figure 1 displays the autocorrelation function (ACF) of a fractional white noise process with $d = 0.4$ together with the ACF of the fitted ARMA model.[4] While the theoretical ACF implied by the ARMA model drops to zero with exponential

[3] L is the lag operator. The expansion of $(1-L)^d$ is given by $1 - dL - \frac{d(1-d)}{2!}L^2 - \frac{d(1-d)(2-d)}{3!}L^3 - \dots$.

[4] The autocorrelation function at lag k of fractional white noise can be expressed as $\rho(k) = \frac{\Gamma(k+d)\Gamma(1-d)}{\Gamma(k-d+1)\Gamma(d)}$, where $\Gamma(\cdot)$ is the gamma function.

decay, the ACF of the fractional white noise process with $d = 0.4$ exhibits hyperbolic decay and declines much more slowly.

Figure 1: Theoretical Autocorrelation Functions



Notes: Sample process with T=1000 observations (1000 observations for initialization), $d = 0.4$, $ARMA(2,2)$-specification as suggested by AIC with maximum lag orders $max(p) = max(q) = 8$.

The different patterns in the ACFs have direct implications on the conclusions drawn from impulse response analysis. If y is misspecified as short-memory ARMA model, 95% of an initial shock should have vanished after 8 periods. In the true long-memory model, however, the same effect takes more than 40 periods. Apparently, short-memory ARMA models can hardly reflect the autocorrelation structure of long memory processes in an adequate way. In particular, ignoring long memory in policy spreads can lead to considerable misperceptions regarding the persistence of shocks and the controllability of the overnight rate.

2.2 Estimating Fractionally Integrated Processes

Let y_t be a covariance stationary process observed at $t = 1, \ldots, T$ with spectral density $f(\lambda)$. By assumption,

$$f(\lambda) \sim G\lambda^{-2d} \quad \text{as} \quad \lambda \longrightarrow 0^+ \tag{2}$$

for $G \in (0, \infty)$ and $d \in \left(-\frac{1}{2}, \frac{1}{2}\right)$. The periodogram of y_t may be defined as

$$I(\lambda) = |\omega(\lambda)|^2 = |(2\pi T)^{-1/2} \sum_{t=1}^{T} y_t e^{it\lambda}|^2 \ . \tag{3}$$

$I(\lambda)$ is evaluated at harmonic frequencies $\lambda_j = \frac{2\pi j}{T}$, with $j = 1, \ldots, m$ and $m < \frac{T}{2}$ determines the bandwidth.[5] The local Whittle estimate $\widehat{d}_{LW}$ can be written as

$$\widehat{d}_{LW} = \arg\min\Big(\log(\frac{1}{m}\sum_{j=1}^{m} \lambda_j^{2d} I(\lambda_j)) - 2d\frac{1}{m}\sum_{j=1}^{m} \log \lambda_j\Big). \tag{4}$$

Robinson (1995) establishes the consistency of the local Whittle estimate under (2) and additional regularity and mild homogeneity conditions:[6] $\widehat{d_{LW}} \xrightarrow{\text{p}} d$ as $T \to \infty$. Under somewhat stronger assumptions, Robinson (1995) shows that the (asymptotic) variance of the estimator is $\frac{1}{4m}$. Thus, the local Whittle estimator may also serve as an approximate test for long memory. Since overnight rates are often characterized by periodic outliers and strong calendar effects, we have to take into account that additive outliers may imply a strong downward bias on estimates of the long memory parameter, see Haldrup and Nielsen (2007).

[5]In our application, we choose m in line with the optimality criterion introduced by Henry (2001).

[6]In particular, the bandwidth m has to tend to infinity much more slowly than T, such that the proportion of the frequency band involved in the actual estimation tends to zero as $T \to \infty$.

3 Monetary Policy Implementation and the Persistence of Policy Spreads

Let us now consider the relation between the persistence of policy spreads and some features of monetary policy implementation. To that aim, we characterize the Bank of England (BoE), the U.S. Federal Reserve (Fed), the European Central Bank (ECB), and the Swiss National Bank (SNB) focussing on the following aspects of their monetary set-up: i) the reserve requirement system, ii) the conduct of open market operations, iii) the role of standing facilities, and iv) the implementation of the central bank's policy rate. In cases of significant reforms of the monetary framework, we will consider the corresponding sub-samples to examine the impact of the institutional changes on policy spread persistence.[7] In the following, we briefly discuss the operational frameworks along the above criteria and derive partially offsetting implications on the persistence of the policy spread.

3.1 Reserve Requirements

Reserve requirements can be a powerful tool to smooth overnight rates within the maintenance period. In fact, interest rate smoothing can nowadays be seen as the main reason for imposing reserve requirements.[8] *Ceteris paribus*, a more effective reserve requirement system should contribute to a less persistent policy spread. In the euro area, for example, remunerated required reserves have been an effective liquidity buffer for the money market. As a result, deviations of the overnight rate from the policy intended target level should be small and short-lived. In contrast, the persistence of the policy spread might be higher in the U.S. where banks have used "sweep accounts" on a large scale to circumvent the opportunity costs of non-remunerated min-

[7] The persistence of policy spreads may change while operational frameworks remain the same. For example, because the persistence of a determinant of policy spreads like e.g. collateral prices changed. However, these changes are extremely hard to identify and beyond the scope of this paper.

[8] About two thirds of the central banks of OECD countries employ minimum reserve requirements, see O'Brien (2007).

imum reserve requirements, see e.g. Carpenter and Demiralp (2008).[9] In the UK, required reserves were completely absent until May 2006. Since then, however, the BoE has encouraged banks to choose voluntary levels of required reserves.

The BoE's implementation of required reserves differs from the ECB's practice in two notable aspects, see BoE (2007) and ECB (2006). First, the BoE allows banks to deviate from the reserve target by $+/-$ 1%, whereas the ECB requires exact fulfillment of the reserve requirement. Second, in contrast to the ECB, the BoE remunerates required reserves exactly at the policy rate, which further emphasizes the central bank's commitment to its interest rate target. Both measures increase the elasticity of funds around the BoE's target rate. Therefore, we expect that policy spread persistence in the UK has been particularly low under the BoE's new operational framework.

3.2 Open Market Operations

Open market operations are the dominant tool for the liquidity management of central banks. The dynamics of interest rates may depend on the frequency of open market operations. In particular, while the ECB usually intervenes in the money market only once a week, the Fed manages the liquidity of the banking system on a daily basis. *Ceteris paribus*, a very active liquidity management of the central bank should increase the central bank's impact on the overnight rate and, thus, decrease the persistence of policy spreads. However, the Fed might have intervened frequently in the money market in order to offset persistent deviations of the overnight rate from the policy rate caused by the absence of a well-functioning minimum reserve system. As a consequence, the combined effect of frequent open market operations and a noneffective reserve system on the policy spread is not clear and could be even country-specific.

The impact of open market operations on the persistence of the policy

[9] Sweep accounts are automated transfer of deposits to virtual accounts which are not subject to minimum reserve requirements. For some banks and periods, reserves could have been even below the level needed for transaction purposes.

spread may also depend on the refinancing risk perceived by the money market. As long as banks are confident that their demand for reserves is met at the policy intended interest rate level, deviations of the overnight rate from the policy rate should be small and transitory. For example, until March 2004, the refinancing risk of Euro area banks had been particularly small because the ECB's weekly main refinancing operations had a bi-weekly maturity, i.e. the refinancing opportunities overlapped. Since March 2004, however, with the introduction of the new operational framework, the ECB has shortened the maturity of MROs from two to one week. As a consequence, there is no overlap of subsequent MROs anymore and auction volumes doubled, probably making banks' refinancing more difficult and more risky. In fact, banks' increased refinancing risk may explain the significant increase in the persistence of the ECB's policy spread under the new framework, see Hassler and Nautz (2008).

3.3 Standing Facilities

In the ECB's regular refinancing operations both the maturity and the volume of reserves allocated to the banking sector are under the central bank's control. By contrast, standing facilities allow banks to deposit or lend reserves at short notice and on their own initiative. In order to keep reserves under control and to promote active trading in the money market, central banks set interest rates of their deposit and lending facilities well below and above the policy rate, respectively. Typically, the policy rate is set exactly at the mid of the corridor because the opportunity cost of holding positive or negative balances at the central bank should be equal at the central bank's interest rate target, see Whitesell (2006). Deposit and lending rates of standing facilities define lower and an upper bounds for overnight rates. For many central banks, including the ECB, the resulting interest rate corridor has proved to be an effective way to prevent the overnight rate from extreme fluctuations. Advancing on the ECB's corridor, the BoE recently introduced a new sophisticated system of standing facilities where the width of the interest rate corridor shrinks systematically at the end of the reserve maintenance period. In line with Pérez Quirós and Rodrigués Mendizábal (2006), effective corridor systems may not only constrain overnight rate volatility, they may also contribute to a low persistence of the policy spread.

Introducing a well functioning corridor system is not always an easy task. In the U.S. financial sector there has been a long "tradition against borrowing" from the central bank. In particular, using the Fed's discount credit has often been interpreted as a sign of management failures, see e.g. Hakkio and Sellon (2000). As a consequence, banks refrained from using the Fed's lending facility and the discount rate could not function as a ceiling for the Federal Funds rate. In 2003, the Fed has introduced new lending facilities, including the *primary credit* facility where liquidity is supplied at rates 100 bp above the Federal Funds rate target. So far, however, banks have used the new facility only reluctantly, see Furfine (2003). Apparently, the tradition against borrowing is still an issue in the U.S.

3.4 The Implementation of the Policy Rate

The persistence of the policy spread may also depend on how the policy rate is implemented by the central bank. For example, the relation between the ECB's policy rate implemented as the minimum bid rate announced in its MROs and the target level of the overnight rate is not very clear. First, since maturities and collateral requirements differ for the corresponding transactions, the "natural" level of the policy spread is uncertain and may even vary over time, see Linzert and Schmidt (2008). Second, marginal and average MRO allotment rates contain new information about the liquidity situation in the money market in addition to the minimum bid rate, see Abbassi and Nautz (2008). Following Tucker (2004), the BoE conducts all short-term repos at the policy rate "to rule out speculation about whether the result of a tender revealed anything about the MPCs rate intentions." A third distinguishing feature of the ECB's policy rate is its inherent asymmetry. In contrast to the symmetrical target used by the Fed, a minimum bid rate may be particular effective for signalling lower bounds for the overnight rate whereas upper bounds are less clear. Therefore, an explicit commitment of the central bank to a transparent interest target should contribute to a low persistence of the policy spread.

In the U.S. the importance of the Federal funds rate target for the implementation and communication of monetary policy decisions has increased significantly over time, see Thornton (2006). While the target rate was published only with a delay of 45 days before 1994, it has been announced and explained immediately after the Fed's rate decision since then. In particular, since 2000, the Fed further improved its communication by the publication of statements about the outlook of monetary policy and the balance of risk, see e.g. Ehrmann and Fratzscher (2007). As a consequence, we expect that the persistence of the U.S. policy spread has significantly decreased since 1994.

Concerning the central bank's interest rate target, the Swiss National Bank (SNB) is a special case. In contrast to many other central banks, the SNB does not target the overnight rate but a market rate with three month maturity.[10] Moreover, there is only a target range for the three month rate rather than a fixed policy rate. Accordingly, even persistent deviations of the operating target from the mid of the range do not necessarily imply a change in the policy stance. For the sake of comparability, we define the SNB policy spread as the spread between the overnight rate and the mid-point of the target range for the three month rate. For the SNB, the less prominent role given to overnight rates and the less explicit definition of the target rate should imply a highly persistent policy spread.

Table 1 summarizes the partially offsetting implications of the various regimes of monetary policy implementation for the persistence of the policy spread.

[10] According to Jordan and Kugler (2004), the overnight rate is not an appropriate operating target because the SNB may employ short-term money market rates to offset short-run pressures on the foreign exchange market.

Table 1: Monetary Policy Implementation and Policy Spread Persistence

Reserve Requirements	Open Market Operations	Standing Facilities	Implementation of Policy rate	Effect on Policy Spread Persistence
ineffective (US, UK_{old})	non-overlapping (EMU_{new}, UK_{new}) low frequency (EMU, UK_{new})	ineffective (US, UK_{old})	less transparent (CH, EMU, US_{old})	⇑ **higher persistence**
effective (EMU, UK_{new}) remunerated at policy rate (UK_{new})	overlapping (EMU_{old}, UK_{old}) high frequency (US, UK_{old})	effective (EMU, UK_{new}) narrow corridor (UK_{new})	more transparent (UK, US_{new})	**lower persistence** ⇓

Notes: The indices *old* and *new* refer to the monetary policy implementation regimes defined in Table 2. Policy spreads are defined as spread between the representative overnight rate and the central bank's policy rate.

4 The Persistence of Policy Spreads

4.1 Data

Calendar effects and outlier adjustment

Our empirical analysis on the link between the persistence of policy spreads and monetary policy implementation is based on daily data of representative overnight rates in the U.S., the euro area, the United Kingdom and Switzerland. In all these countries, overnight rates exhibit strong calendar effects including large interest peaks and troughs especially at the end of a reserve maintenance period. According to Haldrup and Nielsen (2007), outliers can severely mask the long memory properties of the data. Moreover, it is well understood by markets that seasonal increases of overnight rate volatility are temporary and unrelated to signals about the monetary policy stance. Following e.g. Thornton (2006), we excluded all end-of-period observations from the sample and regressed the remaining observations on end-of-month, end-of-quarter, end-of-semester, and end-of-year dummy variables to ensure that our results are not driven by calendar effects. Figure 2 displays the adjusted overnight rate, the corresponding policy rate and the resulting policy spread for each central bank under consideration. Some descriptive statistics of policy spreads are shown in Table 2.

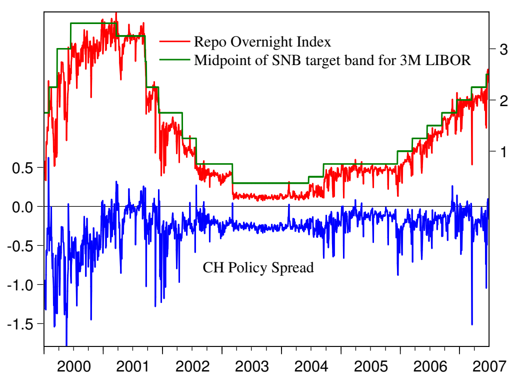
Table 2: Descriptive Statistics of Policy Spreads

Monetary policy implementation regime			Policy spread mean	std. dev.	median
European Monetary Union	EMU_{old}	27 Jun 2000 to 8 Mar 2004	0.071	0.14	0.05
	EMU_{new}	9 Mar 2004 to 30 Jun 2007	0.066	0.04	0.07
Switzerland	CH	1 Jan 2000 to 30 Jun 2007	-0.266	0.24	-0.233
United Kingdom	UK_{old}	5 Jun 1997 to 17 May 2006	-0.061	0.40	-0.08
	UK_{new}	18 May 2006 to 28 Jun 2007	0.057	0.05	0.05
United States	US_{old}	1 Mar 1984 to 31 Jan 1994	0.054	0.25	0.035
	US_{new}	1 Feb 1994 to 18 Jan 2000	0.006	0.17	0.01
	US_{new}	19 Jan 2000 to 30 Jun 2007	0.006	0.09	0.00

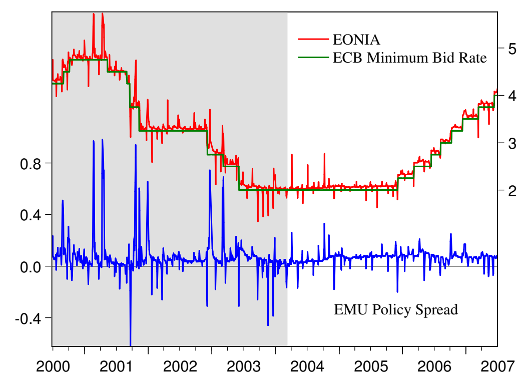
Notes: Policy spread statistics are calculated for daily data adjusted for calendar effects. Policy spreads are defined as spread between the representative overnight rate and the central bank's policy rate.

Figure 2: Policy Spreads

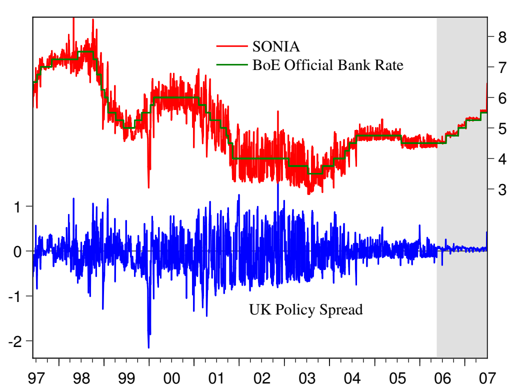
(a) Switzerland



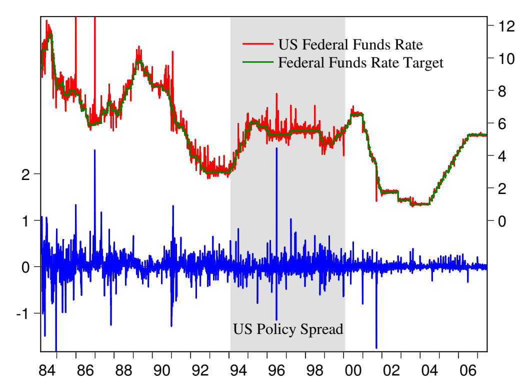
(b) EMU



(c) United Kingdom



(d) United States



Notes: In each chart, the interbank rate and the corresponding target level are plotted on the right axis. The policy spread (adjusted for end-of-maintenance period and calendar effects) is plotted on the left axis. The shaded areas indicate different regimes of monetary policy implementation. Data sources: Swiss National Bank, Euribor FBE, Federal Reserve Bank of St. Louis, Bank of England.

Sample periods and monetary policy implementation regimes

For each central bank, the observation period ends in June 2007, i.e. immediately before the start of the international liquidity crisis when spreads between unsecured money market rates and the policy rate sharply increased. The starting points of the various samples and sub-samples are central bank specific to account for significant changes in the operational framework, see Table 2. Following Hamilton (1996), the U.S. sample starts in March 1984. Further sub-samples refer to 1994 when the role of the Federal Funds rate target significantly increased and to 2000 when the Fed's communication improved considerably. For the euro area, the sample starts in June 2000 with the introduction of the ECB's minimum bid rate. A second sub-sample captures the introduction of the ECB's new framework in March 2004. With a view to the recent reforms of the BoE, the UK sub-samples begin in 1997 and May 2006. No further sub-samples seem to be required for the Swiss sample which starts in 2000 with the launch of the SNB's target band for the three month rate.

4.2 Empirical results

Table 3 summarizes our empirical results on the persistence of policy spreads for all central banks and monetary policy implementation regimes. We found that the ECB's policy spread is $I(0)$ before but fractionally integrated with long memory after March 2004. In line with Hassler and Nautz (2008), the estimated order of fractional integration ($\widehat{d}$) increases from $\widehat{d} \approx 0$ to $\widehat{d} = 0.269$. This notable change in persistence is confirmed by the p-values corresponding to the null hypothesis "d=0". These results strongly indicate that the policy spread exhibits long-memory under the ECB's new framework. From a monetary policy implementation perspective, the increased persistence could be due to banks' increased refinancing risk induced by the introduction of shorter-term and non-overlapping refinancing operations, see Table 1. Yet, since d is clearly below 0.5, the overnight rate remains under the ECB's control.

From 1984 to 1994, all criteria except the frequency of open market operations suggest a high degree of policy spread persistence for the U.S., see Table 1. In fact, there is clear evidence in favor of long memory of the U.S. policy spread during the first monetary policy implementation regime (US_{old}). In particular, short memory is rejected at any conventional significance level. Apparently, in this period the very active liquidity management of the Fed could not offset the policy spread persistence induced by an ineffective reserve requirement system and an opaque interest rate target. Since 1994, the Fed had put much more emphasis on the Federal Funds rate target and its communication to the public. Our results indicate that this change in the implementation of monetary policy had been sufficient to decrease the U.S. policy spread persistence significantly. Since 2000, the volatility of the Federal Funds rate has decreased significantly due to a further improvement of the Fed's communication strategy and the reform of the discount window, see Table 2. As expected, these additional features of the Fed's operational framework did not increase the persistence of the policy spread. The estimated order of fractional integration remains close to zero and short-memory of the policy spread cannot be rejected.

In contrast to the EMU and the U.S. there is no evidence in favor of long memory in the UK policy spread. Under the new regime, starting in May 2006, low persistence of policy spreads is in line with most of the features of monetary policy implementation, see Table 1. Compared with the results obtained for the U.S. the low persistence of UK policy spreads during the first sub-sample is more puzzling. It seems that daily interventions joint with a rather clear statement concerning the intended interest rate level had ensured the BoE's control of the overnight rate, see Wetherilt (2003). While overnight rate volatility was at a non-acceptable high level, the persistence of overnight rate fluctuations around the BoE's interest rate target was only small.

These results indicate that a strong emphasis on a well-communicated interest rate target may greatly reduce the persistence of the policy spread. The hypothesis of a link between policy spread persistence and the implementation of the policy rate is confirmed by the results found for Switzerland. Since the SNB's policy rate refers to the three month rate, the link between the policy rate and the Swiss overnight rate is only weak and the persistence of the implied spread should be large. In fact, the order of fractional fractional of the Swiss policy spread is very close to 0.5 reflecting that overnight rate fluctuations play only a minor role in the monetary implementation strategy of the SNB, see Jordan and Kugler (2004).

Table 3: Long Memory Parameters of Policy Spreads

Monetary policy implementation regime		$\widehat{d}_{LW}$	p-value
CH	1 Jan 2000 to 30 Jun 2007	0.443	0.000*
EMU_{old}	27 Jun 2000 to 8 Mar 2004	0.000	0.998
EMU_{new}	9 Mar 2004 to 30 Jun 2007	0.269	0.001*
UK_{old}	6 Jun 1997 to 17 May 2006	0.055	0.271
UK_{new}	18 May 2006 to 28 Jun 2007	0.091	0.311
US_{old}	1 Mar 1984 to 31 Jan 1994	0.246	0.000*
US_{new}	1 Feb 1994 to 18 Jan 2000	0.015	0.609
US_{new}	19 Jan 2000 to 30 Jun 2007	0.066	0.146

Notes: The Table shows the local-Whittle estimates for the long memory parameter of policy spreads during various regimes of monetary policy implementation. The bandwidth m has been determined in line with Henry (2001). The p-value refers to the two-sided test of the null hypothesis $H_0 : d = 0$ against $H_1 : d \neq 0$. * marks significance at the 1% level.

5 Conclusion

This paper explored the relation between the persistence of the policy spread and the monetary policy implementation of a central bank. We characterized the monetary framework of the Bank of England (BoE), the U.S. Federal Reserve (Fed), the European Central Bank (ECB), and the Swiss National Bank (SNB) focussing on i) the role of reserve requirements, ii) the conduct of open market operations, iii) standing facilities, and iv) the implementation of the central bank's policy rate. In cases of significant reforms of the monetary framework, we also considered the corresponding sub-samples to examine the impact of the institutional changes on policy spread persistence. We found that the central bank's influence on the overnight rate depends on the monetary policy implementation regime. The use of fractional integration techniques revealed that policy spreads exhibit different degrees of persistence, indicating that the monetary policy design determines the strength of the relation between the overnight rate and the central bank's policy rate.

Our results suggest that the introduction of remunerated required reserves (see e.g. O'Brien (2007)) may reinforce the low persistence of the policy spread in the U.S. and, thereby, enhance the Fed's control of money market interest rates. However, while the partial effect of a single monetary instrument is obvious in most cases, the combined effect of a whole set of instruments on policy spread persistence is less clear. Due to offsetting implications, for example, low persistence can be found in monetary regimes with and without effective reserve requirements depending on e.g. the frequency of open market operations and the transparency of the policy rate.

The evidence found for the different monetary policy regimes indicates that the existence and clear communication of a target level for the overnight rate is a particular important condition for a low persistent policy spread. In particular, the increased role of the Federal Funds rate target and the Fed's enhanced communication about the future interest rate path has significantly decreased the persistence of the policy spread in the United States. The merits of a well-communicated interest rate target for the controllability of the overnight rate can be seen in the behavior of the policy spread during the recent credit markets turmoil, see Taylor and Williams (2009). Although the volatility of the federal funds rate has sharply increased since August 2007, controllability of the federal funds rate has not been a major issue because the persistence of the deviations of the Federal Funds rate from its target has remained low.

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