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Forecasting the intraday market price of money☆

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ABSTRACT

Central banks' operations and efficiency arguments would suggest that the intraday interest rate should be set to zero. However, a liquidity crisis introduces frictions related to news, which can cause an upward jump of the intraday rate. This paper documents that these dynamics can be partially predicted during turbulent times. Long memory approaches alone or in combination to account for model uncertainty outperform random walk, autoregressive and moving average benchmarks in terms of point and density forecasting. The relative accuracy is higher when the full distribution is predicted. We also document that such statistical accuracy can provide economic gains in investment strategies based on lending in the intraday market.

1. Introduction

An explicit market for intraday loans does not exist. However, we can observe an intraday interest rate by the spread between the interest rates on two overnight loans delivered at different times within the same day (provided they are repaid at the same time next day). Baglioni and Monticini (2008, 2010), Furfine (2001) and Jurgilas and Zikes (2013) find empirical evidence for the existence of such a market in the US, in the EU and in the UK. That market is partially unexplored and rich in aspects worth analyzing: efficiency, microstructure, arbitrage opportunities and so on. A zero level for the intraday interest spread, and therefore a flat intraday pattern for the rate, should be set for at least two reasons, as discussed in Baglioni and Monticini (2010). The first one is related to the role of the policymakers. A positive intraday spread might induce individual banks to delay payments, imposing a negative externality on the banking system (see Angelini (1998), Bech and Garratt (2003), Mills and Nesmith (2008) and Martin and McAndrews (2008)), and consequently increasing the operational risk in the payment systems (see e.g. FED (2006); FED (2007)). The second reason refers to the role of money as a medium of exchange. The intraday rate is just a transaction cost for setting debt which should be

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minimized (see Zhou (2000)). Moreover, a zero level for the intraday spread provides an insurance for consumers against liquidity shocks (see e.g. Martin (2004); Bhattacharya et al. (2007)). Central banks' daily market operations seem to support these arguments, and indeed central banks often provide free daylight credit to the banking system. For example, the Eurosystem does not charge any fee on daylight overdrafts, and cash settlements must be cleared late in the afternoon and not early in the day.

Baglioni and Monticini (2008) show that thanks to central bank interventions, the intraday markets function fairly well in normal times with interest rates close to zero. However, liquidity crises change the functioning of the markets substantially. Baglioni and Monticini (2010) find that the ability of central banks to reduce the market price of intraday liquidity partially vanishes during crises. Baglioni and Monticini (2013) build up a simple model to explain why in normal times the only friction in action is related to settlement procedures and to the cost of central bank intraday credit (see the above references and VanHoose (1991)), while a liquidity crisis introduces a second component related to the chance of an upward jump of the intraday rate within the day due to some news (e.g., liquidity problems for some players in the market). Furthermore, Brunetti et al. (2011) find that central bank interventions during the recent crisis introduced uncertainty and pushed up the intraday money market rate further than (negative) economic news. Durré and Nardelli (2008) show that money market rates have been more sensitive to fine-tuning operations in recent years and Brunetti et al. (2011) claim that central banks either did not fully grasp the crowding effect, meaning commercial banks replaced money market liquidity with central bank liquidity so that market conditions did not improve (see Heider et al. (2009)) or consistently underestimated demand for funding liquidity.

Using a database from the e-MID market similar to Baglioni and Monticini (2013), we document that positive intraday spreads are often observed in the euro area market from January 2007 to April 2009, when our database stops. Moreover, we show that the dynamics of the series over our sample period are not random, but both in-sample and out-of-sample predictability seems to exist, suggesting that positive rates are not just due to measurement errors. In particular, our results find that long memory approaches, represented by ARFIMA(p, d, q) models where d is the order of integration, provide superior fit-measures and statistically outperform, in terms of point and density forecasting, random walk, autoregressive and moving average models during periods of high volatility. Brunetti et al. (2011) do not find mean reversion, but their linear specifications might not capture high persistence and nonstationarity modeled by our ARFIMA model. Moreover, our more recent sample where the intraday interest rates reduce in the final part of the sample and lower frequency data could explain the difference. Our results also indicate that intraday interest rates behave somewhat differently than longer maturity interest rates for which predictability is often not found and a random walk model is very difficult to beat (see Ang and Piazzesi (2003); Diebold and Li (2006); de Pooter et al. (2010)). Hamilton (2009) finds similar evidence of predictability for the daily changes in the Fed Funds rate. Finally, adding exogenous variables which could proxy funding liquidity and counterparty risks in financial markets as the spread between the three-month Euribor and the three-month Eonia swap rates does not improve forecast accuracy, suggesting that predictability might derive from the econometric properties of the series more than from economic news available in real-time to market participants (see e.g. Robertson and Wright (2012)).

We believe that our findings are very important for at least two players in the intraday market. Firstly, central banks could plan supplementary interventions to keep intraday spreads close to zero when forecasts indicate severe deviations from the zero level. The policy implication for interventions may be found in the following arguments. Intuitively, a bank short of liquidity say at 9 a.m. has two alternatives: (i) borrow in the interbank overnight (ON) market, (ii) obtain intraday credit from the central bank and borrow later (say at 3 p.m.) in the ON market. If these two alternatives were substitutes, such bank would not be willing to pay an implicit intraday interest charge larger than the cost of a six-hour loan from the central bank. This is the reason why the cost of daylight liquidity provided by the central bank may be seen as an upper bound for the implicit intraday interest rate. The ECB does not charge any fee

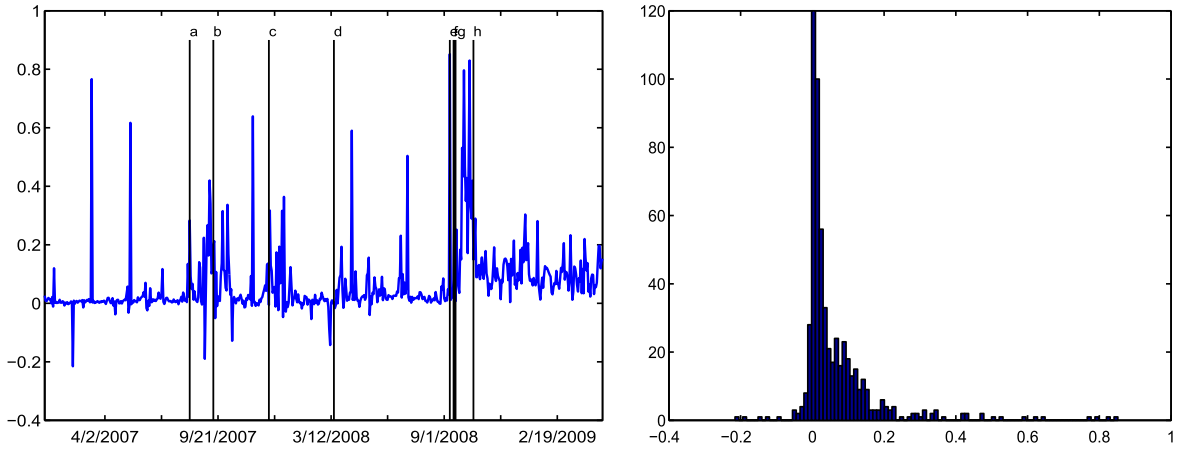

Fig. 1. Data. *Note*: The figure shows in the left panel the intraday interest rate in percent and in the right its histogram. Timeline legend for left panel: a — 8/9/2007, BNP Paribas redemptions on three investment funds; b — 9/14/2007, liquidity support for Northern Rock; c — 12/6/2007, bank writedowns (UBS, Lehman); d — 3/17/2008, collapse of Bear Stearns; e — 9/15/2008, Lehman bankruptcy; f — 9/16/2008, loan to AIG; g — 9/17/2008, money market funds trouble; h — 10/14/2008, US TARP announced; 10/15/2008, ECB extraordinary measures.