

## **Systemic Dynamics in the Federal Funds Market**

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Extended Abstract

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Like every over-the-counter market, the federal funds market is subject to allocational frictions because trading is executed through isolated bilateral negotiation. Existing theories of trading dynamics in over-the-counter markets have focused on search frictions, whereby traders locate each other with delays, to some extent by trial and error, and negotiate prices that depend in part on the difficulty of finding suitable alternative counterparties. Prices also reflect the relative benefits of making a trade immediately versus later (and with a newly found counterparty), for each of the two counterparties. As frictions increase and matching suitable pairs of counterparties becomes more difficult, a distressed trader has relatively less “leverage” during such a bilateral negotiation, and this is reflected in the contracted price. The efficiency of the allocation, and the impact of the search frictions on pricing, are among the main concerns of prior theoretical work. There is little if any prior empirical work on these aspects of the microstructure of over-the-counter markets.

In this project, we analyze how allocational frictions affect trading in the U. S. Federal Funds market, and whether or not these frictions could lead to systemic risks, such as a “gridlock,” by which individual financial institutions would fail to transfer balances

quickly to others as they wait for others to transfer balances to themselves, creating a self-fulfilling slowdown in the efficient re-allocation of excess balances.

Our study uses transactions-level data from Fedwire. In most of our study, we focus on the top 100 institutions by send volume, for the business days of 2005. This data set permits the construction of real-time balances for each institution, and allows us to track the sender and receiver of both payments and loans for every minute of the day.

Identification of a particular payment (or “send”) as a loan, as opposed to another form of payment, is achieved by a procedure that involves an analysis of the terms of payments in the reverse direction, between the same two counterparties, on the next business day.

(Federal funds loans are for “overnight” repayment.)

We document evidence that federal funds trading is driven in part by the precautionary targeting of balances by individual banks. Banks are motivated to end each day with non-negative balances, because overnight overdrafts are not permitted, except in special circumstances. (The discount window is available, but at terms that make it preferable to achieve non-negative balances through federal funds trading with other banks before the end of the day.) Banks are also motivated to end each day with relatively small balances, on average, as a proportion of total volume in the market, in part because the Federal Reserve does not pay interest on overnight balances, and in part because banks have been able to meet their reserve requirements over their two-week maintenance periods with relatively small average daily balances, and therefore (given non-negative balances) a relative small closing balance on each day.

By targeting its balances, a given bank contributes to systemic stability. When its balances are relatively large (compared to normal) at a particular time during the day, a bank has an incentive to trade, and in particular to lend, so as to reduce its balances. We show that, empirically, banks do indeed act consistently with this incentive. Likewise, when balances are low, a bank trades, in particular borrows, on average so as to raise balances. This self-interested balance targeting at the level of individual banks promotes systemic stability. (One may think in terms of the usual “eigenvalue” or “mean-reversion” conditions for dynamic stability of a multi-variate dynamic system. In this case, the coordinate processes of the system are the current balances of each of the banks in the system.) Balance targeting at the level of individual banks mitigates the risk of over-concentration of reserves in some banks, and underallocation at others. This reduces the risk of gridlock, and should play a role in keeping the federal funds market liquid, and funds rate volatility relatively low.

Moreover, motivated in part by discussions with fed funds traders, we document that federal funds trading is significantly more sensitive to reserve balances in the last hour of the day. For example, at some large banks, federal funds traders responsible for targeting a small non-negative end-of-day balance ask other profit centers of their banks to avoid large unscheduled transactions (for example currency trades) near the end of the day. Once a federal funds trader has a reasonable estimate the extent of current and yet-to-be executed send and receive transactions, he or she can adjust pricing and trading negotiations with other banks so as to push the bank’s balances in the desired direction.

We show empirical evidence of this behavior, and further, we find that this sort of behavior is more active following increases in intra-day rate volatility.

We raise the issue, but do not resolve, whether or not precautionary balance targeting behavior by banks in the federal funds market, coupled with a regime in which banks forecast the targeting policies of other banks, could have systemically destabilizing consequences. For example, a potential systemic issue could arise if several large institutions, during a day of extreme mis-allocation of reserves, were to individually “hoard” reserves in light of the heightened risk of other banks doing the same, or given their forecasts that other banks are incapable of releasing excess reserves quickly to the rest of the market. For instance, we heard from traders of rumors that this sort of behavior was initially feared on September 11, 2001, given the physical status of the Bank of New York on that day. Any such gridlock was in the end averted because of energetic liquidity provision by the Federal Reserve.

Without significant liquidity provision by a central bank at such an event, “a run on reserves” could stress the ability of the fixed intra-day supply of reserves to be sufficiently quickly reallocated so as to meet requirements. (The total amount of reserves in the system is relatively small in comparison to the total daily volume of transactions.) Even in an extreme scenario, however, access to the discount window and infusions of liquidity by the Federal Reserve and other central banks would (and did, on 9/11) mitigate adverse systemic effects. (For example, see the accounts of McAndrews and of Lacker.)