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INTERPRETING REPO STATISTICS IN THE FLOW OF FUNDS ACCOUNTS

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ABSTRACT

The Flow of Funds table on federal funds and security repurchase agreements reports and attempts to balance the net lending/borrowing positions of various types of financial institutions. Prior to 2008, this table shows a huge unallocated discrepancy in the form of missing lending (i.e., reverse repo) of almost $900bn at the end of 2006, and moreover the discrepancy shrinks to almost zero during the financial crisis in 2008. Are there important and unmeasured actors in the repo market that are hiding in this discrepancy term? In this note, we show, that much of this discrepancy results from a lack of netting in the Flow of Funds' calculation of domestic and foreign banks' "net" repo position. Due to this lack of netting, banks' lending in repo markets at the end of 2006 is understated by approximately $600bn. The drop from end of 2006 to end of 2008 in net repo financing obtained by banks is overstated by approximately $300bn. There is a smaller discrepancy that remains after correcting the banking statistics which is likely due to the the absence of securities lenders' repo positions in the Flow of Funds calculations.

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The Flow of Funds (FoF) Accounts from the Z.1 Release of the Federal Reserve Board are an important source of information about funding flows in the financial system, and these data have been used extensively by researchers trying to shed light on funding flows before and during the financial crisis (e.g., He, Khang, and Krishnamurthy (2010), Adrian and Shin (2010)). The data on federal funds and security repurchase agreements have received particular attention recently by researchers trying to understand the quantities of short-term borrowing and lending between broker/dealers, commercial banks, and other financial institutions before and during the financial crisis.

The Table L.207 (according to the numbering in the September 2012 release of the FoF) attempts to balance borrowing and lending in the market for security repurchase agreements (repo) and federal funds (unsecured interbank loans). The table lists the *net* repo and federal funds various financial institutions, including domestic and foreign commercial banks and broker/dealers. If the FoF correctly captured all borrowing and lending in the federal funds and repo markets, these net positions should balance to zero. However, for several years leading up to the financial crisis, the table shows an large unallocated discrepancy of of almost $900bn at the end of 2006. This discrepancy term is on the asset side, i.e., it reflects a missing source of lending. Gorton and Metrick (2012) argue that this discrepancy term indicates that entities other than the ones captured in the FoF (commercial banks, broker/dealers,...) are large lenders in the repo market, and that the fact that this discrepancy term shrinks to close to zero during the financial crisis indicates that these unmeasured repo lenders "ran" on repo when the crisis hit.

In this note, we show that the origin of this discrepancy term lies elsewhere. Much of this unallocated discrepancy can be traced to a lack of netting in the calculation

of domestic and foreign banks' "net" federal funds and repo position. While the FoF counts all borrowing (repo and federal funds purchased), it omits most of the lending of these institutions (reverse repo and federal funds sold). As a result, the FoF overstates the net borrowing of domestic and commercial banks through repo and federal funds at the end of 2006 by approximately $600bn. Correcting the calculation for this problem shrinks the unallocated discrepancy term by a similar amount. The drop from end of 2006 to end of 2008 in net repo borrowing of banks is also overstated by approximately $300bn.[1]

Part of the remaining unallocated discrepancy reflects the fact that Table L.207 does not capture the lending activities of securities lenders in the repo market. We provide some estimates from data used in Krishnamurthy, Nagel, and Orlov (2013) to assess the magnitude of this lending volume. We also discuss some aspects of the way in which the FoF calculates the net repo positions of broker/dealers that may contribute to the unallocated discrepancy.

Our calculations and our discussion refer to the the numbers from the September 20, 2012 release of the FoF. The release data is important, because data revisions can cause numbers to be very different between different versions. In particular, there has been a big revision from the June 10, 2010 to the September 17, 2010 release, applied retroactively to historical data, that had a large effect on the discrepancy term in Table L.207. Specifically, the repo position of the Rest of the World sector in Table L.207 for 2006Q4 was reported as $1029.0bn net lending in the June 10, 2010 release, and it was revised down to $364.6 to the September 17, 2010 release of the FoF. As a consequence of this data revision, the unallocated discrepancy term in Table L.207

[1] We have corresponded with the Federal Reserve Board about this problem. As of the time of this writing (April 2013), we have received a preliminary confirmation from the Federal Reserve Board that this netting problem exists and that they are currently considering modifications to their calculations.

was revised up from net lending of $192.5bn to net lending of $856.9bn. The reason for this substantial data revision was that the Rest of the World repo "net" position in the FoF, as it was reported prior to the September 10, 2010 release, was actually a *gross*, not a *net* repo position. The Federal Reserve Board's calculation of this position from the Treasury's TIC data accounted for the lending of foreigners (reverse repo from the perspective of the foreign entity), but did not subtract the borrowing of foreigners (repo from the perspective of the foreign entity). As a consequence, the Rest of the World Repo position prior to September 2010 severely overstated the magnitude of the net lending of foreign entities in the U.S. repo market.[2] As we point out in this note, the "net" position of domestic and foreign banks in Table L.207 seems to be affected by a similar problem, but in the opposite direction (overstatement of borrowing rather than lending).

We now review the FoF calculations and positions estimates for domestic commercial banks (section I), foreign banks (section II), broker/dealers (section III), and securities lenders (section V).

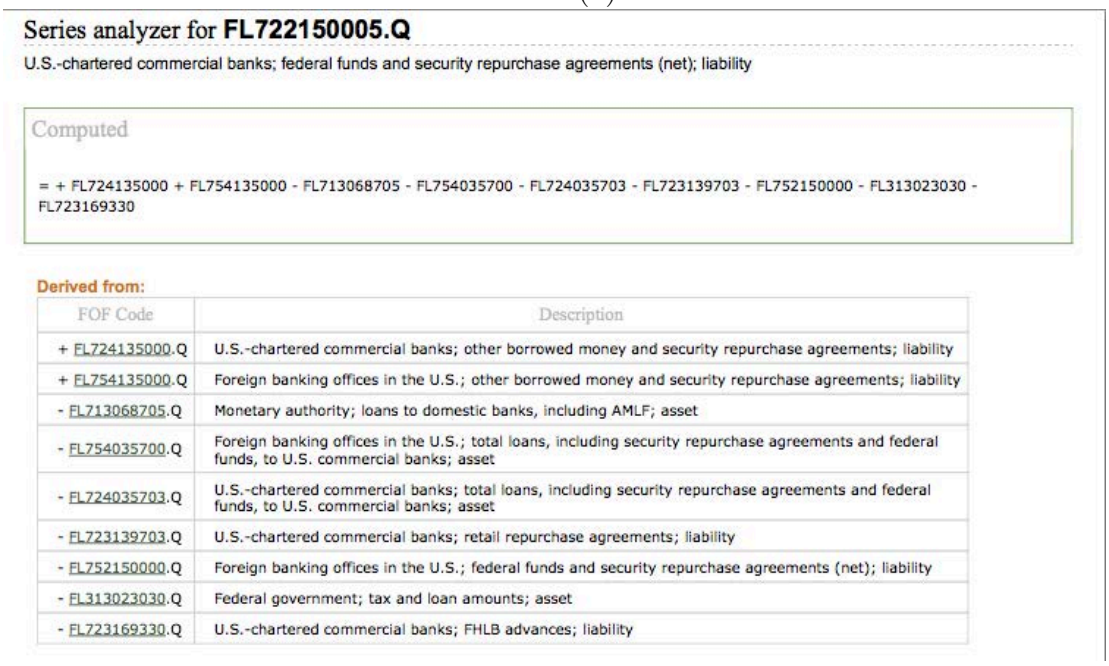
I. U.S.-Chartered Commercial Banks

Figure 1, Panel (a), shows the calculation of the net position in repo and federal funds of U.S.-chartered commercial banks according to the Federal Reserve Board's Flow of Funds guide.[3] Some of the items in this calculation are immaterial. The *retail repurchase agreement* item is zero since 1996. The *Federal government, tax and loan amount* item can be ignored, too; it is negligible according to the Treasury statistics

[2]We thank Jacob Goldfield for sharing with us his analysis of this problem in the FoF Rest of the World net repo calculations and his correspondence with the Federal Reserve Board that led to the data revision in the FoF.

[3]As retrieved from http://www.federalreserve.gov/apps/fof/ in October 2012.

Panel (a)



Series analyzer for **FL722150005.Q**

U.S.-chartered commercial banks; federal funds and security repurchase agreements (net); liability

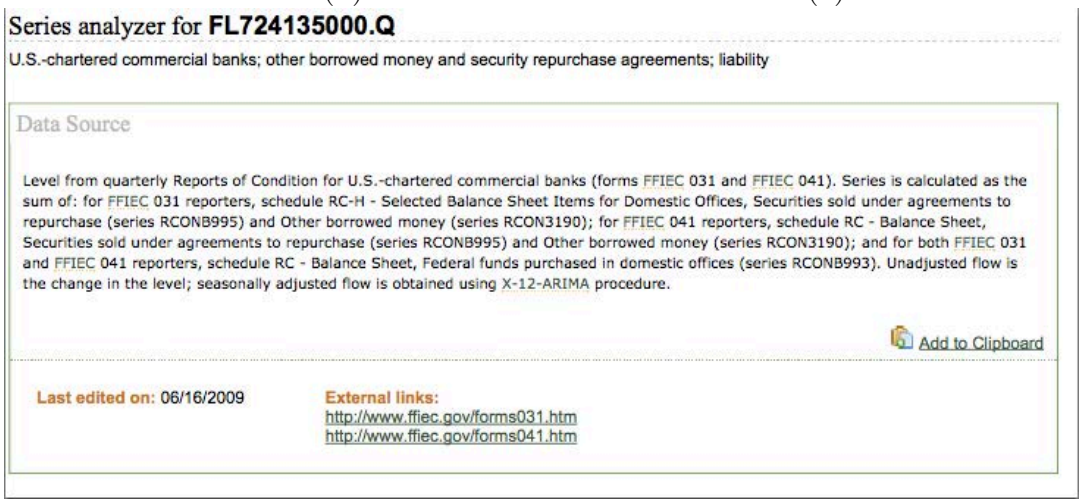
Computed

= + FL724135000 + FL754135000 - FL713068705 - FL754035700 - FL724035703 - FL723139703 - FL752150000 - FL313023030 - FL723169330

Derived from:

FOF Code	Description
+ FL724135000.Q	U.S.-chartered commercial banks; other borrowed money and security repurchase agreements; liability
+ FL754135000.Q	Foreign banking offices in the U.S.; other borrowed money and security repurchase agreements; liability
- FL713068705.Q	Monetary authority; loans to domestic banks, including AMLF; asset
- FL754035700.Q	Foreign banking offices in the U.S.; total loans, including security repurchase agreements and federal funds, to U.S. commercial banks; asset
- FL724035703.Q	U.S.-chartered commercial banks; total loans, including security repurchase agreements and federal funds, to U.S. commercial banks; asset
- FL723139703.Q	U.S.-chartered commercial banks; retail repurchase agreements; liability
- FL752150000.Q	Foreign banking offices in the U.S.; federal funds and security repurchase agreements (net); liability
- FL313023030.Q	Federal government; tax and loan amounts; asset
- FL723169330.Q	U.S.-chartered commercial banks; FHLB advances; liability

Panel (b) Detail on first item from Panel (a)



Series analyzer for **FL724135000.Q**

U.S.-chartered commercial banks; other borrowed money and security repurchase agreements; liability

Data Source

Level from quarterly Reports of Condition for U.S.-chartered commercial banks (forms FFIEC 031 and FFIEC 041). Series is calculated as the sum of: for FFIEC 031 reporters, schedule RC-H - Selected Balance Sheet Items for Domestic Offices, Securities sold under agreements to repurchase (series RCONB995) and Other borrowed money (series RCON3190); for FFIEC 041 reporters, schedule RC - Balance Sheet, Securities sold under agreements to repurchase (series RCONB995) and Other borrowed money (series RCON3190); and for both FFIEC 031 and FFIEC 041 reporters, schedule RC - Balance Sheet, Federal funds purchased in domestic offices (series RCONB993). Unadjusted flow is the change in the level; seasonally adjusted flow is obtained using X-12-ARIMA procedure.

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External links:
http://www.ffiec.gov/forms031.htm
http://www.ffiec.gov/forms041.htm

Figure 1: Calculation of Flow of Funds Net Repo Position of U.S.-Chartered Commercial Banks

that it is based on. The monetary authority item is also zero except in the middle of the financial crisis, hence it cannot play a role in the big discrepancy term prior to the crisis.

Leaving aside the foreign bank office items for now, this leaves three items:

- *other borrowed money and security repurchase agreements* (+)
- *total loans to U.S. commercial banks* (-)
- *FHLB advances* (-)

The first of these three items contains the *gross* repo and federal funds purchased (i.e., borrowing) position, plus other borrowed money (see details on the calculation of this item in Panel (b) of Figure 1). A big portion of this other borrowed money are Federal Home Loan Bank (FHLB) advances which are subtracted via the last of these three items. The second item, *total loans to U.S. commercial banks* is the only one that subtracts some reverse repo (i.e., lending), but only to the extent that the borrowing counterparty is another commercial bank.

The three foreign bank office items that we left aside until this point have little effect on this calculation

- *foreign banking offices; other borrowed money and security repurchase agreements* (+)
- *foreign banking offices; total loans to U.S. commercial banks* (-)
- *foreign banking offices; federal funds and security repurchase agreements (net)* (-)

The first and third items essentially cancel, because, as we show in Section II, despite the label "net", the third item is actually the *gross* borrowing of foreign bank offices

which cancels with first item, which is also a gross borrowing position. The second item subtracts positions that are reverse repo and federal funds purchased positions from the perspective of U.S. commercial banks.

Thus, overall, the only reverse repo and federal funds sold that are being subtracted from repo and federal funds purchased of commercial banks in this calculation are those where a domestic commercial bank or foreign bank office is the counterparty. Thus, the calculation does not subtract any reverse repo or federal funds sold in which the counterparty is a non-bank (a broker/dealer, for example). In other words, the estimated "net" position that emerges from this calculation is actually largely a *gross* repo and federal funds purchased (i.e., borrowing) position.

To do an alternative calculation netting all reverse repo to both commercial banks and non-banks, we use FFIEC call reports data for U.S. commercial banks. This is the same data source that the FoF uses, but our calculation nets repo and federal funds purchased with reverse repo and federal funds sold. We subtract the sum of *reverse repo* (rconb989) and *federal funds sold* (rconb987) from *repo* (rconb995) and *federal funds purchased* (rconb993). Table I shows, the net liability turns out much smaller. For example, in 2006Q4 the FoF reports a net liability of about $671bn, while according to the call reports data domestic commercial banks had a net liability of only $265bn. The lack of netting in the FoF overstates the net borrowing of U.S. commercial banks in repo and federal funds markets by about $406bn.

The call reports data with proper netting also tells a different story about the change between 2006Q4 and 2008Q4. While the FoF number suggest a substantial contraction in commercial banks' net borrowing in federal funds and repo markets by about $335bn, the call reports data, after proper netting, indicate that the contraction was only $21bn.

Table I: Modification of Flow of Funds Repo Statistics

	2006Q4	2007Q4	2008Q4	2009Q4
U.S. Commercial Banks (net liability)				
Flow of Funds	670,900	583,400	335,300	665,600
Alternative: Call reports	265,000	210,000	129,000	234,200
Foreign Bank Offices (net liability)				
Flow of Funds	239,900	226,300	130,000	170,300
Alternative: Netted with H.8 data	19,868	-30,862	44,040	76,406
Broker/dealers (net liability)				
Flow of Funds	1,071,800	1,147,300	586,900	470,900
Alternative: FRBNY Primary Dealer Stats	1,268,700	1,495,438	831,874	552,544
Securities lenders (net asset)				
Flow of funds	0	0	0	0
Alternative: RMA data	431,000	478,000	228,000	229,000
Discrepancy item (net asset)				
Flow of Funds	885,000	651,200	60,200	447,600
Based on alternative calculation	24,968	-109,224	-215,086	-225,050

II. Foreign Bank Offices

Figure 2 shows the description from the FoF guide of the calculation of foreign banks' "net" repo and federal funds purchased position. Even though the FoF labels this series as "net", the description of this series indicates that the calculation only considers federal funds purchased and repo, but there is no netting with federal funds sold and reverse repo.

To adjust for this missing netting, we subtract, in Table I, federal funds sold and reverse repo that we obtain from the Federal Reserve Board's H.8 data series. The resulting net liability is close to zero. Furthermore, comparing 2006Q4 with 2008Q4, we now see a slight increase in net borrowing of foreign bank offices by about $24bn

Figure 2: Calculation of Flow of Funds Net Repo Position of Foreign Bank Offices

instead of the contraction by approximately $110bn reported in the FoF.

III. Security Brokers and Dealers

The calculation of broker/dealer net positions in the FoF, shown in Figure 3, involves a few items that are neither repo nor federal funds. To get an alternative series that captures purely the net repo position, we turn to the Federal Reserve Bank of New York Primary Dealer Statistics and we subtract reverse repo from repo according to these statistics. The result, in Table I, is a somewhat bigger net liability of the broker/dealer sector. Of course, the Fed's Primary Dealer Statistics are not perfect either, as it misses smaller dealers, for example, that are not Primary Dealers. So the discrepancy to the FoF calculations is somewhat difficult to interpret.

Figure 3: Calculation of Flow of Funds Net Repo Position of Security Brokers and Dealers

IV. Securities Lenders

Securities lenders are among the main cash lenders in repo markets, but the Flow of Funds do not capture their lending volume in Table L.207. Krishnamurthy, Nagel, and Orlov (2012) use data from the Risk Management Association to estimate the outstanding reverse repo loans of securities lenders. We include these data in Table I.

The implicit assumption in this calculation is that all securities lending done by securities lenders is classified, by their broker/dealer counterparties, as securities borrowed, not as reverse repo. Otherwise, one would have to do some netting, which would reduce the net reverse repo asset position of securities lenders.[4]

[4]Securities lending and reverse repo are economically similar transactions (see Adrian, Begalle, Copeland, and Martin (2013)), although reported differently. A comprehensive statistic for all collateralized money market transactions should include both securities lending and repo. The subject of this note, the FoF discrepancy, is only about repo.

V. Conclusion

As Table I shows, with proper netting for domestic commercial banks and foreign bank offices, and by including reverse repos of securities lenders, much of the unallocated discrepancy disappears. There may be other problems lurking in the calculation of aggregate repo statistics, but based on our analysis at this point, one should not interpret the large magnitude unallocated discrepancy term prior to 2008 in the FoF (version September 2012) as evidence that there are important unmeasured entities outside of the categories captured by the FoF (commercial banks, broker/dealers,...) who play a significant role in the repo market.

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