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Federal Reserve Interdistrict Settlement

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The Interdistrict Settlement Account (ISA) is used to keep track of movements in assets and liabilities across Federal Reserve Banks within the Federal Reserve System. To the extent that the independent financial status of individual Federal Reserve Banks is meaningful, the ISA is the means by which each Bank grants credit to the other Banks in the System. Even if one views financial independence as more apparent than real, the behavior of individual Reserve Bank balance sheet components, including ISA, can shed light on ongoing financial developments in the economy. This article provides an introduction to the ISA and traces the behavior of ISA and some other components of Reserve Bank balance sheets during the Great Recession and the financial crisis. In addition, it provides some speculative discussion of how Reserve Bank balance sheets could be informative about economic conditions as the Fed exits from unconventional monetary policy.

The ISA may seem like an obscure topic. However, in 2012 the European debt crisis led to much discussion of the TARGET2 system, which is—loosely—Europe's analogue to the combination of ISA and the Fedwire funds transfer system (see Cecchetti, McCauley, and McGuire [2012], Whelan [2012], and the references therein). Discussions about TARGET2 often included comparisons—some of them shaky—to ISA, drawing attention to the fact that there were few sources available describing ISA to the lay public.[1] In attempting to help fill

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[1] Lubik and Rhodes (2012) provide a concise summary of ISA in their essay on TARGET2. Koning (2012) provides a more detailed discussion of ISA, including a

that void, this article also discusses two important ways in which ISA differs from TARGET2.

Monetary policy in the United States is implemented primarily by the Federal Reserve Bank of New York. For example, the securities purchases that comprise the Federal Open Market Committee's (FOMC) large-scale asset purchase programs (LSAPs) are conducted by the New York Fed. However, securities purchased by the New York Fed are apportioned the same day to all 12 Federal Reserve Banks, and there is an annual rebalancing of Federal Reserve Bank balance sheets. Both the apportionment and rebalancing involve use of the ISA, and in recent years these have been main drivers of the ISA. As such we provide a relatively detailed discussion of both topics. Apportionment assures that all 12 Federal Reserve Banks are effectively equal stakeholders in monetary policy operations; the New York Fed simply acts as agent for the other 11 Banks. Rebalancing, in turn, assures that over time the securities are held by Reserve Banks in rough proportion to the liabilities that have been issued by those Reserve Banks.

There is one authoritative source for the ISA, the Federal Reserve's Financial Accounting Manual (FAM). While the FAM is publicly available, it is written for users and not for the interested public. This article is not a substitute for the FAM, but should provide an accessible introduction to the ISA for readers without the time or inclination to delve into the FAM. In that context, it is important to stress that the language and terminology used here conflict at times with the language used in the FAM. Note in particular that ISA balances will be referred to throughout as an asset that can enter with a positive or negative sign on Federal Reserve Bank balance sheets; this is the same convention used in the Federal Reserve Board's H.4.1 release, which is the source for most of the data used in the article.

1. THE INTERDISTRICT SETTLEMENT ACCOUNT: OVERVIEW AND EXAMPLES

Each of the 12 Federal Reserve Banks has its own balance sheet. The assets on a Federal Reserve Bank's balance sheet currently consist primarily of securities allocated to the bank by the New York Fed. The liabilities consist mainly of Federal Reserve notes in circulation (paper currency) and reserve accounts of banks located in the Reserve District. Many transactions that affect a Reserve Bank's balance sheet involve only the Reserve Bank and a commercial bank. For example, if a

history of clearing and settlement across Federal Reserve Banks. Eichengreen, Mehl, and Chitu (2013) also discuss that history—see Section 2.

Table 1 T-Accounts for Commercial Banks, Check Clearing Example

Paying Commercial Bank ("Bank A")	
Assets	**Liabilities**
−$1 million, Reserve account (at Richmond Fed)	−$1 million, customer deposits
Receiving Commercial Bank ("Bank B")	
Assets	**Liabilities**
+$1 million, Reserve account (at Atlanta Fed)	+$1 million, customer deposits

commercial bank withdraws currency from the Federal Reserve Bank of Richmond, there is an increase in the Richmond Fed's net Federal Reserve notes outstanding, and an offsetting decrease in reserves (denoted "other deposits held by depository institutions" on the balance sheet as represented by the H.4.1 release); and if the Richmond Fed makes a discount window loan to a commercial bank (necessarily in its district), then there is an increase in the Richmond Fed's loan assets, and an increase in its reserve liabilities. Other transactions, however, affect the balance sheets of more than one Federal Reserve Bank. The ISA is a line item on the asset side of each Federal Reserve Bank's balance sheet that is used to account for transactions across Federal Reserve Banks. It can be negative or positive for a single Reserve Bank and always sums to zero across the 12 Reserve Banks.[2]

The ISA can be best understood through examples of different types of transactions. Transactions that are initiated by commercial banks are relatively easy to explain, whereas transactions that are undertaken by the Federal Reserve Bank of New York as part of the Fed's monetary or credit policy implementation are more complicated and will lead us into the discussion of allocation/apportionment in the next section. For each example, we will provide both a verbal discussion and a summary using T-accounts.

Consider first a stylized situation where customers of a commercial bank in the Fifth Federal Reserve District (Richmond) write checks to customers of a commercial bank in the Sixth Federal Reserve District (Atlanta) in the net amount of $1 million. The paying commercial bank will see its reserve account at the Richmond Fed (an asset on

[2] The current system for accommodating deficits and surpluses across Federal Reserve Districts dates back to 1975. See Eichengreen, Mehl, and Chitu (2013) for a description and analysis of the pre-1975 system, focusing on the period from 1913 to 1960.

Table 2 T-Accounts for Federal Reserve Banks, Check Clearing Example

Paying Federal Reserve Bank (Richmond)	
Assets	**Liabilities**
−$1 million, ISA balances	−$1 million, Bank A reserve account
Receiving Federal Reserve Bank (Atlanta)	
Assets	**Liabilities**
+$1 million, ISA balances	+$1 million, Bank B reserve account

the commercial bank's balance sheet) reduced by $1 million, and it will see its customers' deposits (a liability) reduced by $1 million. The receiving commercial bank will see corresponding increases in its reserve account at the Atlanta Fed and in its customers' deposits. Just as both commercial banks have balanced changes in assets and liabilities, so do both Federal Reserve Banks. The Richmond Fed's reserve account liabilities decrease by $1 million, the Atlanta Fed's reserve account liabilities increase by $1 million, and the offsetting changes on the asset side of the Reserve Banks' balance sheets occur through the ISA. Because the Richmond Fed is effectively making a payment to the Atlanta Fed, its ISA balance (an asset) falls by $1 million, and the Atlanta Fed's ISA balance rises by $1 million. Tables 1 and 2 show the relevant T-accounts. If ISA did not exist, there are two possibilities for how to account for this transaction (ignoring legal issues). One possibility is that securities or other assets could be transferred from the Richmond Fed to the Atlanta Fed.[3] Alternatively, the balance sheets of the Federal Reserve Banks could be consolidated, so that the transaction would simply involve a relabeling of accounts with the single Federal Reserve Bank. We will not go through these alternatives for the other examples below, but the reader should keep in mind that similar reasoning applies.

Next, consider delivery of $1 million of new currency (bills) to the Federal Reserve Bank of New York (for example), where the new currency is designated as issued by the Federal Reserve Bank of San Francisco.[4] In this case, the Federal Reserve Bank of San Francisco's

[3] Eichengreen, Mehl, and Chitu (2013) discuss how, before 1975, instead of ISA there was a combination of settlement through transfer of gold certificates (to be discussed below) and discretionary "mutual assistance" among Reserve Banks.

[4] All currency is designated as issued by one of the 12 Federal Reserve Banks, and is marked with the corresponding district number and letter. As this example suggests, however, currency does not necessarily enter circulation in the district through which it is officially issued.

Table 3 T-Accounts for Federal Reserve Banks, New Currency Example

Federal Reserve Bank of San Francisco	
Assets	**Liabilities**
+$1 million, ISA balances	+$1 million, Federal Reserve Notes outstanding

Federal Reserve Bank of New York	
Assets	**Liabilities**
−$1 million, ISA balances	−$1 million, Notes held by Federal Reserve Banks

liabilities increase by $1 million ("Federal Reserve notes outstanding" on the H.4.1 release) and the Federal Reserve Bank of New York's liabilities decrease by $1 million ("Notes held by Federal Reserve Banks" on the H.4.1).[5] Of course, both Banks must have an offsetting balance sheet change, and these involve the ISA: The San Francisco Fed's ISA balance increases by $1 million, and the New York Fed's ISA balance decreases by $1 million. The T-accounts are trivial in this case, shown in Table 3. In effect, the New York Fed is purchasing currency from the San Francisco Fed using its ISA account.

We move now to transactions related to the implementation of monetary or credit policy. These transactions are typically initiated by the Federal Reserve Bank of New York, and thus at first only impact the New York Fed's balance sheet.[6] However, according to the policies set forth in the FAM, the associated balance sheet changes are apportioned on a daily basis to all 12 Federal Reserve Banks.

Consider first a typical asset purchase that affects the domestic portfolio of the System Open Market Account (SOMA). The Fed's ongoing large-scale asset purchases fall into this category, so we will use a specific example of one of these purchases. On December 27, 2012, the Federal Reserve Bank of New York purchased $4.614 billion of Treasury securities from the primary dealers who serve as trading counterparties with the New York Fed.[7] These purchases settled on

[5] "Notes held by Federal Reserve Banks" appears on the liability side of each Federal Reserve Bank's balance sheet. However, on the liability side it is *deducted* from the value of Federal Reserve notes outstanding. Thus, if a Reserve Bank has $10 billion in notes outstanding, and holds $100 million of notes in its vaults, then its consolidated liability for these items is $9.9 billion.

[6] Some forms of credit policy, for example the Term Auction Facility, initially hit all the Reserve Bank balance sheets, to the extent that commercial banks in all 12 Districts borrow at the auction. In contrast, the Maiden Lane facilities involved only the New York Fed's balance sheet.

[7] A complete list of purchases is available at www.newyorkfed.org/markets/pomo/display/index.cfm.

Table 4 SOMA Portfolio Allocation Percentages

	Domestic		Foreign	
District	**2012**	**2011**	**2012**	**2011**
Boston	2.429	2.459	3.506	3.456
New York	56.065	46.504	32.258	28.963
Philadelphia	3.306	3.426	8.674	9.686
Cleveland	2.542	2.701	7.393	7.418
Richmond	7.117	11.549	20.685	20.505
Atlanta	6.029	7.434	5.718	5.731
Chicago	5.548	5.939	2.668	2.534
St. Louis	1.563	1.893	0.818	0.815
Minneapolis	0.909	1.537	0.408	3.089
Kansas City	2.009	2.660	0.995	0.900
Dallas	3.885	3.955	1.602	1.515
San Francisco	8.596	9.944	15.277	15.388
System Total	100	100	100	100

December 28, which means that on December 28 the Federal Reserve Bank of New York's securities holdings (an asset) increased by $4.614 billion. The primary dealers were paid for these securities by credits to their accounts in reserve-holding banks; thus, the New York Fed's reserve liabilities increased by $4.614 billion.[8] Subsequently, but still on December 28, the $4.614 billion increase in securities holdings was apportioned to all 12 Federal Reserve Banks according to the percentages listed in the second column of Table 4. How those percentages are determined will be discussed in detail in the next section; the procedure is complicated, but loosely it tends to assign higher percentages to Reserve Banks with a higher percentage of currency outstanding and deposit liabilities. The reduction in the New York Fed's securities holdings and the increases in the other Reserve Banks' securities holdings were offset by increases in New York's ISA balance and decreases in the other Banks' ISA balances. Again, it is as if the other 11 Federal Reserve Banks purchased securities from the New York Fed using their ISA accounts. Table 5 puts this example in T-account form, for the New York Fed and the Richmond Fed. New York has two steps; in the first step it receives all the securities, and in the second step it apportions 43.935 percent of the securities to the other 11 Banks. In the apportionment step, 7.117 percent of the securities are apportioned to Richmond.

[8] In principle, a primary dealer's deposit account could be with a bank located outside the New York Federal Reserve District. In this case ISA would be involved in the initial transaction. For simplicity we assume that the primary dealer's bank has a reserve account with the New York Fed.

Table 5 T-Accounts for Federal Reserve Banks, Asset Purchase Example

	Federal Reserve Bank of New York	
	Assets	**Liabilities**
Step 1	+$4.614 billion securities	+$4.614 billion commercial bank deposits (reserves)
Step 2	−$2.027 billion securities	—
Step 3	+$2.027 ISA balances	—
	Federal Reserve Bank of Richmond	
	Assets	**Liabilities**
	+$328 million securities	—
	−$328 million ISA balances	—

A similar process occurs for foreign-currency denominated assets in the SOMA portfolio, but the apportionment uses percentages based on member bank capital in each district. Apportionment will be discussed in more detail below. An example of a foreign-currency denominated transaction occurred the week of August 15, 2012, when the European Central Bank (ECB) drew on its swap line with the Federal Reserve Bank of New York by $7 billion; the swap line allows the ECB to lend dollars to European banks, creating dollar reserves in the process.[9] The New York Fed's assets increased by $7 billion, in the form of holdings of Euros in an account at the ECB; its liabilities also increased by $7 billion, in the form of increased deposits, corresponding to deposits in U.S. commercial banks held by the European banks that borrowed dollars from the ECB. The same day that the swap drawdown occurred, the $7 billion increase in foreign currency holdings was apportioned to all 12 Federal Reserve Banks according to the percentages listed in the fourth column of Table 4. The reduction in the New York Fed's foreign currency holdings and the increases in the other Reserve Banks' foreign currency holdings were balanced by increases in New York's ISA balance and decreases in the other Banks' ISA balances. Again, this example is summarized in T-account form for New York and Richmond, in Table 6.

[9] Data on swap line drawdowns are available at www.newyorkfed.org/markets/fxswap/fxswap_recent.cfm, and a detailed explanation of the swap facility is provided at www.federalreserve.gov/monetarypolicy/bst_liquidityswaps.htm.

Table 6 T-Accounts for Federal Reserve Banks, Foreign Currency Swap Example

	Federal Reserve Bank of New York	
	Assets	**Liabilities**
Step 1	+$7 billion Euros at ECB	+$7 billion commercial bank deposits (reserves)
Step 2	−$4.742 billion Euros at ECB	—
Step 3	+$4.742 billion ISA balances	—

	Federal Reserve Bank of Richmond	
	Assets	**Liabilities**
	+$1.448 billion Euros at ECB	—
	−$1.448 billion ISA balances	—

2. ALLOCATION OF SOMA TRANSACTIONS AND ANNUAL REBALANCING

Table 4 listed the percentages according to which foreign and domestic SOMA transactions were allocated to the 12 Reserve Banks in 2011 and 2012. These percentages are updated annually through a process that reflects ISA balances over the year and the composition across Districts of currency outstanding (for the domestic portfolio) and the composition across Districts of member bank capital (for the foreign portfolio). New York has by far the highest allocation percentage for both the foreign and domestic portfolios, but the percentages for the other 11 Banks varied widely in 2012, from a low of 0.41 percent of the foreign portfolio for the Minneapolis Fed, to a high of 20.69 percent of the foreign portfolio for the Richmond Fed. The remainder of this section describes how the percentages are determined. An important element of the domestic portfolio rebalancing is that it also involves an approximate "settling" of ISA balances. In contrast, the foreign portfolio rebalancing generates ISA transactions as an outcome, but they do not drive the process.

Domestic Portfolio

In April of each year, the 12 Reserve Banks' allocation percentages for the domestic SOMA portfolio are updated. We will use a hypothetical example for the Federal Reserve Bank of Richmond to explain how the process works. Before going into the details, we need to introduce the gold certificate account, an item on the asset side of each Federal Reserve Bank's balance sheet. The gold certificate account is a carryover from the time that the United States was on a gold standard.

Today, the Systemwide gold certificate account corresponds to the value of gold held by the U.S. Treasury. While the gold certificate account plays a role in the process described below, in no way do the Treasury's gold holdings restrict the quantity of currency or bank reserves that the Federal Reserve can issue.

1. Denote Richmond's average daily ISA balance for the preceding 12 months by B, and recall that we follow the H.4.1 release and put ISA on the asset side of the balance sheet. In the first step, the ISA balance is reduced by B, and there is an offsetting increase of B in the Richmond Bank's gold certificate account. If B is negative, then the ISA balance rises and the gold certificate account falls in this step.[10]

2. Denote the Systemwide ratio of the gold certificate account to the value of Federal Reserve notes by $\bar{\rho}$.[11] Denote the corresponding ratio for the Richmond Bank by ρ_R. In the second step, Richmond's gold certificate account is adjusted upward or downward—as appropriate—to equate the new ρ_R to $\bar{\rho}$. The offsetting balance sheet entry is a decrease or increase in Richmond's holdings of the domestic SOMA portfolio.

3. Denote the new ratio of Richmond's domestic SOMA portfolio holdings to the total domestic SOMA portfolio by δ. Until the following April, Richmond's allocation of the domestic SOMA portfolio will be given by δ.

The rebalancing process is undeniably complicated. However, some intuition can be gained by thinking about a hypothetical case where the allocation of securities purchases is always quickly accompanied by matching reserve flows. Each time the New York Fed purchases securities, an identical quantity of reserve liabilities is created, typically on the balance sheet of the New York Fed. A fraction of the securities are quickly allocated to the Richmond Fed. If reserves of the same magnitude then flow from the New York Fed to the Richmond Fed, there will be offsetting ISA transactions. If this occurs for every securities purchase, then in step 1 above there will be zero average ISA balance, and the only adjustment in April would occur because of different growth in Richmond Federal Reserve notes than in the System as a whole. This example makes clear that it is primarily the combination of

[10] As described in the Appendix, it is possible for the gold certificate account to become negative in step 1. But any negative balance would be reversed in step 2.

[11] The Systemwide value of the gold certificate account has not changed since 2006.

Table 7 Currency and Reserves by District (April 10, 2013), and SOMA Domestic Allocations for 2012

District	Currency (%)	Reserves (%)	SOMA (%)
Boston	3.33	1.64	2.43
New York	37.70	67.07	56.07
Philadelphia	3.31	2.01	3.31
Cleveland	4.34	1.10	2.54
Richmond	7.30	4.85	7.12
Atlanta	12.37	2.96	6.03
Chicago	6.75	3.72	5.55
St. Louis	2.61	0.79	1.56
Minneapolis	1.67	0.53	0.91
Kansas City	2.66	1.26	2.01
Dallas	6.96	2.71	3.89
San Francisco	11.01	11.35	8.60
System Total	100	100	100

differential growth in reserves and currency that leads to changes in a Reserve Bank's allocation percentage for the domestic portfolio.

To further illustrate the relationship between a Reserve Bank's share of liabilities and its allocation percentage, Table 7 lists each Bank's share of total reserves ("other deposits") and net Federal Reserve notes outstanding on April 10, 2013, together with the 2012 SOMA domestic allocation percentages from Table 4. For every Reserve Bank except San Francisco, the SOMA percentage lies between the Reserve Bank's share of currency and its share of reserves. As we have seen, in any given year the allocation is a complicated function of past history, ISA over the prior 12 months, and the distribution of Federal Reserve notes. However, the table shows that the distribution of currency (Federal Reserve notes) and reserves together are generally a good approximation to the SOMA allocation.

Finally, an important thing to note about the annual rebalancing process is that it generally does not result in a Reserve Bank's ISA balance moving to zero. This would only happen if the Reserve Bank's ISA balance on the day of rebalancing were equal to its average balance over the prior 12 months.

Foreign Portfolio

The annual foreign portfolio allocation percentages are determined in January, rather than April. As with the domestic portfolio, a one-time adjustment takes place to bring the account balances across Reserve Banks in line with the new percentages. However, whereas the

domestic allocations are determined by a complicated process involving prior-year ISA balances and the distribution of Federal Reserve notes, the foreign allocations derive in a simple way from the distribution of Reserve Bank capital. Each Reserve Bank has capital and surplus, based on the capital of the member banks in the respective Federal Reserve District (see Section 5 of the Federal Reserve Act for the details). Again, we will use a hypothetical example for the Federal Reserve Bank of Richmond to explain the annual process for determining the new foreign allocation and for reconciling the foreign portfolio.

Denote the Richmond Fed's share of the SOMA foreign portfolio by ϕ_0. Denote the Richmond Fed's share of Systemwide capital and surplus by κ. For the next year, changes to the SOMA foreign portfolio will be allocated to the Richmond Fed according to the ratio κ. There is also a one-time rebalancing, to equate Richmond's foreign portfolio share to its capital share. If the capital share is greater than the foreign portfolio share ($\kappa > \phi_0$), then the foreign portfolio is increased to make the new share, call it ϕ_1, equal to κ. And if $\kappa < \phi_0$, then Richmond's foreign portfolio balance is decreased so that $\phi_1 = \kappa$. In the former case, the increase in Richmond's foreign portfolio balance is offset by a decrease in Richmond's ISA balance. Likewise, if $\kappa < \phi_0$, there is an offsetting increase in Richmond's ISA balance. Effectively, Richmond is buying (or selling) shares in the SOMA foreign portfolio using its ISA balances.

Referring to columns 4 and 5 of Table 4, the differential allocation percentages among Reserve Banks for the foreign portfolio simply reflect different levels of capital of the member banks in each district. The Richmond Fed has a relatively large allocation percentage for the foreign portfolio because Bank of America, one of the four largest banks in the country, is a member bank located in the Richmond District.

If one is tracking Reserve Bank ISA balances, the annual adjustments in January and April are significant for two reasons. First, to the extent that there were persistently large ISA balances over the *prior* year, say because of significant changes in the size of the domestic SOMA portfolio, the April rebalancing would lead to large one-time ISA flows.[12] Second, to the extent there are significant changes in the size of the overall SOMA portfolio over the *coming* year, say because of asset purchases or sales, or swap line drawdowns, the new percentages will affect the ISA flows as the portfolio grows or shrinks.

[12] The foreign portfolio rebalancing in January would lead to large ISA flows if there were a sharp divergence between Reserve Banks' capital shares and their foreign portfolio shares. In order for this to happen, there would have had to be large changes in capital shares over the course of the year, presumably because of banking industry restructuring.

Comparison to TARGET2

The European Monetary Union has a similar character to the United States from a monetary perspective, in that it is composed of a system of central banks that together administer a single currency. Just as the ISA provides, and measures, a form of credit among Federal Reserve Banks, the TARGET2 system in Europe provides, and measures, a form of credit among the national central banks in Europe.[13] Because there is a wealth of literature describing how TARGET2 works in the Eurosystem, we will not go into any detail on that topic here, instead focusing on two important differences between TARGET2 and the ISA. One difference involves how the systems work, and it has received significant attention already.[14] The other difference involves the interpretation of TARGET2 versus ISA balances, which has received less attention.

A key operational difference between TARGET2 and the ISA involves rebalancing. In the Eurosystem, there is no regular administrative process corresponding to the Federal Reserve System's April ISA rebalancing. In principle then, it is possible for TARGET2 balances among countries in the European Monetary Union to grow arbitrarily large in absolute value. In practice, the European sovereign debt crisis was associated with persistently large positive TARGET2 balances for Germany, Netherlands, Luxembourg, and Finland, and persistently large negative TARGET2 balances for Ireland, Portugal, Greece, Spain, and Italy. However, since late 2012, the absolute level of TARGET2 balances has been declining in most of these countries.[15]

As we will see below, the ongoing increase in the Federal Reserve System's balance sheet, together with the limited tendency for reserve balances to flow from New York to the other Districts, means that without the annual rebalancing, New York—like the first group of European countries listed above—would have a persistently increasing ISA balance. Would such a scenario create the same uproar in the United States that it has created in Europe? Likely not, because (i) Federal Reserve Districts do not correspond to national, or even state borders, and (ii) the (hypothetical) accumulation of ISA balances in New York is associated with the fact that New York is a financial center, rather than with an especially strong economy in the New York Federal

[13] We say "a form of credit" because the national central banks and Federal Reserve Banks are only pseudo-independent of each other.

[14] See the references mentioned in the Introduction.

[15] For several of the national central banks, TARGET2 balances are easily accessible through the banks' official websites. The website www.eurocrisismonitor.com provides updated time series of all TARGET2 balances.

Reserve District. In fact, as Eichengreen, Mehl, and Chitu (2013) discuss, prior to 1975 annual rebalancing did not take place among Federal Reserve Banks. In principle, there was instead daily settlement across regional banks using gold certificates, but in practice "interdistrict accommodation operations" took place and balances did build up over time. Eichengreen, Mehl, and Chitu (2013, 4) argue that the build up of these balances "did not excite experts or the American public, nor in most cases did they trigger insurmountable tensions between regions."[16]

The second important difference between ISA and TARGET2 arises from the different degrees of financial integration within Europe and the United States. One element—albeit a relatively recent one—of the highly integrated U.S. financial system is the prominent role of interstate bank branching. Interstate bank branching and its corollary interdistrict bank branching mean that some bank deposits are located in a Federal Reserve District that is different than the one where the reserves backing that deposit are held. Because the location of reserves may not coincide with the residence of depositors, ISA flows may give misleading information about underlying financial flows.

Consider again the check clearing example from Table 1. Suppose JPMorgan Chase customers in Ohio write checks for $1 million to Bank of America customers in California. These transactions represent a transfer of bank deposits from residents of the Cleveland Federal Reserve District to residents of the San Francisco Federal Reserve District. However, JPMorgan Chase's reserve account is held with the Federal Reserve Bank of New York, and Bank of America's reserve account is held with the Federal Reserve Bank of Richmond. Based on ISA balances then, one would incorrectly interpret the transactions as representing a transfer of liquid assets from the New York District to the Richmond District.

In practice, the fraction of deposits with the property just described is quite large. For example, on June 30, 2013, JPMorgan Chase had customer deposits of $950 billion, but less than half of those deposits were held at branches within the New York Federal Reserve District. Or consider Bank of America, with customer deposits of $1.02 trillion, more than 45 percent of which were held in just four states *outside* the Richmond district: California ($241 billion), Florida ($81 billion), New York ($62 billion), and Texas ($82 billion).[17] These examples are much

[16] It should be noted as well that earlier (im)balances did tend to be driven by differential economic activity across regions, as opposed to FOMC-directed securities purchases or swap line drawdowns.

[17] The numbers in this paragraph are taken from the FDIC's Summary of Deposits website, www2.fdic.gov/sod/.

less prevalent in Europe: For the most part, transfers of deposits from a bank in Germany to a bank in Finland, for example, would represent transfers of deposits from German residents to Finnish residents.

3. INTERDISTRICT FLOWS DURING AND AFTER THE GREAT RECESSION

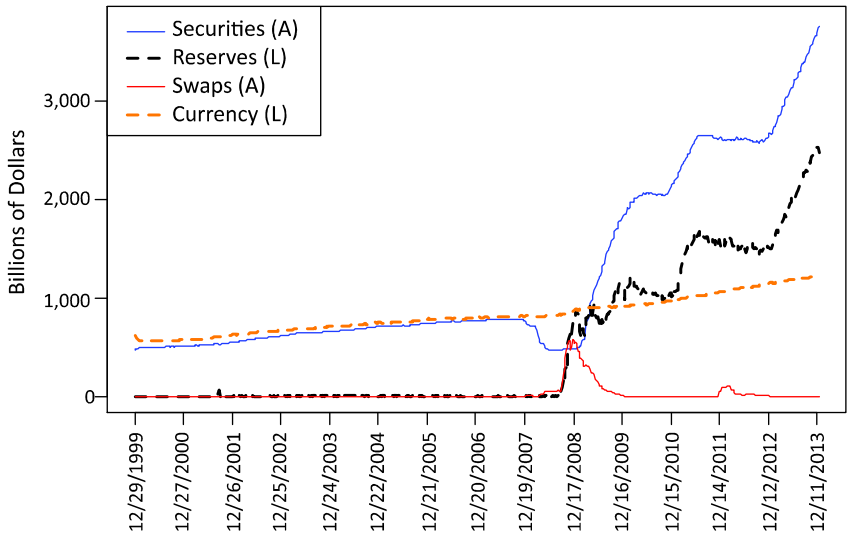
We turn now to actual data on ISA and other aspects of Reserve Bank balance sheets, concentrating on the post-2007 period. ISA behavior underwent a marked change after 2007 as a result of the Fed's credit programs, asset purchases, and swap lines with foreign central banks. After describing some of the more notable aspects of that behavior, we then suggest one way in which ISA behavior could provide useful information about the state of the economy as the Fed begins its exit from unconventional monetary policy.

Unconventional Monetary Policy and the ISA

Prior to September 2008, the balance sheets of the 12 Federal Reserve Banks grew at a fairly steady rate, mainly reflecting growth in currency demand as the economy grew. Secular growth does not necessarily imply changes in ISA balances, and both the volatility and absolute level of Reserve Bank ISA balances were low over this period. During the autumn of 2008, the Federal Reserve began paying interest on reserves at near market rates and lowered its Fed Funds rate target to near zero. Either one of these actions on its own would have severely reduced banks' incentive to economize on reserve holdings—previously a small fraction of currency outstanding. Simultaneously, and in a process that continues today, the Fed embarked on a series of credit expansion and asset purchase programs that dramatically increased the quantity of bank reserves: As of December 25, 2013, the aggregate level of reserves stood at $2.5 trillion, more than 239 times the level in early September 2008.[18] As described in Section 1, the asset purchases and central bank liquidity swaps that have generated much of this increase necessarily involve ISA transactions because the initial balance sheet increase at the New York Fed is subsequently allocated to the other 11 Banks. Thus, ISA balances at the 12 Reserve Banks behaved very differently after September 2008 than they had previously. In the remainder of

[18] See Keister and McAndrews (2009) and Ennis and Wolman (2012) for additional details on the behavior of bank reserves and the Federal Reserve System's balance sheet more generally.

Figure 1 Selected Components of Consolidated Federal Reserve Bank Balance Sheets

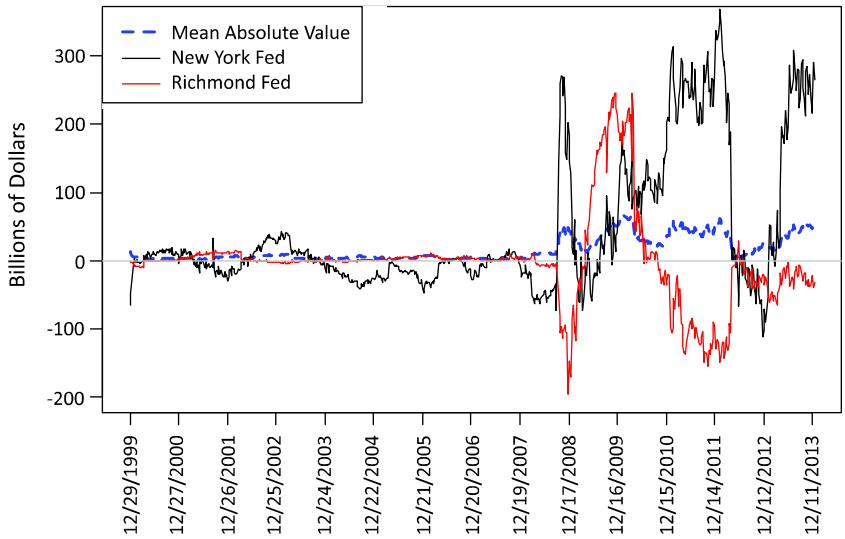


this section we discuss ISA behavior in the post-September 2008 period, concentrating on the Richmond and New York Banks.

Figure 1 displays four of the main components of the consolidated 12 Federal Reserve Bank balance sheets. Currency and reserves, which are liabilities to the Fed (hence denoted by an "L" in the legend), are plotted as the dashed orange and black lines, and the asset categories securities and swaps (hence "A" in the legend) are plotted as the solid blue and red lines. The figure reflects the discussion in the previous paragraph: In "normal times" securities grew steadily, hand in hand with currency. Once the large balance sheet expansions began in 2008, the dramatic increases in swaps and then securities were reflected in the growth of reserves, with currency remaining on a relatively stable upward trend.

For the same time period, Figure 2 plots ISA balances for the New York and Richmond Federal Reserve Banks, as well as the mean absolute value of ISA balances across all 12 Reserve Banks. There are several notable features of this figure. As stated above, before 2008, when currency and securities were growing steadily and reserves were

Figure 2 Interdistrict Settlement Account



low, both the level and volatility of ISA balances were low relative to their later behavior; this applies to Richmond, New York, and the entire System as reflected in the mean absolute value. That said, the swings in New York's ISA balance were large relative to the other Banks (compare the black line in Figure 2 to the red solid and blue dashed lines).

In a typical year before 2008, the New York Fed would be purchasing securities at a steady rate, and then immediately "selling" a significant fraction of those securities to the other 11 Banks, in exchange for ISA balances. This would tend to make New York's ISA balance increase over the course of the year ending in April, when the annual rebalancing of the domestic SOMA portfolio occurs. However, a close look at Figure 2 reveals that New York's ISA balance was just as likely to be decreasing over the year to April. The explanation may lie in the behavior of reserve balances: When the New York Fed purchases securities, the initial increase in reserves generally occurs in the accounts of banks in the New York District because the securities are sold by primary dealers, whose commercial bank accounts tend to be with New York banks. Over time, however (prior to 2008), the newly created

reserves would spread out across the System, roughly in proportion to economic activity, and be converted to currency. If the spreading out occurred before the conversion to currency, then it would involve an increase in ISA balances for other Banks and a decrease for New York, to offset New York's lower reserve account liabilities and other Banks' higher reserve account liabilities. Overall, ISA balances were low and stable at the other 11 Banks because, to a first approximation, the other 11 Banks were simply offsetting New York's fluctuations, with percentages similar to those in Table 4 (recall that the percentages are updated annually).

Beginning in September 2008, just as the size and composition of the consolidated Federal Reserve Banks' balance sheet began to change dramatically, so did the behavior of ISA balances. This occurred at the New York Fed as well as the other Reserve Banks. From the end of 1999 through September 10, 2008, the New York Fed's average absolute ISA balance was $17.1 billion; from September 17, 2008, through the end of 2013, New York's absolute ISA balance averaged $141.2 billion. For all Federal Reserve Banks, the corresponding increase was from $4.5 billion to $35.2 billion.[19]

While the entire post-2008 period has been characterized by high and volatile ISA balances, the behavior of New York and Richmond's ISA balances relative to the rest of the System divides into five distinct phases. In phase 1, from September 2008 through March 2009, New York's ISA balance rose and fell dramatically, and Richmond moved in opposite directions with somewhat smaller swings. Phase 1 is mainly accounted for by the behavior of swap lines. Swap line drawdowns increased from $62 billion on September 17, 2008, to their peak of $583 billion on December 10, and then by March 11, 2009, had fallen to $314 billion. As swap drawdowns rose and fell, New York's ISA balance would naturally rise and fall (Richmond's would fall and rise). In phase 2, roughly from March through the end of 2009, both New York and Richmond's ISA balances were increasing. For New York, this was due to the first round of LSAPs, and for Richmond it seems to have been due to an increase in deposits (reserves) that was quite large relative to other Banks (see Figure 4). Both Richmond and New York's ISA balances were relatively stable throughout 2010, apart from a large decrease for Richmond with the annual rebalancing of the domestic SOMA portfolio in April; because of Richmond's large average balance

[19] The calculation for all 12 Banks is as follows: First, calculate the weekly mean absolute balance across Banks, then average that balance across time to arrive at $4.5 billion and $35.2 billion for the two periods.

over the previous 12 months, the 2010 rebalancing involved reducing Richmond's ISA balance by approximately $175 billion.[20]

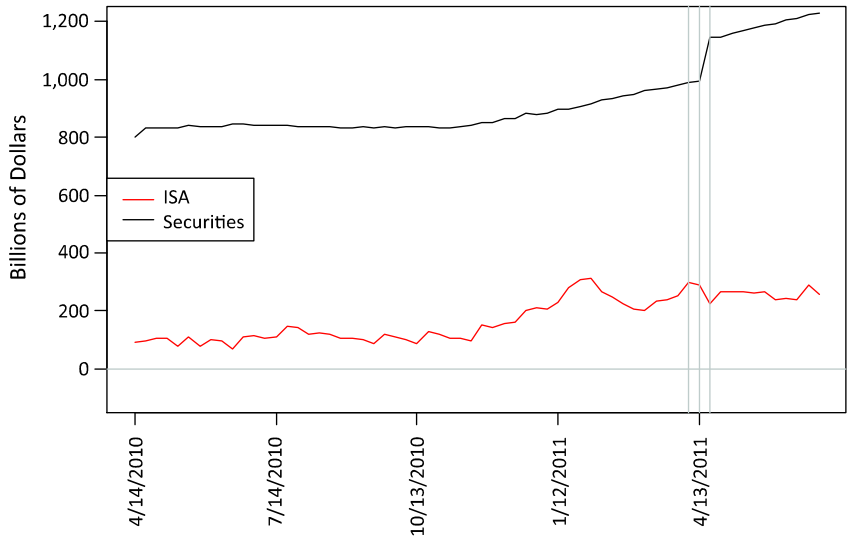
During phase 3, which lasted from late 2010 through the April 2012 domestic SOMA rebalancing, ISA balances in Richmond and New York were driven by the increase in reserves from the second LSAP program. The typical pattern associated with securities purchases occurred: New York's ISA balance increased as it allocated the newly purchased securities across the System, and Richmond's ISA balance decreased as it "purchased" securities from New York. These asset purchases ended in the middle of 2011, and ISA balances were relatively stable until the April 2012 rebalancing. At that time there was a large reallocation of securities from Richmond to New York, with a corresponding decrease in New York's ISA balance and an increase in Richmond's ISA balance; effectively, New York was purchasing back a similar but not identical quantity of securities from Richmond.

Regarding phase 3, there has been some speculation among commentators that rebalancing did not occur in April 2011. As evidence in favor of this view, Koning (2012) notes that while the New York Fed had an average ISA balance of around $147 billion over the previous 12 months, there is no evidence in the H.4.1 data of a similar-sized ISA decrease in April 2011. However, Koning also notes that the discrepancy may be a result of the inherent limitations in weekly data. In fact, this latter view is correct. Rebalancing did occur as usual, as can be confirmed by looking at the behavior of securities on the New York Fed's balance sheet.

Figure 3 zooms in on the behavior of the New York Fed's ISA and securities holdings, from April 2010 through June 2011. The three vertical lines in the figure represent April 6, April 13, and April 20, 2011. As described in Section 2, the annual domestic portfolio rebalancing for a Bank with positive ISA balance over the past year involves a decrease in its ISA balance and an equal-sized increase in its securities holding; the Bank is effectively purchasing securities with its ISA balance. Although New York's ISA did not display an unusual decrease in April 2011, its securities holdings did increase by $150 billion from April 13 to April 20. Securities were increasing steadily during that period because of the second LSAP program, but the rate of increase was nowhere close to $150 billion per week. The only plausible explanation for the $150 billion increase in securities is the annual rebalancing, which Koning indeed calculates ought to have been close to $150

[20] The number in the text is approximate because it is based on the weekly H.4 data, which incorporate all factors that affected the ISA during the week that settlement occurred.

Figure 3 New York: ISA and Securities around April 2011



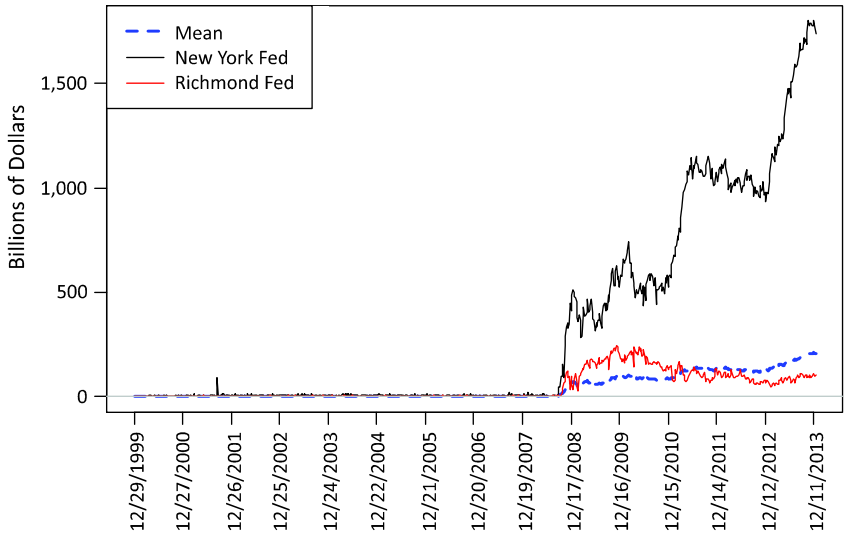
billion. The ISA change is not visible in the weekly data because it was partially offset by other factors unrelated to the rebalancing.

Phase 4, from April 2012 until late 2012, was characterized by declining ISA balances in both Richmond and New York. During this period, aggregate reserves were relatively stable (Figure 4), but deposit liabilities in both Richmond and New York were declining, with the offset coming from ISA balances. Evidently reserves were flowing out of Richmond and New York to the other Districts. Finally, phase 5 corresponds to the ongoing third LSAP program. New York's ISA balance has increased markedly from allocating the new securities purchases, and Richmond's balance has generally been declining since the last SOMA rebalancing in April 2013.

ISA Fluctuations as a Potential Signal for Monetary Policy

In comparing TARGET2 to ISA, we noted that the prevalence of interdistrict branching in the United States meant that ISA behavior was unable to provide the kind of information about cross-region

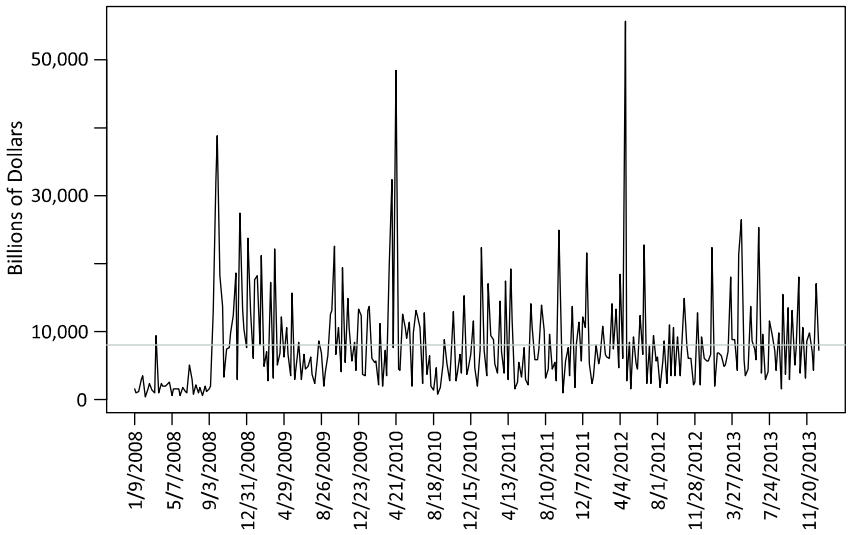
Figure 4 Deposits (Reserves)



payment flows that TARGET2 can provide. However, it should be clear from the example we used to make that point that ISA behavior does provide some information about payment flows across institutions. At the weekly level, only net flows across Federal Reserve Districts are captured, so flows across institutions within the same Federal Reserve District are missed entirely. Nonetheless, there may be some value in the information that is captured by ISA.

Starting in December 2013, the Federal Reserve began to reduce the pace of securities purchases in its third LSAP program. Assuming that the economic recovery continues, the tapering of asset purchases is likely to be the first stage in an exit from unconventional monetary policy, where the later stages will involve an increase in the federal funds rate target and a reduction in the Federal Reserve's securities holdings. Ennis and Wolman (2010, 2012) have argued that the large quantity of reserves outstanding makes it especially important that the Fed not fall behind the curve in raising its target for the federal funds rate. The financial flows represented by ISA fluctuations may provide one useful signal about the right time to raise that target.

Figure 5 Summary Statistic for Dispersion of ISA Changes



Informally, the idea is that if monetary policy were to fall behind the curve we would eventually expect to see inflation, but the inflation would likely be preceded by more rapid turnover of the monetary base (in particular, bank reserves). That increase in turnover would in turn be reflected in an increase in volatility of ISA balances. Figure 5 plots one measure of this volatility, from 2008 through 2013. For each Reserve Bank, we calculated the absolute valuable of the weekly change in the Bank's ISA balance, from the H.4.1 report. Then, for each week, we calculated the standard deviation of these changes across the 12 Banks. The jagged line in Figure 5 is the time series for this standard deviation, and the grey horizontal line is the mean over the period from January 2008 through December 2013. There are no surprises in Figure 5, given what we already know from the previous figures. In September 2009 there was a discrete upward shift in the dispersion measure, but since that time the series' behavior has been relatively steady, apart from spikes at the April rebalancing in 2010 and 2012. In the scenario where ISA behavior signals that it may be time for interest rates to rise, we would see an upward shift in the dispersion measure.

Anyone can track the dispersion measure in Figure 5, simply by downloading data from the Federal Reserve's website. As such, it may provide a useful way for the interested public to track monetary conditions. Policymakers themselves have access to the daily reserve balances of every financial institution with an account at a Federal Reserve Bank. They can therefore construct a more granular version of Figure 5, which begins with the absolute daily change in reserve balances for each account-holding institution, instead of the absolute weekly change in ISA balances for each Reserve Bank.

4. CONCLUSION

The massive expansion of the Federal Reserve System's balance sheet since 2008 has been accompanied by a notable increase in payment flows across Federal Reserve Districts. These payment flows are measured by the Federal Reserve's Interdistrict Settlement Account (ISA), much as fluctuations in TARGET2 balances measure payment flows across national central banks within the Eurosystem. There is, however, an important difference in the mechanics of the two systems; annual rebalancing occurs in the United States but not in Europe. In addition, because the U.S. banking system is highly integrated across regions, there are limits to the kind of information about payment flows that can be conveyed by ISA data.

Although the post-crisis period comprises several distinct phases of ISA behavior, as described in Section 3, the overall trend has been one in which the FOMC's asset purchase programs have tended to increase ISA balances (an asset) as well as deposit liabilities on the New York Fed's balance sheet. Absent the annual rebalancing process, described in Section 2, rough calculations suggest that New York's ISA balance would have risen to approximately $800 billion by the end of 2013, assuming that it started at zero at the beginning of 1999. Going forward however, as the asset purchase programs are eventually reversed, we should expect the behavior of ISA balances at New York and the other Banks to reverse as well. As long as the quantity of bank reserves remains large, the behavior of ISA balances may turn out to be a useful indicator of when the time has come for the fed funds target to rise.

APPENDIX: FORMAL DESCRIPTION OF ISA SETTLEMENT

What follows is a more formal statement of the process described in Section 2, for annual settlement of ISA using the domestic SOMA portfolio.

1. (a) Denote Richmond's average ISA balance for the preceding 12 months by B_R, and recall that we follow H.4.1 and put ISA on the asset side. In the first step, the ISA balance is reduced by B_R, and there is an offsetting increase of B_R in the Richmond Bank's asset item, "gold certificate account." If B_R is negative, then the ISA balance rises and the gold certificate account falls in this step.

   (b) Denote the Systemwide ratio of the gold certificate account to the value of Federal Reserve notes by $\bar{\rho}$. Denote the corresponding ratio for the Richmond Bank by ρ_R. In the second step, Richmond's gold certificate account is adjusted upward or downward—as appropriate—to equate the new ρ_R to $\bar{\rho}$. The offsetting balance sheet entry is a decrease or increase in Richmond's holdings of the domestic SOMA portfolio.

   (c) Denote the new ratio of Richmond's domestic SOMA portfolio holdings to the total domestic SOMA portfolio by δ. Until the following April, Richmond's allocation of the domestic SOMA portfolio will be given by δ.

   (d) Given

$I_{R,0} =$	Richmond's initial ISA balance
$B_R =$	Richmond's average ISA balance
$I_{R,1} =$	Richmond's new ISA balance
$G_{R,0} =$	Richmond's initial gold certificate account
$G_{R,1} =$	Richmond's "intermediate" gold certificate account
$G_{R,2} =$	Richmond's new gold certificate account
$G =$	System's gold certificate account
$N =$	System's Federal Reserve notes
$N_R =$	Richmond's Federal Reserve notes outstanding
$S_{R,0} =$	Richmond's initial SOMA holdings
$S_{R,1} =$	Richmond's new SOMA holdings
$S =$	System's SOMA holdings
$\delta_R =$	Richmond's new SOMA allocation percentage

   i. In step a, we have $I_{R,1} = I_{R,0} - B_R$ and $G_{R,1} = G_{R,0} + B_R$.

   ii. In step b, we have $G_{R,2} = G_{R,1} + \left(\frac{G}{N} N_R - G_{R,1}\right)$ and $S_{R,1} = S_{R,0} - \left(G_{R,2} - G_{R,1}\right)$.

   iii. Thus, for step c, $\delta_R = S_{R,1}/S$.

   iv. Note that $G_{R,1}$ is completely artificial. For an instant, a bank's gold certificate account could go highly negative

or could go higher than the System's total, though at every instance the total across Banks does sum to the System's total. We can rewrite the process without $G_{R,1}$ as $G_{R,2} = \frac{G}{N} N_R$ and $S_{R,1} = S_{R,0} - \left(\frac{G}{N} N_R - (G_{R,0} + B_R)\right)$. This makes it clear that Richmond's gold certificate account only changes to the extent that either (i) the System's ratio of gold certificate account to notes changes, or (ii) Richmond's notes quantity changes. And, Richmond's SOMA changes if (i) Richmond's gold certificate account changes, or (ii), more importantly in practice, if Richmond's ISA balance averaged something other than zero over the previous 12 months.

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