Volume 10, Number 11 ☙ November 2004
FEDERAL RESERVE BANK OF NEW YORK

Current Issues
IN ECONOMICS AND FINANCE

www.newyorkfed.org/research/current_issues

Recent Innovations in Treasury Cash Management

Kenneth D. Garbade, John C. Partlan, and Paul J. Santoro

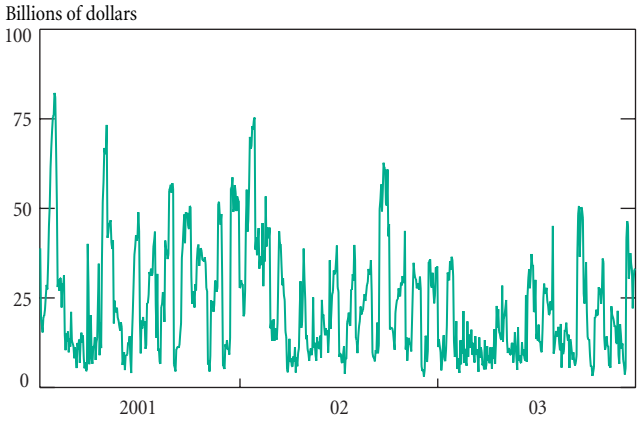
The Treasury Tax and Loan program, a joint undertaking of the Treasury and the Federal Reserve, is designed to manage federal tax receipts and stabilize the supply of reserves in the banking system. Three recent innovations—electronic collection of business taxes, real-time investment of excess Treasury balances, and competitive bidding for Treasury deposits—have materially enhanced the ability of the two agencies to achieve these objectives.

The U.S. government is the largest transactor in the world. During fiscal year 2003, aggregate federal receipts and expenditures averaged $18.8 billion daily. Money was disbursed to pay for purchases of goods and services, civilian and military salaries, transfer payments such as social security, and interest on the national debt. Receipts came primarily from personal and corporate income taxes and social security contributions.

Like other economic agents, the U.S. Treasury maintains a cash balance to buffer unanticipated and short-run differences between receipts and expenditures. Unlike other agents, however, the Treasury has to pay special attention to the question of *where* it keeps its cash. The Treasury disburses almost all of its payments from accounts at Federal Reserve Banks, but virtually all Treasury receipts are transfers of funds previously held at private institutions. Thus, there is a continuous flow of funds from private institutions to the Reserve Banks and back again. If the Treasury deposited all of its receipts in its Reserve Bank accounts as soon as the receipts came in, and if it held the funds in those accounts until they were disbursed, increases in its cash position would drain reserves from the banking system and, conversely, decreases would add reserves. As Chart 1 shows, Treasury balances exhibit significant trends, building up when receipts exceed disbursements and running down when disbursements exceed receipts. Maintaining Treasury balances primarily at Federal Reserve Banks would, therefore, necessitate frequent and large-scale open market operations to mitigate undesirable fluctuations in bank reserves and the federal funds rate.[1] A more efficient strategy, and the one adopted by the Treasury, is to maintain a stable working balance in its Reserve Bank accounts and to leave the remainder of its cash in private depository institutions until needed.

Dampening fluctuations in aggregate bank reserves by stabilizing Treasury balances at Federal Reserve Banks was the original purpose of the Treasury Tax and Loan (TT&L) program, and it remains a primary objective.[2] At the same time, the TT&L program is a key component of the Treasury's fiscal management system and serves two additional purposes related to that system: processing federal tax payments and earning interest on public funds invested

Chart 1
Treasury Cash Balance



Source: U.S. Department of the Treasury, Daily Treasury Statement, <http://www.fms.treas.gov/dts>.

at private depository institutions. The program lies at the interface between Federal Reserve monetary policy and Treasury cash management and provides an outstanding example of the benefits, to taxpayers and to the economy as a whole, of the long-standing cooperation between the two agencies.

This edition of *Current Issues* examines three recent innovations in the TT&L program that have materially enhanced the ability of Treasury and Federal Reserve officials to achieve the objectives of the program. Understanding the innovations is important not only because the TT&L program is instrumental in carrying out monetary policy and federal cash management, but also because the innovations shed light on why and how public sector innovation occurs. We begin by describing the broad structure of the TT&L program, including the program's role in the implementation of monetary policy, and then discuss the three innovations.

An Overview of the Treasury Tax and Loan Program

The key to understanding the TT&L program is understanding the role played by private depository institutions. A depository institution can participate in any of three ways: as a collector institution, a retainer institution, or an investor institution.

Collector institutions are tax collection conduits. They accept tax payments from businesses (primarily withholdings of personal income taxes, corporate income taxes, and social security contributions) in electronic form and at their teller windows and transfer the payments to Treasury accounts at district Federal Reserve Banks. About a dozen "lockbox" banks and Internal Revenue Service service centers perform a related function: receiving and processing tax payments sent in by mail.

A retainer institution also accepts tax payments but, subject to a balance limit specified by the institution and pledge of sufficient collateral, retains the payments in an interest-bearing "Main Account" until called for by the Treasury. If the Main Account balance exceeds the institution's balance limit, or if it exceeds the collateral value of the assets pledged by the institution, the excess is transferred promptly to a Treasury account at the institution's district Federal Reserve Bank. The interest rate on Main Account balances is prescribed by the secretary of the Treasury to be the weekly average overnight federal funds rate less 25 basis points. (Box 1 explains the rationale for this floating rate.)

An investor institution does everything a retainer institution does and, in addition, accepts discretionary investments from the Treasury. (The Treasury invests funds that would otherwise cause its Reserve Bank balance to rise above the target level.) An investor institution can choose to operate with one-day notice, in which case it receives one business day's notice of a pending investment, or with same-day notice, in which case it agrees to accept funds either on the same day it is notified of the investment or on the following day. Direct investments are credited to the institution's Main Account and must be collateralized; they earn interest at the weekly average overnight federal funds rate less 25 basis points. Table 1 shows direct investments made during November 2003.

Table 1
Treasury Direct Investments in November 2003

Announcement Date	Investment Date	Amount Invested (Millions of Dollars)
Institutions Operating with Same-Day Notice		
11/5	11/5	992
11/5	11/6	1,077
11/14	11/17[a]	1,219
11/19	11/19	888
11/26	11/28[b]	3,936
Institutions Operating with One-Day Notice		
11/5	11/6	65
11/14	11/17	70
11/26	11/28	215

Source: Federal Reserve Bank of New York.

[a] November 17, 2003, was a Monday.
[b] November 27, 2003, was Thanksgiving.

Box 1

The Interest Rate on Main Account Balances

The rate of interest on Main Account balances is the weekly average overnight federal funds rate less 25 basis points. (The weekly average rate is computed for a seven-day interval beginning on Thursday and ending the following Wednesday, with the rate for a Saturday, Sunday, or holiday taken as the rate for the preceding business day.) This rate was established in 1978 in the course of a major overhaul of the Treasury Tax and Loan program. Treasury officials concluded that the rate on overnight repurchase agreements (RPs) was an acceptable market-linked rate for collateralized balances that provided "recognition [of] costs of alternative collateralized borrowings by banks and [of] the depositaries' short-term investment potential for [TT&L balances]."[a] Since RP rates were not widely reported in the late 1970s, officials decided that the TT&L rate should be set at the more familiar federal funds rate less the 25 basis point average spread between the funds rate and the RP rate that prevailed at that time.

By the late 1990s, RP rates were widely available and Treasury officials suggested that the TT&L rate might be set directly at the overnight RP rate.[b] However, the average spread between the federal funds rate and the RP rate had in the meantime declined to less than 5 basis points, so changing to the RP rate would have increased the return on Treasury balances by more than 20 basis points. Not surprisingly, bankers objected. Among other things, they argued that the 25 basis point spread was necessary and appropriate compensation for (a) the operational cost of collateralizing Treasury balances and (b) the value of the option granted to the Treasury to call its balances at any time. More pointedly, some bankers suggested that some institutions might reduce their participation in the TT&L program if the Treasury raised the TT&L rate to the RP rate. This prospect was worrisome because reduced participation could have impaired the ability of the private sector to absorb peak Treasury balances. The Treasury decided to leave the TT&L rate unchanged, but it also began to develop a mechanism—the Term Investment Option (described in the text)—for identifying a market rate of return on its deposits.[c]

[a] Lovett (1978, p. 44).

[b] *Federal Register*, July 30, 1999, pp. 41747-9.

[c] Responses to the proposal to change the RP rate, together with the Treasury's decision to leave the rate unchanged, are recorded in the *Federal Register*, March 15, 2002, pp. 11573-7.

A remarkably large number of depository institutions participate in the TT&L program. At the end of 2003, there were 11,758 collector institutions, 949 retainer institutions, and 162 investor institutions. During that year, program participants processed $1.58 trillion in tax payments. During fiscal year 2003, the Treasury maintained an average daily aggregate Main Account balance of $8.9 billion at retainer and investor institutions.

Treasury Calls

Collector institutions transfer tax payments to Treasury accounts at Federal Reserve Banks every day, but retainer and investor institutions retain the payments they receive—and investor institutions retain the Treasury's direct investments—until the Treasury "calls" for the funds. Retainer and investor institutions are divided into three classes—designated A, B, and C—for purposes of Treasury calls.

The smallest institutions, those that process less than $10 million of tax payments annually, are designated class A institutions and generally receive at least five business days' advance notice of a call. Institutions that process between $10 million and $100 million of tax payments, as well as institutions that process more than $100 million of payments but have deposit liabilities of less than $100 million, are designated class B institutions and generally receive at least three days' notice. Calls to class A and B institutions are typically issued on a Friday, two or three times a month, and are usually for either 50 percent or 100 percent of Main Account balances as of a specified future date. For example, class A and B institutions were notified on Friday, November 14, 2003, that they were to transfer (on Wednesday, November 26) 100 percent of the Main Account balances posted as of the close of business on Tuesday, November 25 (Table 2, first two highlighted rows).

The largest institutions—those that both process more than $100 million of tax payments annually and have deposit liabilities of more than $100 million—are designated class C institutions. (An institution is also placed in class C if it has a balance limit of more than $250 million or if it has deposit liabilities of more than $5 billion.) Calls to class C institutions are issued frequently, sometimes daily, and the institutions receive either one-day or same-day notice. For example, class C institutions were notified at about 10:45 a.m. on Monday, November 17, 2003, that they were to transfer 26 percent of their current uncalled Main Account balances that day and 60 percent of the remaining balances the following day (Table 2, third and fourth highlighted rows).

Table 2
Treasury Calls on Main Account Balances Announced in November 2003

Notice Date	Balance Date	Transfer Date	Percentage of Balance to be Transferred	Amount Transferred (Millions of Dollars)
		Class A Institutions		
11/14	11/25	11/26	100	95
11/28	12/8	12/9	100	147
		Class B Institutions		
11/14	11/25	11/26	100	411
11/21	11/28	12/1	100	170
11/28	12/8	12/9	100	259
		Class C Institutions		
11/3	11/3	11/3	38	2,804
11/3	11/3	11/4	100	4,499
11/4	11/4	11/4	20	1,015
11/4	11/4	11/5	25	1,032
11/6	11/6	11/7	53	4,512
11/7	11/7	11/7	20	1,301
11/7	11/7	11/10	21	1,039
11/10	11/10	11/10	38	3,121
11/10	11/10	11/12	100	5,080
11/12	11/12	11/12	73	2,111
11/13	11/13	11/13	91	2,427
11/14	11/14	11/14	86	3,346
11/17	11/17	11/17	26	2,132
11/17	11/17	11/18	60	3,673
11/18	11/18	11/19	48	3,352
11/19	11/19	11/20	22	1,530
11/20	11/20	11/20	6	398
11/20	11/20	11/21	69	4,109
11/21	11/21	11/21	27	1,198
11/24	11/24	11/25	59	4,139
11/25	11/25	11/25	34	1,852
11/25	11/25	11/26	72	2,547
11/26	11/26	11/26	27	1,141
11/28	11/28	11/28	21	2,685
11/28	11/28	12/1	100	10,050

Source: Federal Reserve Bank of New York.

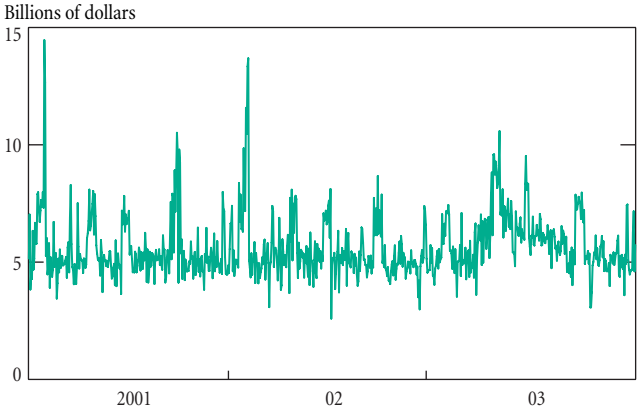
We noted earlier that there were more than 1,100 retainer and investor institutions in the TT&L program at the end of 2003. These institutions were divided into 461 class A institutions, 472 class B institutions, and 178 class C institutions. During fiscal year 2003, class A institutions held aggregate Main Account balances of $74 million at the close of business on a typical day, class B institutions held average balances of $290 million, and class C institutions held average balances of $8.54 billion.

Maintaining the Target Reserve Bank Balance

At the present time, the Treasury aims to maintain an aggregate Reserve Bank balance of about $7 billion during periods of heavy and volatile tax flows (in the second half of the months of January, April, June, and September and briefly in the middle of March and December) and $5 billion at other times. Calls and direct investments allow the Treasury to maintain its Reserve Bank balance fairly close to the target level on most days (Chart 2). This control is the end result of a closely timed decision-making process involving Treasury cash managers and the staff of the Federal Reserve Bank of New York.

Each morning before 9:00 a.m. (all times in this article are eastern time), Treasury cash managers and New York Fed staffers estimate independently the current day's tax receipts from collector institutions and lockbox facilities, other receipts, and disbursements in a wide variety of categories. The estimates are combined with the previous day's closing Treasury balance at the Reserve Banks, payments of principal and interest, proceeds from sales of new debt issues, maturing calls on retainer and investor institutions, and direct investments scheduled on the preceding business day to produce pro forma estimates of the current day's closing Treasury balance at the Reserve Banks. The Treasury and Fed staffs compare their estimates during a 9:00 a.m. conference call and come to a consensus for that day's discretionary cash management action. On most days, the action is based on a simple average of the two estimates. If the average estimated closing balance exceeds the target level, the Treasury invests the excess with investor institutions that have sufficient free collateral and room under their balance limits to accept additional balances (see the figure at the bottom of page 5).

Chart 2
Treasury Cash Balances at Federal Reserve Banks



Source: U.S. Department of the Treasury, Daily Treasury Statement, <http://www.fms.treas.gov/dts>.

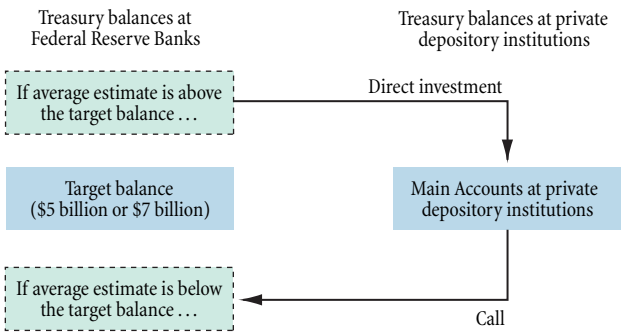
If the average estimated closing balance is below target, the Treasury issues a same-day call to make up the anticipated shortfall. Box 2 explains how the estimate of the closing Treasury balance affects Federal Reserve open market operations later in the same morning. Since discretionary cash management actions must be based, in part, on imperfect forecasts of the current day's receipts and disbursements, there is always some unexpected variation in Treasury balances at the Fed—and hence in reserves available to the banking system.

Collateral

By law, a retainer or investor institution must pledge collateral against its Main Account balance. The Treasury accepts a wide variety of assets as collateral, ranging from Treasury securities to commercial, agricultural, and student loans, but it assigns a lower collateral value to less liquid and less creditworthy assets, as well as to assets with more volatile market prices.[3] Collateral must be held either at a Federal Reserve Bank or at a depository institution that provides custodial services and is acceptable to the Treasury.

In 1982, the Treasury added a Special Direct Investment (SDI) facility to the TT&L program to allow depository institutions to pledge additional types of collateral at times when Treasury balances are unusually high. The Treasury places funds with institutions participating in the SDI program the same way it places conventional investments: with either same-day or one-day notice. The key feature of the SDI program is that SDI balances can be secured with student loans, commercial loans, and one-to-four-family whole mortgages *retained on the premises of the institution*. Retaining possession is important because amortizing assets such as student loans and whole mortgages can be cumbersome to administer from remote locations. SDI balances may be withdrawn with one-day or same-day notice.

Discretionary Cash Management Actions



Note: The arrows indicate the flow of funds between the Treasury's Federal Reserve accounts and Main Accounts at private depository institutions.

Box 2

Treasury Cash Balances at Federal Reserve Banks and Open Market Operations

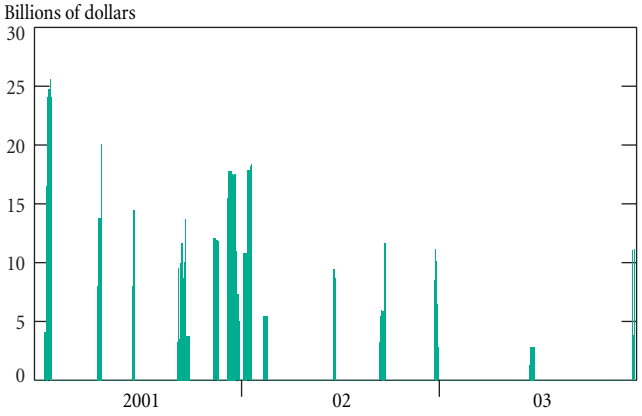
Every business day at about 9:20 a.m., the Manager of the System Open Market Account confers with a member of the Federal Open Market Committee and with staff of the Board of Governors and the Federal Reserve Bank of New York to decide on open market operations for the day. On most days, the decision is based primarily on technical factors such as anticipated reserve drains due to growth of currency in circulation and expected additions to reserves due to increases in float. If reserves are expected to fall below a level believed to be consistent with the target level for the overnight federal funds rate, the Fed enters the market at about 9:30 a.m. to supply additional reserves by entering into repurchase agreements with primary dealers. If reserves are expected to be inappropriately high, the Fed absorbs reserves with reverse repurchase agreements.

An important part of the decision-making process for open market operations is anticipating changes in the Treasury's Reserve Bank balance, because increases in that balance drain reserves from the banking system while decreases in the balance supply reserves. Participants in the 9:20 conference call use the projections developed earlier in the morning by Treasury cash managers and staff of the Federal Reserve Bank of New York, as well as a third projection developed by Board staff.

The Treasury placed SDI balances with investor institutions during six intervals in 2001, five intervals in 2002, and two intervals in 2003 (Chart 3). Designed to accommodate temporary surges in Treasury balances, the facility was used

Chart 3

Special Direct Investment Balances



Source: U.S. Department of the Treasury, Daily Treasury Statement, <http://www.fms.treas.gov/dts>.

Table 3
Treasury Cash Balances, Treasury Tax and Loan Capacity, and Funds Supplied through Federal Reserve Repurchase Agreements with Primary Dealers
Billions of Dollars

	Treasury Cash Balance				
Date	Total	At Federal Reserve Banks	Outside of Federal Reserve Banks	Aggregate TT&L Capacity	Federal Reserve RPs
4/17/00	67.5	11.4	56.1	59.9	21.7
4/18	48.1	8.7	39.5	59.6	18.7
4/19	59.7	5.7	54.1	59.4	23.8
4/20	33.8	8.0	25.8	55.4	15.1
4/21	45.2	8.3	37.0	55.9	16.1
4/24	73.9	8.2	65.7	70.9	17.0
4/25	91.4	16.4	75.0	77.5	23.3
4/26	105.6	29.4	76.1	77.5	39.8
4/27	77.9	6.0	71.9	77.8	18.5
4/28	92.6	15.9	76.7	77.8	24.9
5/1	83.4	17.3	66.1	77.8	31.2
5/2	98.0	22.2	75.8	77.8	28.5
5/3	80.4	8.0	72.4	77.8	32.5
5/4	78.3	6.0	72.2	77.9	16.0
5/5	77.6	5.1	72.5	77.8	13.0

Source: Federal Reserve Bank of New York.

primarily during periods of heavy tax receipts. The Treasury reduced its use of SDIs in 2003 partly because of lower tax receipts and partly because it was experimenting with a new investment program, the Term Investment Option (TIO), described in the next section.

In spite of the wide variety of assets accepted as collateral for Main Account balances, and in spite of the overflow capacity afforded by the Special Direct Investment facility, the Treasury's cash position sometimes grows so large that retainer and investor institutions are unable to absorb the entire excess over the target Reserve Bank balance. For example, personal and corporate income tax payments swamped the absorptive capacity of retainer and investor institutions in late April and early May 2000 and led to extraordinarily large Treasury balances at Federal Reserve Banks between April 25 and May 2 (Table 3). The ballooning balances drained reserves from the banking system and forced the Fed to replenish reserves with open market operations (reported in the last column of the table).

Recent Innovations in Treasury Cash Management

Evolutionary changes in the national payments system and revolutionary changes in telecommunications and information-processing technologies have created opportunities for the Treasury to keep Reserve Bank balances closer to target levels, to process taxes at lower cost, and to earn something closer to a market rate of return on its deposits at private depository institutions. This section describes three innovations that have drawn upon the emerging opportunities.

An Innovation in Tax Collection

The Electronic Federal Tax Payment System (EFTPS) is an innovation in tax collection that has reduced processing costs, increased the average rate of return on public funds invested at private depository institutions, and facilitated maintenance of the Treasury's Reserve Bank balance closer to target levels. EFTPS was mandated by Congress in 1993 as part of the North American Free Trade Agreement Implementation Act to fund a portion of the budget impact of that legislation.[4]

The Treasury presently uses two mechanisms to collect most business taxes: EFTPS and PATAX (Paper Tax System). To appreciate how EFTPS contributes to the objectives of the TT&L program, we first have to understand how PATAX, a recent update of an older system, works.

A business that chooses to make a federal tax payment with a conventional paper check prepares a "federal tax deposit coupon" identifying itself and the amount of the payment and delivers the coupon and the check to its depository institution. Upon receipt, the institution debits the customer's checking account and credits an interest-free Treasury tax collection account. (The depository institution must pledge collateral to cover any balances in the collection account in excess of insurance coverage.) The following day, the accumulated balance in the collection account is transferred to a Treasury account at a Federal Reserve Bank (if the institution is a collector institution) or to the Main Account at the same institution (if the institution is a retainer or investor institution).

A business enrolled in EFTPS makes a tax payment by authorizing—via telephone or computer—withdrawal of the payment from its account at a participating depository institution on a specified future date. On the payment date, the funds are withdrawn and transmitted to a Treasury account at a Federal Reserve Bank via an automated clearinghouse (ACH) transfer.[5] If the participating institution is a retainer or investor institution with sufficient free collateral and room under its balance limit to accept additional funds, the payment is immediately routed back to the institution's Main Account. EFTPS was first required for large business taxpayers in the fall of 1996 and subsequently became mandatory for any business making more than $200,000 in aggregate annual tax payments. In fiscal year 2003, the

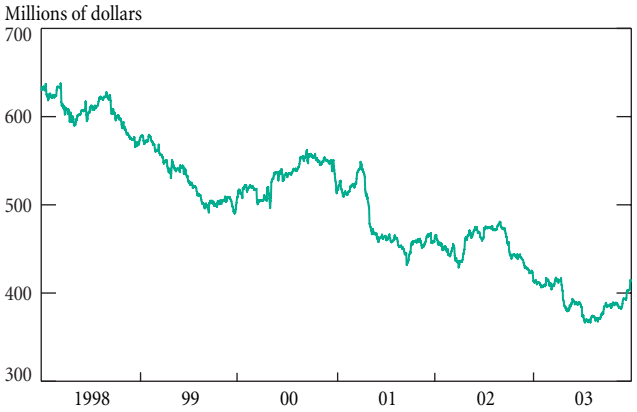
federal government collected almost $1.5 trillion through EFTPS—far more than the $76 billion collected through PATAX during the same year.

The substitution of electronic payments for paper-based payments has led to three major improvements in the TT&L program:

- The reduction in the volume of payments held overnight in interest-free collection accounts increased the average return on aggregate Treasury balances.
- The reduced use of paper coupons and paper checks led to lower processing costs.
- Electronic notification of pending payments allowed the Treasury and the Federal Reserve to replace imperfect forecasts of those payments with data on actual flows.

The last improvement enhanced the ability of the Treasury and Federal Reserve staffs to forecast, and thus to control, Treasury balances at Federal Reserve Banks. The average daily absolute forecast error for closing Treasury balances fell from about $600 million in the late 1990s to about $400 million more recently (Chart 4). (Forecast errors have not disappeared entirely because cash managers still have to forecast most disbursements and some receipts.)

Chart 4
Average Daily Absolute Forecast Error for Closing Treasury Balances in Federal Reserve Banks
250-Business-Day Trailing Moving Average



Source: Federal Reserve Bank of New York.

Notes: Let e_k be the forecast error for day k, computed as the difference between the closing balance in the Treasury's Reserve Bank accounts at the end of day k and the simple average of the forecasts of that balance generated in the morning of the same day by Treasury cash managers and staff of the Federal Reserve Bank of New York. The average absolute forecast error for day k was computed as the average of the absolute values of the errors for day k and the preceding 249 days: $\sum_{i=0}^{249}|e_{k-i}|/250$.

An Innovation in Stabilizing Treasury Balances at Federal Reserve Banks

In July 2000, the Treasury and the Federal Reserve implemented the Treasury Investment Program (TIP), a major revamping of TT&L infrastructure that centralized, at the Federal Reserve Bank of St. Louis, many of the functions previously carried out by individual Federal Reserve Banks. The consolidated functions included tracking Main Account and Special Direct Investment account balances, monitoring collateral pledges, and investing and calling Treasury balances.

TIP allowed Treasury cash managers to monitor, for the first time, certain transfers to the Treasury's Reserve Bank accounts on a very nearly real-time basis and to neutralize errors in forecasting those transfers. Since the introduction of EFTPS, the four most important categories of tax-related transfers to the Treasury's Reserve Bank accounts have been (1) ACH transfers (through EFTPS) from collector institutions, (2) transfers from lockbox facilities, (3) PATAX payments from collector institutions, and (4) transfers of excess balances from retainer and investor institutions. On any given day, all transfers in the first category—and a large portion of the transfers in the second category—are known before the 9:00 a.m. conference call between the Treasury and New York Fed staffs and are incorporated in the decision to invest or call in balances.[6] Transfers in the third and fourth categories, however, have to be forecast.[7] If the sum of the transfers in the third and fourth categories comes in above the forecast level, the Treasury balance at Federal Reserve Banks will exceed the target balance, reserves in the private banking system may be undesirably scarce, and the federal funds rate may rise above its target level.

A TIP facility called Dynamic Investment neutralizes errors in forecasting PATAX payments from collector institutions and transfers of excess balances from retainer and investor institutions (hereafter, collectively denoted as "payments") by recycling Treasury balances back to private depository institutions on an *intraday* basis. In a representative case, Treasury cash managers might set the initial value of the "Balance Available for Dynamic Investment"—an index coded in the TIP software, hereafter the "Balance"—equal to $200 million less the forecast payments. Actual payments are added to the Balance as they come in. For example, if payments are expected to be $500 million, the initial Balance might be set at -$300 million. If $250 million of payments come in by 11 a.m., the updated Balance will be -$50 million. Once an hour between noon and 5 p.m., any positive Balance is moved to the Main Accounts at participating institutions and the recycled funds are subtracted from the Balance, thereby resetting the Balance for the next hour.

If actual payments cumulate over the course of the day to the originally forecast value of $500 million, $200 million will be transferred to private depository institutions through the Dynamic Investment facility. (To ensure that the supply of bank reserves is not affected by an accurate forecast, this expected $200 million of Dynamic Investments is offset by a $200 million larger call, or smaller direct investment, at the 9:00 a.m. conference call.) If actual payments are unexpectedly large, additional funds will be transferred to private institutions. For example, if actual payments are $650 million instead of the $500 million originally forecast, then $350 million will be transferred to private institutions, including $200 million of expected transfers and an additional, unexpected transfer of $150 million (Table 4, column 2). The latter transfer offsets the reserve drain associated with the unexpectedly large volume of payments. In this way, Dynamic Investment neutralizes any larger than expected payments that might otherwise lead to an undesirable scarcity of reserves in the banking system.

Conversely, if actual payments are unexpectedly small, a smaller than expected volume of funds will be transferred to private institutions through the Dynamic Investment facility. For example, if actual payments are $350 million instead of the $500 million originally forecast, only $50 million (rather than $200 million) will be transferred (Table 4, column 3). The $150 million shortfall in transfers offsets the unexpected retention of $150 million of reserves at private institutions. Thus, the Dynamic Investment facility acts as an automatic stabilizer in maintaining the Treasury's Reserve Bank balance at the target level.

Table 4

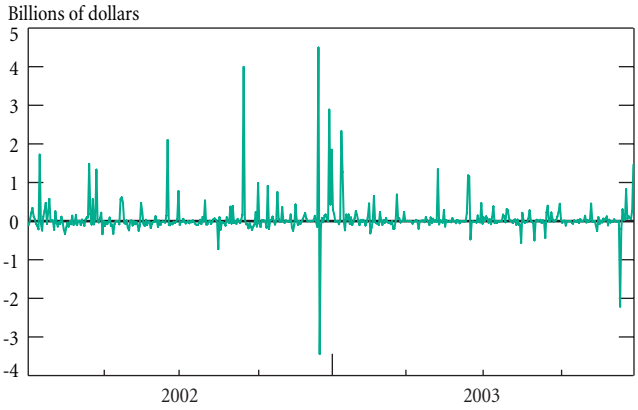
Dynamic Investment as a Function of PATAX Payments from Collector Institutions and Transfers of Excess Balances from Retainer and Investor Institutions

	Payments as Expected	Unexpectedly High Payments	Unexpectedly Low Payments
Payments	500	650	350
Dynamic Investment: Equal to payments net of -$300 million initial value of Balance Available for Dynamic Investment	200	350	50
Net amount transferred to Treasury accounts at Federal Reserve Banks: Payments, less amount invested through Dynamic Investment, plus $200 million larger morning call or smaller direct investment	500	500	500

Notes: In all three cases, Treasury cash managers expect $500 million in payments. They set the Balance Available for Dynamic Investment at an initial value of -$300 million and, to offset the expected $200 million of Dynamic Investments during the day, either add $200 million to the morning call or invest $200 million less in the morning's direct investment. PATAX payments are those made under the Paper Tax System.

Chart 5

Funds Returned Unexpectedly to the Private Banking System through Dynamic Investment



Source: Federal Reserve Bank of New York.

Chart 5 shows the quantity of funds returned unexpectedly to the private banking system through Dynamic Investment as a result of forecasting errors. The quantity of funds returned unexpectedly is positive on days when payments and transfers were larger than forecast at the start of the day; it is negative on days when payments and transfers fell short of initial forecasts. Although Treasury and Fed forecasts were quite accurate on many days, there were some days when payments and transfers were materially stronger or weaker than expected and neutralization of forecast errors proved valuable.

An Innovation in Interest Rate Determination

The Term Investment Option is an investment facility first offered to depository institutions on a pilot basis in the spring of 2002 and on a broader basis beginning in November 2003. TIO addresses a particularly vexatious issue: how the interest rate on Treasury balances at private depository institutions should be determined. (Box 1 describes the problems the Treasury encountered when it tried to change that interest rate in the late 1990s.) The new facility has two novel features: it provides for a competitively determined interest rate and it offers greater certainty about the length of time funds will be left on deposit. The latter feature is believed to be particularly important in attracting institutions to the TIO program.

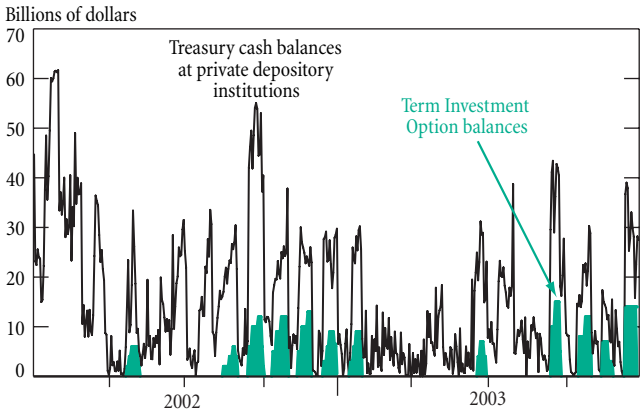
The easiest way to explain how TIO works is through an example. On Tuesday, January 13, 2004, the Treasury

announced that it would auction, on the following day, $9 billion for deposit for nineteen days, from Thursday, January 15, to Tuesday, February 3.[8] On January 14, participating institutions bid for the funds through an Internet application known as *TERMLink*, indicating the maximum rate they would pay on a specified quantity of funds. Following the close of bidding at 11 a.m., Treasury officials determined that they could place $9 billion with institutions bidding rates of 0.961 percent or higher. All successful bids were filled at 0.961 percent—that is, the auction used a single-price format. Bids that specified higher rates were filled in full. Bids that specified exactly 0.961 percent were prorated—because at that rate, bidding interest exceeded the amount of funds available after the full awards to the higher-rate bids were accounted for. Institutions that bid the 0.961 percent rate received 57.50 percent of the amount bid for.

The Treasury sponsored a total of forty-two TIO auctions through the end of April 2004. (Details on TIO offerings and auction results are available at <http://www.fms.treas.gov/tip/>.) The initial offerings were relatively small ($2 billion to $5 billion, consistent with the notion of a pilot program), but offerings became larger after mid-2003. The largest was a $14 billion offering in December 2003. Terms varied from as few as three days to as many as nineteen days.

Chart 6 shows the variation in TIO balances and aggregate Treasury balances at private depository institutions through the end of 2003. The Treasury made term investments during twelve separate intervals, holding between one and four auctions in each interval. Term investments were made during the second half of a month and in the first few days of the following month—times when the Treasury is typically flush with cash.

Chart 6
Term Investment Option Balances and Treasury Cash Balances at Private Depository Institutions



Source: U.S. Department of the Treasury, Daily Treasury Statement, <http://www.fms.treas.gov/dts>.

The TIO program materially enhanced the return on public funds invested at private institutions. Over the first forty-two auctions, the difference between auction rates and what the Treasury would have earned had it left the balances in Main Accounts (earning interest at the weekly average federal funds rate less 25 basis points) was uniformly positive and averaged 17.3 basis points. Box 3 examines TIO auction results in more detail (see page 10).

The Term Investment Option was an important innovation for two reasons. First, it changed the locus of interest rate determination for Treasury investments from administrative discretion to a market-driven auction process. Treasury officials now have an unambiguous measure of the value placed on TIO balances by different depository institutions, and the balances can be directed to the institutions that value them most highly. Second, the new program has led Treasury officials to consider whether they can commit a portion of their cash balances to term investments. Not surprisingly, market participants have been quick to appreciate the information content of TIO offering announcements for projecting Treasury borrowing requirements.[9]

Conclusion

The Treasury Tax and Loan program is a cooperative effort of the U.S. Treasury and the Federal Reserve System that is important for both monetary policy and Treasury cash management. This article described three recent innovations that have enhanced the ability of Treasury and Federal Reserve officials to achieve the primary objectives of the program: dampening fluctuations in bank reserves, processing federal tax payments, and earning a market rate of interest on investments of public funds.

Of the three innovations, the Electronic Federal Tax Payment System offers the most obvious benefits. EFTPS has reduced the cost of processing business tax payments by replacing paper checks with electronic transfers, enhanced the return on public funds by reducing the amount of money held overnight in interest-free collection accounts, and allowed cash managers to replace imperfect forecasts of some tax payments with data on actual flows. A second innovation, Dynamic Investment, acts as an automatic stabilizer, keeping the Treasury's Reserve Bank balance closer to the target level. The third innovation, the Term Investment Option, has changed the locus of interest rate determination to a market-driven auction process and generated, on average, an additional 17 basis points of yield on TIO balances.

Box 3

The Rate of Interest on Term Investment Option Balances

One of the key issues in the Term Investment Option program is how interest rates on TIO balances compare with rates on Main Account balances. This box examines the variation in the spread between TIO auction rates and Main Account rates in the program's first forty-two auctions, which took place between April 2002 and April 2004.

Let $Rtio_k$ denote the rate from the k^{th} auction (in percent), Q_k the size of the k^{th} offering (in billions of dollars), T_k the term of the k^{th} offering (in days), and A_k the time elapsed (in decimal years) between the first auction and the k^{th} auction. Let $Rmain_k$ denote the average rate on Main Account balances over the same interval as the k^{th} offering. Regressing the interest rate differential $Rtio_k - Rmain_k$ on Q_k, T_k, and A_k gives[a]

$$Rtio_k - Rmain_k = \underset{(0.0228)}{0.1037} - \underset{(0.0027)}{0.0109} \times Q_k + \underset{(0.0017)}{0.0049} \times T_k + \underset{(0.0122)}{0.0632} \times A_k \quad (1)$$

standard error of estimate = 0.039
R-squared = 0.4277
42 observations

The standard errors of the estimated coefficients are shown in parentheses. All of the coefficients are significantly different from zero at a 95 percent confidence level. The estimates suggest that an offering of $6 billion for fifteen days in January 2004 would have attracted an interest rate about 22 basis points above the Main Account rate. (The expected value of $Rtio_k - Rmain_k$ is 0.22 percent when $Q_k = 6.0$, $T_k = 15$, and $A_k = 1.75$.) Longer-term offerings generally attracted relatively higher rates (each additional day raised the spread by about 0.5 basis point) and larger offerings attracted relatively lower rates (each additional billion dollars reduced the spread by about 1.1 basis points).[b] In addition, the spread widened at a rate of about 6 basis points per year as the TIO program evolved from a pilot effort to a regular feature of the Treasury cash management system.

The positive coefficient on T_k in equation 1 shows that bidders paid relatively higher rates for longer-term balances. However, the willingness of bidders to pay for longer-dated TIO balances was not different from the willingness of borrowers to pay for longer-dated funds from other sources. Let Rp_k denote the rate on a repurchase agreement on Treasury collateral for the same term as the k^{th} TIO offering observed on the day of the k^{th} auction.[c] Regressing the interest rate differential $Rtio_k - Rp_k$ on Q_k, T_k, and A_k gives

$$Rtio_k - Rp_k = \underset{(0.0272)}{-0.0372} - \underset{(0.0032)}{0.0123} \times Q_k + \underset{(0.0021)}{0.0017} \times T_k + \underset{(0.0145)}{0.0567} \times A_k \quad (2)$$

standard error of estimate = 0.047
R-squared = 0.3465
42 observations

The insignificant coefficient on T_k implies that the variation of TIO auction rates as a function of term was about the same as the variation of RP rates as a function of term. The coefficients on Q_k and A_k are about the same as the coefficients on those two variables in equation 1. Spreads between TIO auction rates and RP rates tended to be algebraically smaller (less positive or more negative) the larger an offering and tended to become algebraically larger (more positive or less negative) as the TIO program evolved.

Equation 2 also suggests that the Treasury was not far from the mark when it proposed in 1999 (see Box 1) to change the Treasury Tax and Loan rate from the federal funds rate less 25 basis points to the RP rate. The estimated coefficients imply that an offering of $6 billion for fifteen days in January 2004 would have attracted an interest rate not materially different from the contemporaneous rate on fifteen-day repurchase agreements. (From equation 2, the expected value of $Rtio_k - Rp_k$ is 0.01 percent when $Q_k = 6.0$, $T_k = 15$, and $A_k = 1.75$.) On average over all forty-two auctions, the difference between TIO auction rates and rates on repurchase agreements with comparable terms was -1.7 basis points.

---

[a]There were two unusual auctions in the data set. The third auction in December 2002 offered $3 billion but attracted bids for only $1.1 billion. The auction in December 2003 was covered but attracted unusually weak bids. The regression results are not materially different when these two offerings are withheld from the data set.

[b]We examined whether the existence of outstanding TIO balances had a similarly depressing effect. Let AOB_k denote the quantity of TIO balances already outstanding at the time of the k^{th} auction. Adding AOB_k to equation 1 resulted in an estimated coefficient that was not significantly different from zero. The lower auction rates associated with larger offerings thus appear to be a matter of the offerings themselves and not of the total amount of TIO balances that would be outstanding following placement of the offered funds. This finding suggests that the Treasury might get better rates with frequent small offerings than with less frequent large offerings.

[c]We did not observe directly the RP rate over the same term as a given TIO offering, but we did have data on rates on repurchase agreements that began on the day of a TIO auction and matured one business day later; one, two, and three weeks later; and one, two, and three months later. We fit a cubic spline to the data we had and identified from the spline the rate on a repurchase agreement ending on the day the TIO offering was to mature. We then identified the forward RP rate over the same term as the TIO offering from the one-business-day RP rate and the term rate identified from the spline. The identified forward RP rate for the k^{th} TIO auction is our estimate of Rp_k.

Notes

The authors thank Chuck Andreatta, Ken Carfine, Ellen Correia, Lou Crandall, Kurt Eidemiller, Dennis Farley, Erica Groshen, Jean Lovati, Glen Owens, Debby Perelmuter, Julie Remache, Lori Santamorena, Jose Serrano, Sam Stokes, and Barbara Wiss for assistance in researching this article and for comments on earlier drafts.

1. Between 1974 and 1978, the Treasury *did* maintain a large fraction of its balances at Federal Reserve Banks and the Fed *was* forced to intervene frequently. See Brockschmidt (1975), McDonough (1976), Lovett (1978), and Lang (1979).

2. The origins and early evolution of the TT&L program are sketched in Federal Reserve Bank of Dallas (1973), Brockschmidt (1975), Lovett (1978), and Lang (1979). See also Chapman (1923). The TT&L program is described in the Code of Federal Regulations, Title 31, Part 203 ("Payment of Federal Taxes and the Treasury Tax and Loan Program") and Part 380 ("Collateral Acceptability and Valuation"), Federal Reserve Bank Operating Circular 8 ("Collateral") and Operating Circular 9 ("Federal Tax Payments and Treasury Tax and Loan Depositaries"), and the *Treasury Financial Manual*.

3. See U.S. Department of the Treasury, Collateral Release no. 26, September 2001, available at <http://www.publicdebt.treas.gov/gsr/gsr082001colrelease.htm>, and U.S. Department of the Treasury, Collateral Margins Table, effective September 30, 2002, available at <ftp://ftp.publicdebt.treas.gov/gsr202marginstable.pdf>.

4. See U.S. House Committee (1993, pp. 4, 88, 105-6, 163-5, and 170). EFTPS is described in *Financial Institution Handbook for EFTPS,* available at <http://www.fms.treas.gov/eftps/eftpshandbook.pdf>.

5. Alternatively, a taxpayer can direct a *same-day* transfer of funds through the Federal Reserve Electronic Tax Application (FR-ETA). See *Making EFTPS Same-Day Federal Tax Payments*, available at <http://www.frbservices.org/Treasury/pdf/Sameday.pdf>.

6. ACH payments are known from taxpayer-initiated EFTPS transfer authorizations submitted earlier. Lockbox facilities generally advise the Treasury each morning of the balances to be transferred that day.

7. Transfers of excess balances from retainer and investor institutions can be forecast more accurately since the introduction of EFTPS because knowledge of pending ACH payments to those institutions has led to improved forecasts of excess balances at the same institutions.

8. With a few exceptions, TIO deposits must be secured with the same types of assets that can be used to secure Main Account balances. See <http://www.publicdebt.treas.gov/gsr/gsrcltio.htm>.

9. For example, on May 14, 2004, the daily commentary by Wrightson ICAP (available at <http://www.wrightson.com/treasury/commentary/finance/2004/05/14/>) observed that "the Treasury once again kept its 3- and 6-month bill auction unchanged at $33 billion. We had originally expected the weekly offerings to have reached $36 billion by this point in the quarter. However, the Treasury's cash flow has been stronger than we expected, and the Treasury clearly expects that trend to continue. The Treasury's confidence in its near-term cash flow prospects can be seen in its decision yesterday to place an additional $6 billion in a TT&L Term Investment Operation starting on Monday. With $6 billion locked away in a TIO, our projections suggest that the Treasury won't have enough remaining cash on hand to keep its Fed account at the $5 billion target. Needless to say, the Treasury would not have committed the funds to the TIO unless the information available to it indicated that it would have an adequate cushion in its cash balance."

References

Brockschmidt, Peggy. 1975. "Treasury Cash Balances." Federal Reserve Bank of Kansas City *Monthly Review*, July-August: 12-20.

Chapman, John. 1923. *Fiscal Functions of the Federal Reserve Banks*. New York: Ronald Press Company.

Federal Reserve Bank of Dallas. 1973. "Government Balances Managed to Avoid Upsetting Money Markets." Federal Reserve Bank of Dallas *Business Review*, November: 7-9.

Lang, Richard. 1979. "TTL Note Accounts and the Money Supply Process." Federal Reserve Bank of St. Louis *Review* 61, no. 1 (October): 3-14.

Lovett, Joan. 1978. "Treasury Tax and Loan Accounts and Federal Reserve Open Market Operations." Federal Reserve Bank of New York *Quarterly Review* 3, no. 2 (summer): 41-6.

McDonough, William. 1976. "New Policy Prompts Increased Defensive Operations by Federal Reserve." Federal Reserve Bank of Dallas *Business Review*, March: 8-12.

U.S. House. Committee on Ways and Means. 1993. *North American Free Trade Agreement Implementation Act*. H. Rep. 103-361 (part I), to accompany H.R. 3450. 103rd Cong., 1st sess., November 15.

About the Authors

Kenneth D. Garbade is a vice president in the Capital Markets Function of the Research and Statistics Group; John C. Partlan is a markets officer and Paul J. Santoro a senior financial analyst on the Monetary Projections Staff of the Markets Group.

Current Issues in Economics and Finance is published by the Research and Statistics Group of the Federal Reserve Bank of New York. Dorothy Meadow Sobol is the editor.

Editorial Staff: Valerie LaPorte, Mike De Mott, Susan Szarkowitz
Production Staff: Carol Perlmutter, David Rosenberg, Jane Urry, Karen Carter