

**Government Cash Management:
Its Interaction with Other Financial Policies**

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TECHNICAL NOTES AND MANUALS

Government Cash Management: Its Interaction with Other Financial Policies

Mike Williams

This note¹ addresses the following main issues:

- What good practice in government cash management means; and how it interacts with other policies.
- Why close coordination or integration between debt and cash management is important.
- How in practice cash managers can develop more active policies; the potential benefits of that to financial market development; and its implications for monetary policy.
- What this means for institutional structures: for debt and cash managers, and for their interaction with the central bank.

This note offers guidance on policy, institutional and practical issues for governments looking to develop a more sophisticated cash management function, specifically to move towards more active cash management.² This involves financial market intervention by the government cash manager, with the aim of smoothing the projected short-term profile of the government's net cash balances. The note is particularly relevant to emerging market countries where there are already functioning, if not necessarily well-developed, domestic money and bond markets. It is less immediately relevant for low-income countries that are highly dependent on donor financing and concessional loans or credits, and who lack even a limited domestic financial market.³

After a brief overview of good cash management practices, the note focuses on the interaction between cash and debt management, which takes the discussion into the interaction of cash management with monetary policy and financial market development. After discussing

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¹This note has benefitted from comments from Ian Lienert, Israel Fainboim, Brian Olden, John Gardner, Tej Prakash, and Allison Holland (all IMF), Antonio Velandia (World Bank), and Ian Storkey (consultant).

²This note is intended as an accompaniment to Lienert (2009).

³Although cash programming and forecasting may be just as critical for these countries.

policy issues, institutional questions are considered: how should cash and debt managers coordinate; and how should their functions be coordinated with those of the central bank.⁴

In this paper, references to the ministry of finance (MoF) should be taken to include the treasury functions, notwithstanding that some countries have a separate treasury department or agency. A debt management unit (DMU) may also be part of the MoF or separately constituted (e.g., as a debt management office, DMO). The DMU or DMO may perform cash management functions, although these will often be shared with the MoF.

Cash Management and Other Financial Policies

Cash Management: An Overview

There is a general understanding of what constitutes good practice in government cash management, as summarized in Box 1.

Box 1: Key Characteristics of Good Practice in Government Cash Management

Centralization of government cash balances and establishment of a Treasury Single Account (TSA)

Modern systems: an adequate transaction processing and accounting framework (processing government transactions with few handling steps, reliance on electronic transactions); modern banking, payment, and settlement systems

Ability to make accurate projections of short-term cash inflows and outflows

Strong institutional interaction, covering in particular:

- Information sharing between the cash managers, revenue-collecting agencies and spending ministries (and any relevant ministry branch offices)
- Strong coordination of debt and cash management
- Formal agreements between the MoF and the central bank on information flows and respective responsibilities

Use of short-term instruments (treasury bills, repo and reverse repo, term deposits, etc.) to help manage balances and timing mismatches

The Treasury Single Account System

A TSA is a prerequisite for modern cash management. It involves the consolidation of all government cash balances into a single account, usually and preferably at the central bank. This

⁴Both the IMF and World Bank have stressed that poor cash management may be costly and damaging to other policies. “Results of the World Bank/IMF joint public debt management and market development technical assistance program] indicate that weak government cash management is a major impediment to public debt management and debt market development,” see introduction to Mu (2006).

consolidation allows the MoF to minimize the volume of idle balances in the banking system, with consequent cost savings. These derive from the interest saved from using cash surpluses in one area of government activity to cover cash shortages in another. If cash is not consolidated, the extra cash requirement has to be financed by borrowing.

There is no best way in which the TSA interacts with the government invoice processing or payment arrangements. All expenditure transactions of the government may be approved centrally in the MoF. Alternatively, line agencies may be responsible for government payments and they may have separate accounts in the banking system to facilitate that. The central bank (or possibly the MoF directly) may be responsible for processing receipts and payments through the local payments and interbank clearance systems, or the task may be contracted out to the banking sector. Some countries operate a hybrid system under which major receipts and payments flow directly across the TSA, but smaller transactions rely on the commercial banking system. In all these arrangements it is important that any balances left with the banking system are swept overnight back into the TSA. It is then for the government cash managers to decide to what extent any net balance should be lent back to the banking system.

The TSA usually includes multiple subaccounts, for example to maintain the distinct accounting identity or ledger of line ministries, agencies and tax departments.⁵ If necessary, a cash disbursement ceiling for each spending entity can be enforced against these ledgers. For cash management purposes, positive and negative balances in these accounts are netted into the main TSA operational account—the top account in a pyramid structure.⁶

This distinction between ledger accounts and actual bank accounts is important. The legal authority to spend of a government spending unit is not represented by actual cash. At any one time the aggregate permissions to spend may greatly exceed the cash held in the top account. This is not a problem so long as cash is available when payments actually need to be made.

The focus here is on domestic currency accounts. A MoF may also hold foreign currency accounts at the central bank to meet its external obligations. In general this is not efficient. It is preferable for the MoF to obtain foreign currency as required, usually from the central bank (which decides whether to purchase from the market or draw on its reserves). Alternatively it may be possible for the MoF to hold foreign currency subaccounts within the TSA, which are managed as accounts fungible with domestic currency accounts.

In some countries, government balances are held outside the central bank, in a government-owned commercial bank. This model potentially weakens the MoF's policy leverage

⁵Fainboim and Pattanayak (2010) list the types of bank account that may be seen as part of the TSA system. This paper explains the essential features and benefits of a TSA, elaborates alternative models and approaches for its design, and discusses the preconditions and sequencing for successful implementation of a TSA.

⁶In some countries, the MoF may hold a number of bank accounts at the central bank and be able to transfer cash between them. This has some of the characteristics of a TSA. However, if the transfer relies on a daily policy decision, it is likely to be much less efficient and reliable—and more subject to operational risk—than an automatic and complete netting.

over the management of its cash flows unless there is a clear agency agreement giving the MoF unambiguous control over all government balances backed by an information flow. This structure exposes the government to moral hazard, particularly in times of financial stress, and possibly also credit risk albeit that the government itself underwrites the banks. There may also be both a lack of financial transparency, with neither interest being paid on balances or fees being paid for services; and cross-subsidies, associated with time lags between the receipt by the bank or banks of tax payments and these receipts being passed to the top-of-the-tier government account. More generally this model adds a layer of complexity to coordination and makes information sharing more cumbersome, potentially adding to operational tensions with the central bank.

Cash Flow Forecasting

Forecasts of future cash flows are essential for more active cash management. The separation between the permission to spend and making actual cash payments means that flows through the TSA must be the focus of the forecast. Ideally, forecasts of daily cash flows across the TSA should be available for at least three months ahead. This must be coupled with an ability to monitor actual changes in the aggregate balance of the TSA top account, certainly the following morning if not closer to real time.

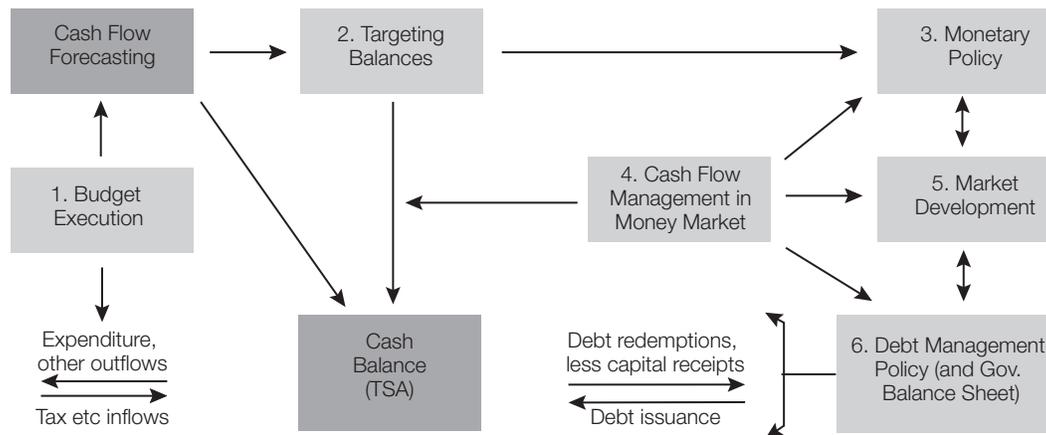
Good forecasting is a challenge in all countries. Forecasting systems use a variety of techniques (see Lienert, 2009), which tend to draw on both bottom-up information—the detailed information available to line ministries and tax departments—and top-down analysis—how total spending and revenue varies over time. It is important to emphasize the use made of the relevant spending or revenue departments' knowledge. They are usually closer to the transactions than the MoF and should be monitoring expected and actual cash flows, whether income or expenditure. This requires good information networks, both personal and systems-based. Who is best placed to pull the forecasts together is discussed further below.

Policy Interaction

The TSA is the focal point of cash management policy. How cash managers interact with other functions has important implications for a range of wider financial policies. These interactions are illustrated in Figure 1.

The TSA fluctuates with cash inflows and outflows generated by taxes and expenditures and debt and other capital transactions. The first policy choice is how budget execution and payment processes interact with expenditure flows (i.e., the arrangements for expenditure approval and how that relates to the timing of expenditures). The second relates to how far the level of cash balances is a policy target. Effective targeting requires cash flow forecasts, and efficient budget execution facilitates forecast preparation. Depending on how accurately the cash balance target is met, there will be benefits to monetary policy; and how the MoF chooses to manage the target through operations in the money markets also has implications

Figure 1. Cash Management and its Interaction with other Policy Areas



Source: Williams (2009).

for both monetary policy and financial market development. These in turn bring potential benefits to debt management.

The Importance of Cash and Debt Management Coordination

The importance of close coordination between these two functions is widely emphasised. It is helpful to consider the reasons.

Financing the government's gross borrowing requirement requires choices between instruments: internal or external, short- or long-term, fixed-rate or floating-rate, retail or wholesale, and so on. Good practice dictates that these choices are made in the context of a medium-term debt management strategy (MTDS), which sets out how the government intends the composition of the debt portfolio to develop over time, consistently with its trade-off between cost and risk.⁷ These strategic choices will have direct implications for the mix of shorter-term and longer-term instruments, that is, between treasury bills (T-Bills) and treasury bonds (T-Bonds).⁸ Decisions as to which instrument to issue, and when, should be made by the debt manager. These choices will depend on market appetite, market volatility, and interest rate prospects. In some circumstances the choice may be constrained by the overriding need to meet the fiscal deficit financing requirement, that is, the need to issue debt whatever the strategy requires. Selling T-Bills sometimes may be the only option, despite the high rollover requirement of short-term borrowing. On other occasions there may be pressures to act opportunistically to take advantage of favourable conditions and issue bonds to overfund

⁷See World Bank and IMF (2009).

⁸T-Bills are discounted instruments with maturity of one year or less: T-Bonds here includes all securities with an original maturity or more than one year.

immediate needs, notwithstanding the carrying cost associated with excess cash, and the risk that opportunistic behaviour adds to market uncertainty and future issuance costs.

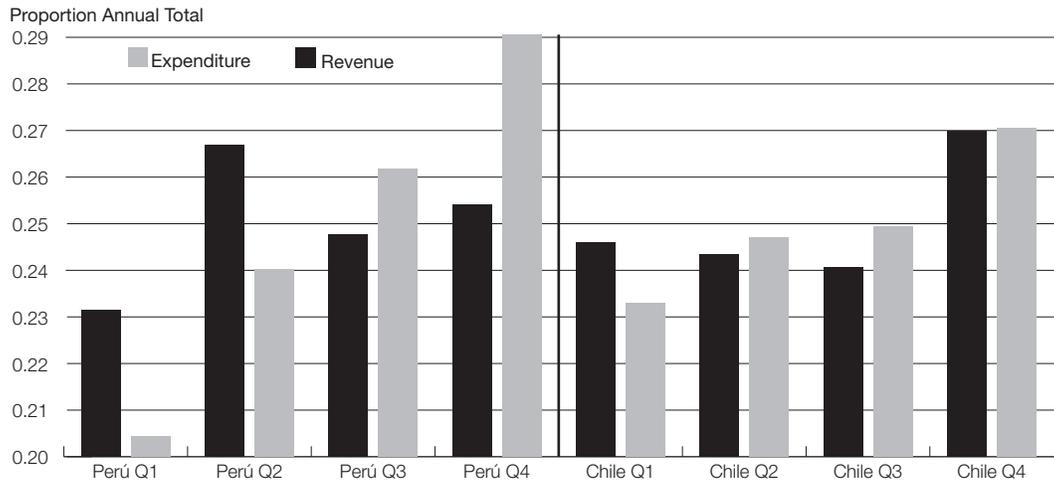
Thus debt managers have to juggle the full range of instruments in making decisions about issuance. They have to trade off from day to day, week to week, and month to month, the demands of the strategy and the demands of the market.

Issuance choices, of bills and bonds, are made taking into account demand, supply, and price information.

- In relation to demand, intermediaries and/or end-investors may need a steady flow of T-Bonds to meet their obligations or shorter-term instruments for liquidity management. Their needs will change across the year with their own cash flows and market developments.
- From the supply perspective, government financing choices are made in the context of the profile of financing flows. Most countries have marked quarterly, monthly, and intra-monthly seasonal patterns of cash flows. The driver of seasonality is typically tax receipts.⁹ Two examples are shown in Figure 2. The pattern may be exacerbated by the in-year timing of debt redemptions. If there is an underdeveloped money market, this pattern has to be reflected in the pattern of bond issuance, which also has to be geared to bond redemptions. For prudential reasons, some countries frontload debt issuance to build a cash buffer. This is not always possible and it can be costly when the interest earned on surplus cash is much less than the cost of additional borrowing.
- Price considerations are summarised by the yield curve, which is the representation of the yield on different government debt instruments by their outstanding maturity. The yield curve's shape is determined by a mixture of liquidity preference, interest rate expectations, and preferred investor maturity ranges. It is also affected by economic conditions: a downward slope is more common at the start of a recession when interest rates are expected to fall. Segmented markets also play a part, that is, where supply and demand is different in different segments, and each market segment is only loosely connected to the others. There can often be anomalies between the money market yield curve, up to one year, and the bond curve, above one year. If these price considerations are to feed into financing decisions, it is important that the relevant decision makers have an understanding and control of the policy interactions across the whole yield curve.

⁹Business taxes in particular have a marked pattern across the year. On the expenditure side, some transfers or investment spending may be uneven over the year. Some countries have an end-year surge in expenditure to avoid being penalized by rules preventing end-year carryover of unused budget appropriations. The within-the-month pattern is often associated with the payment of civil service salaries as well as the due days for tax payments.

Figure 2. Examples of Revenue and Expenditure Patterns



Source: Banco de Reserva del Perú and Banco Central de Chile.

The above charts show the average proportion of total annual revenue and expenditure (excluding interest) in each quarter. For Perú the data relate to 2000–08 and for Chile 1997–2005 (Sources: *Banco de Reserva del Perú* and *Banco Central de Chile*). The gap between revenue and expenditure in some quarters is readily apparent as is the tendency for expenditure to increase throughout the year and especially in the last quarter.

Other day-to-day coordination requirements include:

- Linkage of issuance dates with redemption dates, to maximize the opportunities for investors to roll over into a new issue.
- Maturity dates should also be chosen to avoid weeks, and especially days, of heavy cash outflow (e.g., salary payments); and indeed should target days of cash inflow (the due date for tax payments).
- Debt managers can mitigate the cash management problems that potentially arise when large bonds come to maturity (Box 2).

The potential strain between debt and cash management objectives over whether to issue bonds or bills when faced with an imminent cash shortage is lessened as the scope for active cash management develops. Debt managers prefer to issue bonds with a stable and predictable pattern. Regular issuance reduces market uncertainty and investors can better plan ahead. With a liquid money market, the timing of bond sales can be separated from the profile of the government's net cash flow. It is left to T-Bills and other money market instruments to deal with the short-term fluctuations. That in turn greatly improves the transparency and efficiency of debt management.

Box 2: Handling Large Bond Redemptions

The challenge is to manage the government's cash flow in such a way as to ensure that lumpy redemptions do not force it to ration cash. Redemptions are entirely predictable, and some anticipatory action is possible.

Large redemptions can be pushed forward in time. Although terminology varies across countries, the distinction is between:

- **Conversion:** the full outstanding volume of an existing bond is converted into a new bond. The need properly to inform retail holders may require keeping the offer open for some days. The offer-price ratio (between the new and old bond) is usually determined against the yield curve.
- **Switch auction:** some part of an existing bond is switched through an auction process into another existing bond or a new bond. The price of the source bond may be fixed and investors bid on the price of the target bond at auction. Switch auctions are usually aimed at the professional wholesale market; it may be an objective to leave a sufficiently large volume of the source bond to retain some liquidity.

Both techniques are also useful ways of building up liquidity and volume in benchmark bonds.

An alternative approach is to buy back the maturing bonds or some part of them before redemption. This is likely to be simpler procedurally but it may be less cost-effective. It relies on the MoF having additional resources available and it may require incentives to investors to encourage them to sell. There are two suitable techniques:

- **Reverse auctions:** the conventional auction process is run, but investors bid the implied yield or price at which they would be prepared to part with the bonds.
- **Bilateral purchases in the market:** under this mechanism, the debt managers would indicate to the market that they are prepared to buy in a bond within, say, six months of maturity. They would do so only at the current equivalent money market rate, less a small spread as a sweetener.

As this interaction with the market develops, the integration of debt and cash management functions becomes especially important. It ensures that the government presents a consistent face to the market. Where two parts of government are interacting with the market, there are risks of giving conflicting signals, adding to uncertainty and also potentially distorting the money market.¹⁰ Front office staff in the treasury or DMU, that is, those directly managing the transactions in the market, may also need to intervene in the money market for debt management reasons, or in the debt market for cash management reasons. Debt managers' intervention to smooth the impact of large maturities has been noted in Box 2. They may also have to

¹⁰In one country, the treasury's reliance on public corporations to supply or absorb excess cash overnight was damaging both to the corporations and to the development of the money market, since price signals were ignored and the market denied potential cash flow. Where two separate parts of the MoF are interacting with the market, it can also be administratively costly in terms of systems and scarce resources.

Box 3: The UK Debt Management Office's Standing Repo Facility¹

The UKDMO operates an automatic, non-discretionary “standing repo facility,” whereby any market maker may request that the DMO repos out any UK government bond (“gilt”). This will usually involve temporary creation of the relevant gilt.

The facility ensures that market makers can be sure of being able to access and deliver any gilt at any time, albeit at a price, hence maintaining their ability to make two-way prices in the secondary market. Participants may roll the facility on a day-to-day basis, but the DMO would not accommodate a continuous roll.

The DMO offers a penal overnight rate equivalent to 300 basis points below the Bank of England's prevailing Bank Rate at the time (subject to a floor of 0.10%). At the same time, the DMO will normally insist on a back-to-back reverse repo with gilt collateral at the Bank's official rate, in order to neutralize the effect of the standing repo on funding requirements and its own cash management. Details of the amount and terms of any standing repo trigger are published on the DMO's website as soon as possible.

If the DMO considers that there is sufficient evidence of severe market dislocation or disruption, it may offer gilt(s) for repo-ing to any market maker on different terms to those of the standing repo facility.

¹UK DMO “Official Operations In the Gilt-Edged Market” (2009) www.dmo.gov.uk.

intervene in the repo market to remove distortions in the bond market.¹¹ Box 3 summarizes how this arrangement works in the United Kingdom (there are similar, although in some cases discretionary, schemes elsewhere, e.g., in France and the USA).

As the sophistication of market interventions develops, a single government interface with the market becomes especially important. The front office managers need to build a relationship with individual intermediaries, whether they are selling bonds or bills, borrowing or investing in the repo or other money markets, or intervening for wider reasons. That requires a single point of contact across a range of debt and cash management operations.¹²

Instruments used in “Rough Tuning” and “Fine Tuning”

T-Bills are the usual instrument of choice in moving towards more active cash management. A distinction can be made between “rough tuning” and “fine tuning.” Rough tuning is the issue of T-Bills, or other short-term borrowing instruments, in a way deliberately designed to offset

¹¹A “repo” (short for sale and repurchase agreement) is the sale of securities tied to an agreement to buy them back later. A reverse-repo is the purchase of securities tied to an agreement to sell back later. A repo is best thought of as a collateralized loan; thus a government cash manager may decide to borrow by way of repo, raising cash against a temporary transfer of assets. Conversely a reverse-repo may best be thought of as a collateralized investment. For repo transactions, government debt managers almost invariably use or require T-Bills or T-Bonds as collateral assets.

¹²This point remains even if some of the actual operations are contracted out to, say, the central bank as an agent. However, as the sophistication of interventions develops, this “out-sourcing” to the central bank arguably becomes less satisfactory as a model.

the impact on the banking sector of net cash flows in and out of government accounts. Net T-Bill issuance will be higher or lower in any week depending on whether outflows are expected to be higher or lower than inflows in that week. A simple example of the use of T-Bills in rough tuning is presented in Annex A.

Fine tuning involves greater activity by the cash managers, who draw on a wider range of instruments or institutional options, to smooth more fully short-term changes in the TSA balance at the central bank. Fine tuning is more detailed and precise, with the focus on the day rather than the week or month as is the case with rough tuning. It is also more intensive in terms of time and system requirements. Although many countries rough tune their cash flows, relatively few accurately fine tune TSA balances.¹³ If done well, fine tuning of course allows for a much lower overall cash balance as intra-week or intra-month fluctuations are absorbed by active use of financial instruments.

T-Bills are a well-understood instrument in domestic financial markets. T-Bills have various roles: as an instrument of debt management, of cash management, and of monetary policy. Cash management is focused on a much shorter time period than debt management. Modest year-on-year changes in the T-Bill stock can be consistent with sharp movements in the stock within the year, providing the T-Bill market is fairly liquid and there is good underlying demand from financial institutions.

There can be a potential strain between cash management and monetary policy. Insofar as the government endeavours to mop up (or return) the liquidity that its activities add to (and drain from) the market, there will be a tendency for cash management and monetary policy to go hand in hand. But this may not always be the case, particularly when the central bank uses its own bills to manage liquidity, discussed further below.¹⁴

Short-term T-Bills are more useful for cash management than longer-term bills. Many countries focus on one-month bills for cash management. The volume of issue can be more readily varied to offset peaks and flows in the cash profile. Bills with a maturity of three months or more are less flexible and the stock outstanding is more often held steady in line with investors' demand and portfolio requirements. The United States issues two-week bills, labelling them as "cash management bills." Brazil also distinguishes cash management bills from conventional T-Bills. There are examples of T-Bills issued with non-standard maturities geared to the days when a cash inflow is expected. Italy and New Zealand are among the countries that do this.

Repo is the instrument of choice for fine tuning or for borrowing and lending outside the normal T-Bill issuance schedule. Repo has the great advantage that the lending is collateralized, reducing any credit risk concerns. Repo is also very flexible, in both the speed of execu-

¹³Fine tuning is practised in some eurozone countries, as well as the UK and Sweden.

¹⁴During the financial crisis of 2008–09, some governments also had to issue additional T-Bills to make sure there was enough high quality collateral in the market, with the central bank in effect purchasing or borrowing other collateral in return for T-Bills.

tion and the range of maturities available. Many settlement systems are able to settle transactions on the same day, also handling the collateral automatically.¹⁵

Although repo is the preferred instrument for fine tuning, other instruments are used, particularly for lending or investing short-term surpluses. It is usually straightforward to lend cash on the interbank market but it is not recommended, except possibly in small sums overnight, because of the credit risk exposure to the borrowing bank.¹⁶

If the repo market is not well developed (in some countries it may be waiting on an adequate legal framework), it is often possible to make conventional deposits with a bank but insist on collateral in return for the life of the deposit.¹⁷ Indeed, this is often the instrument of choice for countries with no developed repo market.

Alternatively it may be possible to invest the cash with the central bank in a deposit account that is separate from the TSA operational account and remunerated with a relevant market rate. The central bank's attitude to such a request will usually depend on current liquidity conditions. Some central banks are reluctant to see governments withdraw their balances for on-lending to the commercial banks, at a time when they are trying to sterilize the domestic market impact of foreign currency inflows. Another option, practised by some eurozone debt offices, is the lending of surplus cash to each other.

The Cash Manager's Contribution to Financial Market Development

There is a natural demand for T-Bills as a risk-free asset for banks and other financial institutions. T-Bills can readily be used as collateral and they are usually easy to trade and settle. The development of the secondary market benefits from a range of potential holders and a continuing supply from government. Their use for monetary policy operations enhances these attributes.

More active cash management is linked to the development of domestic financial markets. The use of the repo or similar secured market instruments by government cash managers or by the central bank contributes to activity in the money market and stimulates the government bond market, since domestic government bonds are normally the preferred collateral. This in turn makes treasury securities more attractive to banks as a liquidity management

¹⁵Countries who are actively fine tuning their cash balances will do very substantially more repo and similar transactions than T-Bill issuances. Thus the *Agence France Trésor* (AFT) in France and the DMO in the UK will regularly do 40 or more transactions a day.

¹⁶There are exceptions, for example, in late 2008 when the repo market in some developed countries almost dried up as banks held on to collateral to protect their balance sheets. In those circumstances cash managers had to turn to the interbank market or lend surpluses to the central bank. For the case of France, see *Government Cash Management During Financial Market Turmoil*, Lienert and Chailloux, 2009, <http://blog-pfm.imf.org/pfm-blog/2009/12/government-cash-management-during-financial-market-turmoil.html>

¹⁷In the USA, government tax receipts are held against collateral in "Treasury Tax and Loan" accounts in selected banks before they are transferred to central government. China and some other countries have organised tenders whereby banks compete for the deposits.

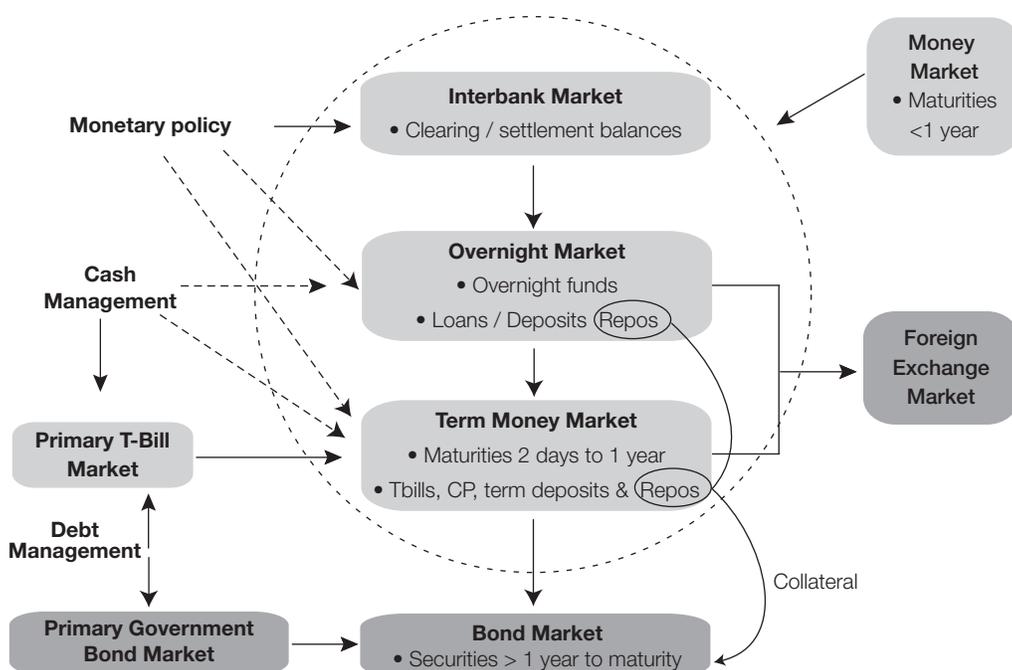
instrument and spurs the development of market infrastructure required for an interbank repo market since it greatly reduces the risk to any bank of lending to another (see Árvai & Heenan 2008).

These linkages are illustrated in Figure 3. Government cash managers interact directly with the T-Bill primary market. As they move to more active management, they will probably be using repo—initially overnight repo but subsequently term repo, that is, maturities usually of 1 to 14 days although some repo markets provide longer maturities. Government bonds are the dominant form of repo collateral and this demand will help liquidity in the bond market. This benefits the debt manager who, as well as issuing bonds, may also need to intervene in the repo market to ensure market makers provide a two-way market. How the central bank manages liquidity will also directly impact interbank and money markets and thus also the bond market.

There are two preconditions before cash managers can become active participants in the money market:

- First, there are the general requirements underpinning market development: a clear trend towards a stable macroeconomic and regulatory environment, and liberalized interest rates.
- Second, a commitment to market financing of government borrowing. Cash managers are intrinsically price takers: it is the central bank's monetary policy operations that influ-

Figure 3. Money Market: Interaction with other Financial Markets



ence the general level of interest rates. The MoF may be a monopoly issuer of T-Bills, but attempts to manipulate the discount rate will have a distortionary impact on other parts of the financial market.

The importance of being a price taker of course makes it difficult to manage cash actively if the government is overwhelmingly the dominant participant in the money market. The banks might be willing to buy a varying volume of T-Bills, particularly if the government's surplus or deficit is the mirror image of theirs, but the lack of price signals will do little to encourage related markets and can potentially expose the government issuer to collusive bidding.¹⁸ Active cash management works better, as does debt management, when there is a secondary market with a range of instruments, investors and intermediaries. Any market reform program needs to be sequenced evenly across all the structures underpinning the market: demand, supply, and infrastructure (tax, regulation, contract law, etc., as well as payment and settlement systems).

A developed money market is therefore important both as an objective in itself and through its links to other financial markets.¹⁹ It supports:

- Effective monetary policy and financial stability.
- Active balance sheet and risk management by banks and financial institutions.
- Government debt and cash management, not least by reducing the risks and consequences of debt auction failure, by reducing liquidity risk premia and by providing opportunities to invest excess cash balances.

The clear need for a coordinated approach to money market development drives home the importance of debt and cash managers working closely together. It also highlights the importance of the interaction between cash management policies and monetary policy.

Interaction with Monetary Policy

Treasury Bills and Central Bank Bills

The needs of cash management and monetary policy normally coincide. Changes in the government's cash balance at the central bank (i.e., changes in the main operational TSA account) are usually the main autonomous influence on domestic banking system liquidity (i.e., credit institutions' holdings of deposits at the central bank).²⁰ If the government is able to moderate the fluctuations in balances at the central bank then the central bank's domestic liquidity

¹⁸This has been a problem in some transition and emerging economies where money markets remain underdeveloped; there are few market participants and market participants are largely domestic banks.

¹⁹See for example Árvai & Heenan (2008) and Gray & Talbot (2007).

²⁰The other two important influences are changes in the public's demand for banknotes and changes in net foreign currency flows. The former is usually fairly predictable and central banks can anticipate the additional demand needed at the time, for example, of major public holidays. The latter may at times be substantial, depending on exchange rate policy and the central bank's willingness to intervene in the currency market, for example, to maintain a preferred rate.

management task is reduced accordingly. In this sense active cash management facilitates monetary policy. In many European countries, both in and out of the eurozone, it is government's policy to maintain TSA balances at the central bank at a constant and low level. In these cases, central banks can carry out monetary policy operations on the assumption that the government's position is flat. The approach tends to be associated with central bank independence, and of course buttresses it.

There can, however, be strains between cash management and monetary policy. These arise particularly when the central bank does not have sufficient means (i.e., collateral) to mop up excess domestic liquidity through repo operations, whether that liquidity is generated by the MoF running a deficit or by foreign currency inflows. The need to absorb liquidity in the banking system typically leads the central bank to issue its own bills (CB-Bills).

The use of different but similar instruments for monetary policy and cash management potentially risks market fragmentation and the loss of the benefits from a larger and more liquid T-Bill market. Essentially the same demand is spread over two types of instrument so the volume of each issue is likely to be smaller than it might otherwise be, which will tend to reduce liquidity.²¹ It may be possible to mitigate this problem by the central bank and the MoF agreeing to issue paper of different maturity, for example, the central bank issues CB-Bills of two weeks or less and the MoF T-Bills of three months or more. This may reduce the problem but not remove it: the longer term bills may still compete in the secondary market as they move closer to maturity. Moreover, there may be market constraints on issuing bills at different parts of the short-term yield curve. The risk is that competition between CB-Bills and T-Bills may end up costing both institutions more, as liquidity in both is limited.

One approach in these circumstances is for the MoF to overfund the borrowing requirement, by issuing extra T-Bills or T-Bonds, depositing the surplus cash in a sterilized account²² at the central bank, and allowing the central bank to conduct monetary policy through repo or outright transactions of government securities in the secondary market. In Mexico during the 1990s, the central bank bought the T-Bills issued by the government, selling them into the market as it needed to drain liquidity. Singapore during 2001–03 provides another example.²³ At the other extreme, there are countries where the money market is dominated by CB-Bills, where the government may not even have issued its own T-Bills, or only to a limited extent (Indonesia and China are examples of this, respectively).

²¹The costs of this problem may depend on how actively bills are traded in the secondary market, particularly at the shortest maturities. Separate issuance may also cause distortions in relative prices.

²²Sterilization here means that the cash is held at the central bank and not invested elsewhere in the economy where it might affect interest rates or activity. In principle the account should be remunerated at a rate equal to the cost issuing the extra T-Bills; since the central bank would have otherwise had to issue its bills to drain liquidity; that would leave both parties in the same position.

²³See McCauley (2006), who also estimates the market fragmentation costs associated with the issue of “market stabilization bonds” by the Bank of Korea.

Under a more tailored approach the MoF can sell additional T-Bills at the request of the central bank, as an add-on to the normal auction, but sterilize the proceeds by holding them in a separate account at the central bank, remunerated at the discount rate set in the bill auction. This arrangement, and the amounts involved in each auction, must be made transparent to the market. The T-Bills issued at the request of the bank must be identical in all respects with the rest of the stock of T-Bills, thereby preserving monetary policy options and avoiding the risk of market fragmentation. In the UK, the DMO and the Bank of England have agreed to such an arrangement (although it has never been drawn on). The approach has more recently been used in countries as different as India (see Box 4) and Macedonia. In Mozambique, the process is reversed; the central bank issues T-Bills, or rather CB-Bills, from its own balance sheet, but some of the stock can be hypothecated to the MoF. In New Zealand, the Reserve Bank may issue T-Bills at its own discretion (within a framework agreed with the treasury), with the proceeds passed directly to the government's account.

These more targeted arrangements, however, have not always worked well. They require trust between the MoF and central bank. In particular they rely on a willingness of the MoF

Box 4: India's Market Stabilisation Scheme (MSS)¹

The MSS was introduced following the signing of a Memorandum of Understanding (MoU) between the Government of India (GoI) and the Reserve Bank of India (RBI) in March 2004.

The intention was to differentiate the RBI's structural liquidity absorption from its day-to-day liquidity management operations. Under the MSS, the RBI issues T-Bills (and potentially other government securities) by auction, with exactly the same features as T-Bills issued by the GoI for financing purposes.

The RBI notifies the amount, term, and timing of issuance; and the mutually agreed ceiling on the outstanding obligations of the GoI in respect of securities issued under the MSS. The T-Bills issued are matched by an equivalent cash balance held by the GoI in a separate account at the RBI. These balances are used only for the redemption and/or buy-back of the T-Bills issued by the RBI. The impact on the revenue/fiscal balance of the GoI extends only to the payment of discount on the bills.

There was substantial issuance under the MSS over period 2004–09, not least to sterilize the liquidity generated by foreign currency inflows. Over these five years, issues under the MSS on average comprised about one-third of gross T-Bill issuance, with substantial issues of 91- and 364-day bills, and somewhat smaller volumes of 182-day bills.

The MoU was amended in February 2009 to enable the transfer of part of the outstanding balance in the GoI's separate account at the RBI to its normal cash account. An equivalent amount of bills issued under the MSS are then regarded as part of the normal market borrowing of the GoI.

¹Details from Annual Policy Statements of the RBI, www.rbi.org.in.

always to accept a request from the central bank to issue additional T-Bills for monetary policy reasons. There may also be difficulties where the central bank's borrowing requirements are much greater than the MoF's. In such cases the central bank may want more control over the choice of maturities or conduct of the auctions, rather than accepting a simple add-on to the MoF's issuance plans.²⁴

Operational Coordination

Operational coordination is important. There needs to be agreement with the MoF and central bank covering:

- The flow of information *from* the MoF on the government's expected cash flows and balance at the central bank. This information is an important input into the central bank's liquidity forecasts.
- The flow of information *to* the MoF on the government's actual balance at central bank (ideally in close to real time, certainly the next day).
- The mode and timing of respective market interventions; the timing during the week or day of auctions or other operations in the money market.

As cash managers' capabilities develop and they become more active, some central banks have concerns that their operations might cut across the bank's monetary policy operations in other respects. In particular, the central bank will not want to see the market trying to second guess the authorities' intentions from cash management decisions or confused by apparently different market signals. The concern may be purely operational, for example, that the cash managers have the necessary competence to avoid bidding up the price of collateral at exactly the same time as the central bank is lending to the market. In some cases the bank would prefer to take full responsibility in its monetary policy operations for offsetting the impact of fluctuations in the government's cash flows. Such issues are resolvable by policy transparency, a clear statement of responsibilities, agreements about the daily or weekly operational timetable, and so on.²⁵

²⁴In Macedonia, where there were additional auctions of "Treasury bills for monetary purposes", the policy was put on hold in 2008 because the central bank's needs so greatly exceeded those of the government.

²⁵As an example of the problems that can arise, even in a relatively sophisticated environment: in one Latin American country in the early part of the last decade, the treasury, which was separate from the DMU at the time, managed its large cash surplus with reverse repos that were a very large volume of the money market and a greater source of liquidity to the banking system than was the central bank in its monetary policy operations. The problem was not so much the size of these balances, but the way that they were invested, that made monetary policy more difficult and damaged the development of the money market. A very small number of counterparties was used, and the lending was very short-term despite its structural nature. The banks often simply on-lent the cash to the central bank, rather than distributing it around the banking system. This issue has since been addressed.

Payment of Interest on the TSA

Agreement is also needed on the rates of interest paid on the TSA balance and any other government's deposits at the central bank. Although international experience varies, it is best practice to pay a market-related interest rate:

- It improves accounting transparency and avoids the implicit cross-subsidy associated with administered rates.
- It removes the incentive for the MoF to take economically inappropriate decisions in relation to its balances, such as placing funds in commercial banks with low credit ratings.

Similarly, in the interests of transparency and proper financial incentives the MoF should pay transaction-related fees. The main benefit of such reciprocal arrangements between the MoF and the central bank is the avoidance of potential distortion to incentives.

It is not always easy to move fully in this direction. There may be legislative constraints. To pay administrative fees to the central bank, room needs to be found within the budget, even if net debt interest payments are reduced by more. The payment of interest on government deposits will affect the central bank's profits. For a profitable central bank that is arguably an advantage: it reduces the risk that some part of the extra "profits" generated by the central bank would be lost through leakage to higher administrative or other expenses, that is, it keeps the central bank lean and efficient. However, if the central bank is loss-making or government cash balances are large, whether as a result of poor forecasting or a lack of alternative investments, payment of interest may financially undermine the central bank. These pressures may come perhaps when the central bank is already trying to sterilize foreign currency inflows and the counterpart on its balance sheet is low yielding foreign currency reserves. Losses may be exacerbated by revaluation effects. In the long run a loss-making central bank will need to be recapitalized by the government; in the short term it may be expedient for the MoF to forego interest on part of the balances (maybe that part below a threshold, so that the correct incentives still apply to balances above the threshold).

Institutional Implications

The Changing Role of the Cash Management Unit

Cash management has historically been seen as a function of the MoF, usually its treasury department, whether or not it is organized as an integral part of the MoF or a separate agency or bureau. The "cash management unit" (CMU) usually also manages the transmittal of government receipts into the TSA and payments from it. It should be aware of the impact of budget execution procedures on government payments.

The CMU's overriding priorities are narrow: ensuring that the government is able to meet its obligations at all times and that cash outlays are kept in line with cash availability. In lower

income countries cash management in practice is entwined with budget execution: spending allocations tend to be released only when cash availability is assured or spending commitments are queued. This is cash rationing, not cash management. Indeed the “real” budget may in practice bear little relation to the published budget and rationing is used as an arbitrary and disruptive way of closing the gap between the reality of available financial resources and political expectations. Even without this problem of budget realism, it may be difficult to create the fiscal space needed to build a cash buffer sufficient to cope with fluctuations in revenue.

Modern cash management on the other hand is defined more broadly.²⁶ It requires planning ahead. The combination of cash flow forecasting and modern payments systems allows separation between the permission to spend and the provision of cash. Pre-funding of spending departments’ bank accounts becomes unnecessary. What matters is the availability of cash in the main account (i.e., the TSA) at a time the payments are cleared; and it is flows through the TSA that are the focus of the forecast.

Integrated Debt and Cash Management Offices

Effective cash management not only removes the need for cash rationing, it opens up the scope for wider policy and financial benefits. This in turn has facilitated—and been facilitated by—the integration of debt and cash management functions which is increasingly the norm (Box 5). In eurozone countries, it is forbidden in law for governments to borrow from their central bank and their TSA balances must not fall below zero. Such arrangements force government cash managers and debt managers to work closely together.

The integrated cash and debt functions can be within the MoF rather than in a semi-independent agency. Thus Brazil’s national treasury has debt and cash management responsibilities and Colombia has integrated its treasury and public credit departments (although in many other Latin American countries, as in Indonesia, the two functions are still separate, within the MoF). The developing cash management function in China is closely linked with the debt management department. Bulgaria has developed a treasury function with responsibility for both debt and cash management.

Integration is not a necessary condition. The key requirement is effective coordination of debt and cash management. With timely contacts at operational level, two units of the same organisation can work effectively, as the case of the United States illustrates.²⁷ There are ex-

²⁶Storkey (2003) defines cash management as “having the right amount of money in the right place and time to meet the government’s obligations in the most cost-effective way.” Williams (2004) widened the definition somewhat: “the strategy and associated processes for managing cost-effectively the government’s short-term cash flows and cash balances, both within government, and between government and other sectors.”

²⁷In the US Department of Treasury, the overarching unit involved in cash management is the Office of Fiscal Service, comprising the Office of the Fiscal Assistant Secretary and two Treasury Bureaus: the Financial Management Service (FMS) and the Bureau of the Public Debt. There is also daily interaction between FMS and the Federal Reserve.

Box 5: Debt and Cash Management in Selected OECD Countries

Most OECD countries have integrated debt and cash management functions. This is perhaps most striking in the eurozone countries, several of which have set up separate debt (and cash) management offices with some degree of operational independence from their MoF.

The operation of monetary policy by the European Central Bank (ECB) requires the EU member countries to manage their balances at the national central bank to a target figure—so that the potential impact of government flows on monetary conditions is offset within the banking sector and does not have to be taken into account in the ECB's monetary policy operations.

The size of the target balances varies and the arrangements for meeting it vary in their effectiveness. There has been a general attempt to reduce both size and volatility. It is volatility that is of more concern to the ECB because variations in the individual government balances have an impact on the eurosystem's aggregate balance sheet. At the aggregate level, overnight balances on government deposits with the eurosystem are the most volatile of the “autonomous factors.”

Some EU countries, such as the UK, Sweden, and Hungary, all of whom have integrated debt and cash offices, follow the same policy as the eurozone. Other OECD countries that have integrated functions include New Zealand, Australia, and Turkey. A few countries, such as the USA and Canada, rely on coordination rather than integration. In Canada, the central bank still takes full responsibility for handling government cash flow fluctuations in its monetary policy operations, but that approach is an outlier.

amples where there may be a CMU and a DMU in different parts of the MoF and which can only communicate by going up one hierarchy, across and down the other; in the extreme they need to coordinate through the Minister. Such formality is rarely effective, given the importance of timely response. A cash management committee or similar may help to bring such units together. However, close daily interaction at policy and operational levels is crucial, and organizational integration is one way to ensure that.

As the sophistication of cash and debt management operations develops, the case for integration strengthens. Not only is there a greater need for policy coordination, but cash and debt management requires financial market skills that are rare in the public sector. Separation of functions risks diluting these scarce and potentially expensive resources.

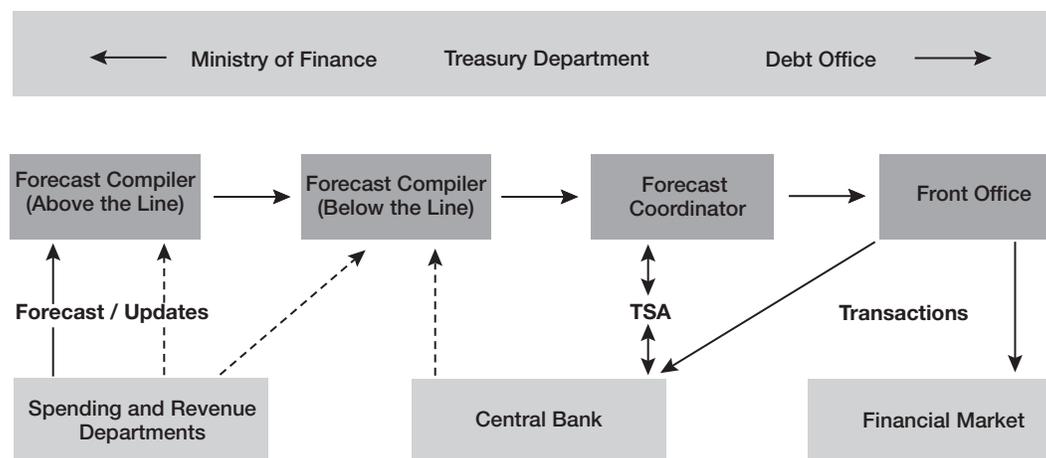
Integration in Practice: Cash Flow Forecasts, People, and Systems

An integrated debt and cash management unit is no different in structure from a conventional DMU, with its separately identified front, middle and back office functions. The front office workload is potentially greater, particularly as the number of daily market transactions increases with the development of more active cash management. This in turn requires effective systems to process transactions and to access market data.

A sophisticated DMU will have good systems already, but as in the case for debt managers' activities in the secondary market there should be appropriate governance and risk management arrangements around an active cash management function. The potentially wider range of counterparties makes credit risk analysis important, even when repo dominates. The objective of cash management is not profit maximization—its focus is on cost-effective cash flow management in a way that supports other policies—and the approach will be more cautious than that of a private sector treasury management function.²⁸

The main continuing requirement is to refine short-term cash flow forecasting capability. Although there is no single model, Figure 4 illustrates the spectrum of arrangements. There is often a difference between the compilation of “above the line” (i.e., revenue and expenditure²⁹) forecasts, which may fall to those monitoring budget execution, and projections of “below the line” transactions (debt and other financing operations) where the cash and debt managers may be better placed.

Figure 4. Organizational Responsibilities for Forecasting



Source: Williams (2009).

Figure 4 distinguishes between four forecasting processes. The above the line forecast may be compiled by those who are responsible for budget execution. They draw on information from the revenue and spending departments (when they have payment processing responsibilities). This is then passed to another compiler who adds below the line transactions. That

²⁸Performance management has several dimensions; ensuring that the government always has cash to meet its obligations is overriding; but other indicators must track how the front office interacts with the market, for example, that it does not distort normal market functioning, and whether its approach to market and credit risk are within agreed parameters.

²⁹In this context, “above the line” includes all revenue and expenditures contributing to the fiscal balance; “below the line” then includes financing transactions. In practice some revenue or spending information may be generated, for example, from the banking system rather than government agencies directly (and the DMU may itself project debt interest); information on privatisation proceeds or other capital receipts may also be handled variously.

function may often lie in the treasury department within the MoF or possibly in the DMU or debt office. The data are often generated directly from debt or money market transactions, although capital receipts and information from the central bank on foreign currency transactions may also be important.

These arrangements should be supported by in-house analysis of past patterns of receipts and expenditure, whether in the treasury department or the DMU. Indeed in some countries, forecasting relies very heavily on such analysis, with limited information from elsewhere in government, except perhaps in respect of large or unusual transactions.

The forecast coordinator should work closely with the front office, that is, that part of the debt office dealing directly with the market. The coordinator should always have available an up-to-date cash flow position, monitoring actual transactions across the TSA, as well as updated forecasts.

In terms of staff, cash management needs one or two people close to the front office who have responsibility for monitoring and coordinating the latest information, in relation both to government flows and to flows across the TSA and the central bank. They should also be tasked to analyze past outturns against previous forecasts, building experience over time with a view to reducing forecast errors systematically.

Most countries develop databases for cash flow forecasts that are separate from the main Integrated Financial Management Information System (IFMIS) of the government. This reflects the different purposes. Cash flow data are needed to support immediate operational decisions. They do not have to be of “accounting” quality or precision, but the databases have to be flexible and under the control of the cash managers. The development of active cash management will also mean much more work on scenarios and what-if calculations. Active cash managers may have a transaction processing system that includes a cash flow management module. However, this is not an immediate essential requirement for many countries.

The main systems requirements are:

- Taking data feeds (directly, preferably electronically) from a large number of sources, covering a large number of time periods. This may include the revenue collection agencies.³⁰ In LICs, as well as some transition economies and EU-candidate countries, donor inflows—especially the size and timing of budget support—are crucial.
- Providing for user validation of new data before storing it.

³⁰The number of feeds is potentially large. Each spending ministry and agency, certainly the larger ones, should provide regular forecast information, although in a number of cases they may do that to the MoF (possibly via the IFMIS), rather than directly to the cash managers. These data will often be enhanced by requirements to report separately updated information on, for example, large payments in the pipeline. There are usually fewer tax departments; but information on significant non-tax payments will also need to be supplied by a range of agencies.

- Aggregating the data into user-generated reports, including graphical presentations which can be updated in real time; and also exporting them as required.
- Maintaining a historical record of the different profiles submitted.
- Allowing users to generate scenarios and what-ifs against the aggregate data, storing the scenarios.

The development of active cash management will be demanding on resources. At some point, a transactions processing system will be needed to handle an increased volume of transactions. Additional staff numbers will be modest, but the skill requirements will be more significant. Fine tuning, aimed at smoothing fully short-term changes in the government's balances at the central bank, is more challenging. It self-evidently requires:

- A flexible and developed money market.
- Staff who are capable of trading in the financial markets, within a strong management framework.
- The necessary transactions processing and other IT systems.
- Much more highly developed credit risk and operational risk management systems than those needed for debt management. This is because of the extra number of transactions and also because of the greater exposure to counterparties and (depending on the collateral taken) to issuers. Linked with this is the need for legal and contractual documentation.
- An efficient local settlement system and related infrastructure.

Interaction with the Central Bank

In view of the potential for tension between the MoF and the central bank, it is important that there are arrangements in place for addressing the legitimate concerns of the two institutions. Cash and debt management is one area where both the MoF and the central bank have operational objectives. There is substantial scope for mutual benefit, for example, in policies for the development of the money market and in the exchange of cash flow forecasts. Close coordination is also necessary to avoid adverse investor perception or accentuating market uncertainty. Three levels of the relationship can be identified.

First, the overall relationship between the institutions in the area of debt and cash management and their interaction with monetary policy operations needs to be clarified at a high level. Mechanisms internationally vary from primary legislation to an exchange of letters. Written documents need to be backed up by dialogue to deal with policy clashes or other misunderstandings that threaten to damage the effectiveness of either institution. As necessary, relevant issues can be added to the agenda of the regular meetings between the governor and minister of finance. Such meetings are not only for fire-fighting. There may be areas of coordination to

be explored. One example is the sharing of IT investment in new databases where a high-level stimulus will help to ensure that coordination is taken forward at an operational level.

Secondly, there is need to identify areas of operational policy where both institutions have an interest. The central bank will for example be able usefully to give the MoF its perspective on the views of the market and investors about the T-Bond and T-Bill issuance program for the period ahead. The central bank should also be consulted by the MoF about potential new cash management operations that could have liquidity implications. Each institution would expect to be consulted by the other about policies and operations for bill issuance given the need for an agreed strategy for the development of the bill market and the respective roles of CB-Bills and T-Bills. Both institutions would want to avoid either competing against each other or giving confusing or inconsistent signals to the market. In some countries (e.g., Brazil) the central bank and the MoF agree a common list of primary dealers or auction counterparties.³¹

The arrangements for consultation and advice in these areas would normally be covered by a protocol or memorandum of understanding (MoU). This would set out the relevant issues and the route for consultation. Three specific operational issues that need to be covered by the MoU, even if the details are set down elsewhere, are:

- The payment of interest on government balances at the central bank. This has to be agreed at the policy level, but the basis of interest—maturity, relevant market analogues, etc.—should also be identified.
- The arrangements for exchange of material about cash flow forecasts. That could usefully be the subject of a weekly meeting at operational level.
- Determinants of for example the timing within the day or week of respective auctions or tenders and the associated market announcements.

In countries where the MoF is able to borrow from the central bank, understandings of the limits of such borrowing should also be included in clear protocols. Best practice is that direct access to such financing from the central bank is, by law, limited to emergency situations in which other funding operations are not viable and, when used, the maturity is limited to two weeks without continuing rollover of borrowings (see World Bank, 2009).

Thirdly, the central bank supplies a number of services to the MoF or the DMU. The most important of these will be as banker of the government. The bank may also supply some debt and cash management services, such as being the fiscal agent (managing auctions), the settlement agent, registrar or paying agent. A fully fledged contract between the two organisations may not be necessary. However, some form of “service level agreement” (SLA) is useful for clarifying expectations on both sides. Box 6 gives an indication of the issues that might be covered by a SLA.

³¹The central bank cannot of course be expected to disclose any details of specific monetary policy operations.

Box 6: Elements of a Service Level Agreement between the Central Bank and the MoF (or DMU)

Issues covered by an SLA might include:

The notice that both sides would give of any impending change in the auction pattern or timetable.

The turnaround times by the central bank in handling any relevant transactions—whether as fiscal agent, settlement agent, or paying agent.

Details of information flows in either direction. Under active cash management it is important for the MoF to have a view of flows across the TSA in near to real time. There also needs to be agreement on the details and timing of regular exchange of cash flow forecasts.

The basis of calculation of fees paid for the services and the circumstances in which they might be changed.

Provisions for compensation when the SLA is breached.

Understandings about how operational risk is managed and to what standard. This will include the handling of any business continuity issues (caused, e.g., by computer failure).

Arrangements for performance review.

The French debt office (AFT) and central bank (*Banque de France*, BdF) agreed in 2002 on a quite innovative SLA, the broad details of which have been made public.³² It is governed by three principles: information provision, security, and financial neutrality. It even provides compensation for investment opportunities that are missed because the BdF is unable to honour its contractual commitments.

Conclusion

Good government cash management matters. It matters not only from the fiscal and budgetary perspective of cost effectiveness and efficiency, but also because of the benefit it can bring to other financial policies—in particular to debt management, to monetary policy and to the development of the local financial markets.

These wider benefits, however, require well-founded and effective cash flow forecasting arrangements; and strong coordination, both between cash management and debt management, and between the cash managers and the central bank. Coordination is required at policy and operational levels; this has been greatly facilitated in many countries by the integration of debt and cash management functions.

³²See: http://www.aft.gouv.fr/article_787.html

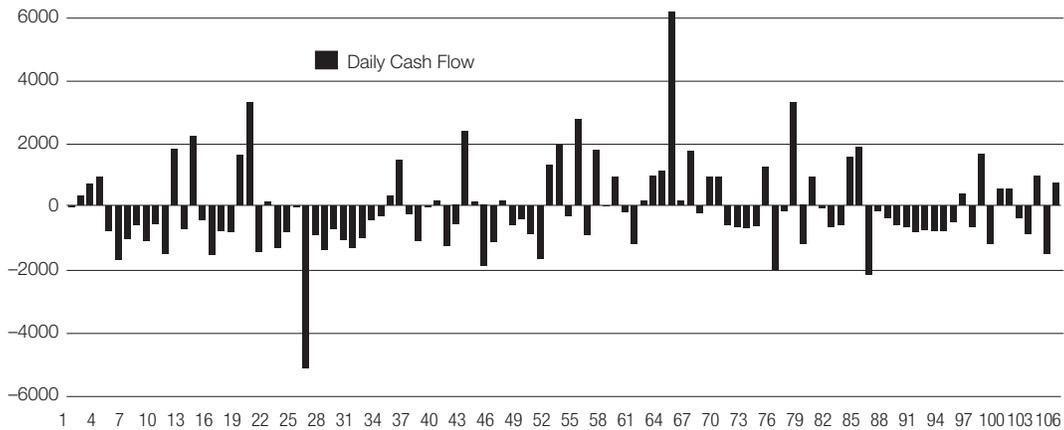
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Annex A: Rough Tuning: An Illustrative Example

1. This annex illustrates how a cash manager might try to “rough tune” prospective cash flows, using T-Bills. The cash manager has been presented with the daily cash flow forecast over the next 106 working days as shown in Figure A1 (all figures are in millions of local currency). These figures are after planned debt issuance and redemptions, but no decisions have been taken on T-Bill issuance.
2. The task is to plan T-Bill issuance over the same period in such a way as to smooth the cash flow profile so that the cumulative surplus or deficit at any time will be fairly small. The intention is to announce provisional gross issuance plans to the market, at least over the following quarter. Practice is to issue just one-month (28 days) or three-month (91 days) bills.

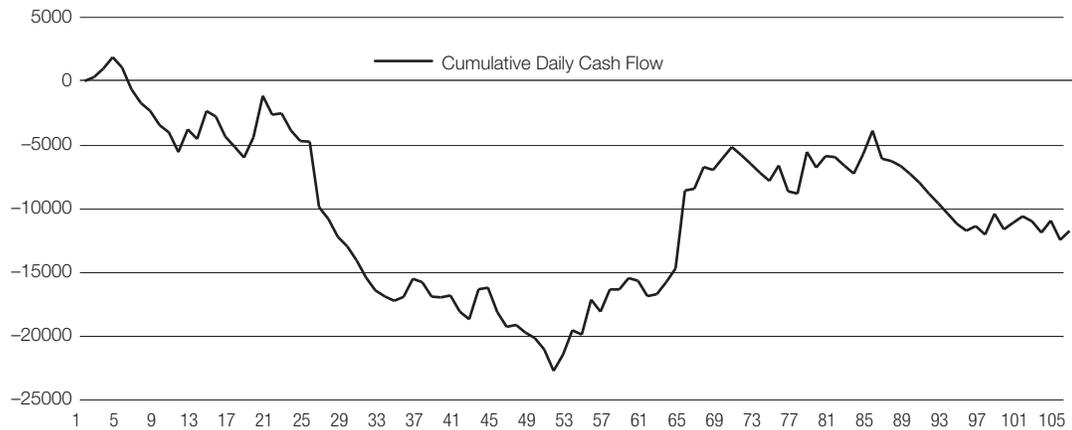
Figure A1. Forecast Daily Cash Flow



Source: Author's illustration.

3. The task is more daunting than appears from a first glance at the above chart of daily cash flows. This is because the daily flows accumulate to a very substantial deficit over the first part of the period, as is clear from Figure A2.

Figure A2. Cumulative Daily Cash Flow



Source: Author's illustration.

Assumptions and Constraints

4. The existing T-Bill stock is, in local currency:

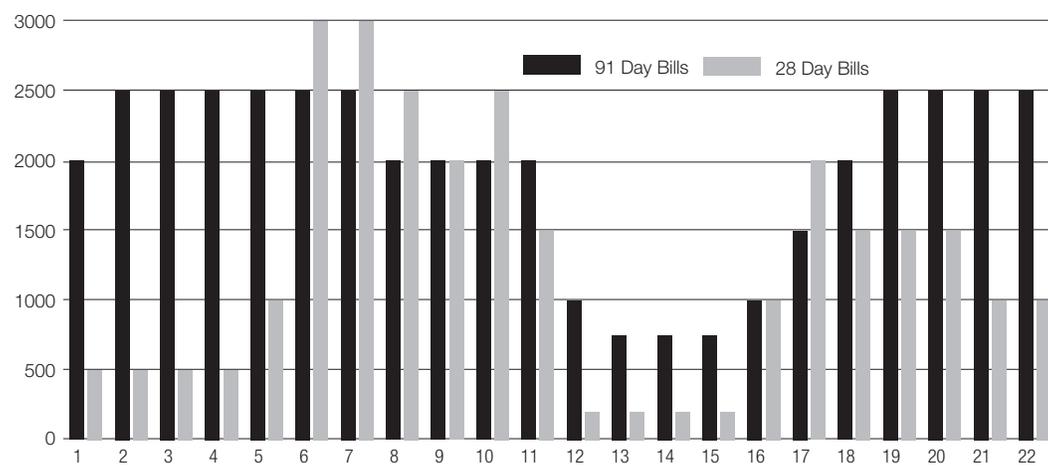
28 day bills	4,000
91 day bills	13,000
Total	17,000

5. The stock is (by coincidence) in steady state: that is, the existing 28 day bills will be redeemed equally over the next 4 weeks; and the 91 day bills over 13 weeks.
6. Bills are issued once a week; there are 5 working days in each week (no public holidays in the period). Bills are issued on day 1, 6, 11...106 (22 weeks). They are redeemed on the same day of the week that they are issued, that is, settlement lags are ignored.
7. The market does not have an infinite capacity to absorb T-Bills and should be treated as “gently” as possible. For example, the market would prefer to avoid a massive variation in issuance from the steady state of 1,000 of each type of bill—say, a maximum weekly issuance of 2,500 for 91 day bills; and 3,000 for 28 day bills. Large variation from week to week should also be avoided; but at least some of each bill should be issued each week.
8. Ideally the maximum cumulative cash flow deficit at any one time should be no more than 5,000. For instance that might be the opening cash balance in the TSA at the central bank—which should never go negative. The maximum surplus can be a little more, but ideally should not be much more.
9. The issuance of 91 day bills should ideally be less variable from week to week than that of 28 day bills.

The Result

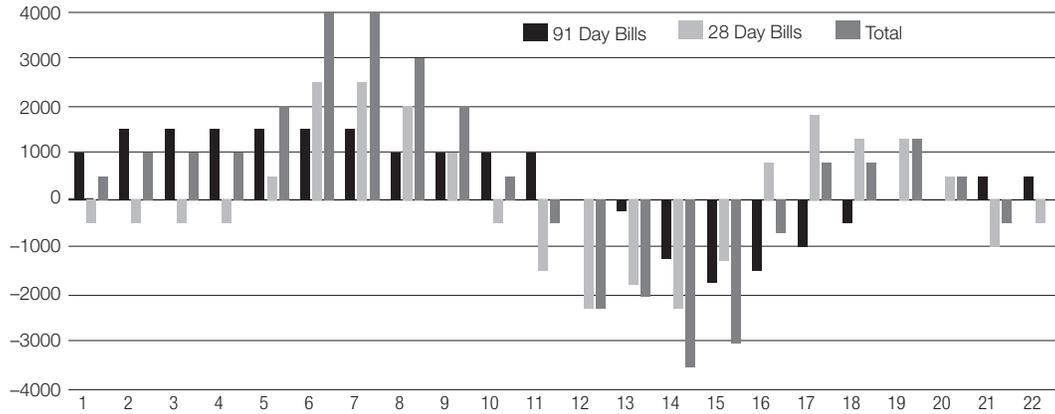
10. The cash manager uses a simple spreadsheet to explore how different gross issuance patterns affect the cumulative profile, at the same time monitoring the net issuance profile and the impact on the stock.
11. There is no single “right” answer. The following charts set out one solution. Figures A3–5 show bill issuance by week; and Figure A6 the final cash flow profile. The more variable issue of one-month bills is readily apparent, although the profile also requires some variation in three-month issuance.

Figure A3. Gross Weekly Bill Issuance



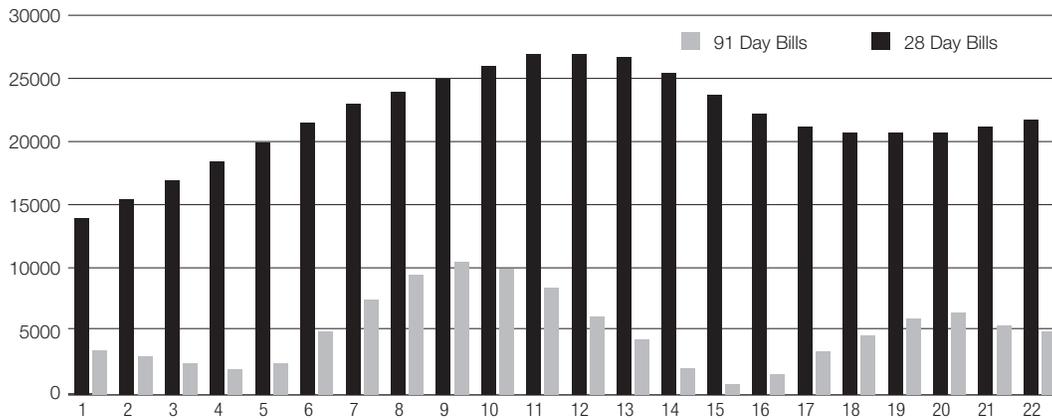
Source: Author's illustration.

Figure A4. Net Weekly Bill Issuance



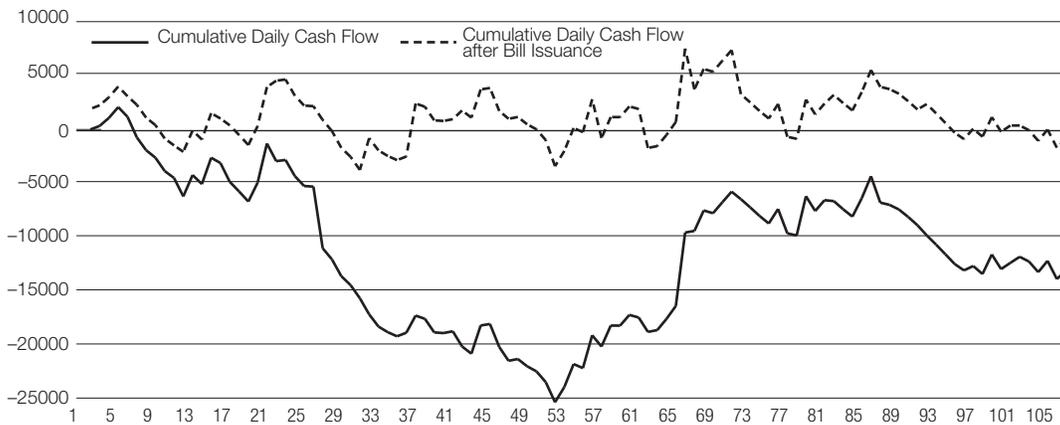
Source: Author's illustration.

Figure A5. Weekly Treasury Bill Stock



Source: Author's illustration.

Figure A6. Daily Cumulative Cash Flow after Bill Issuance



Source: Author's illustration.