

A FRAMEWORK FOR MEASURING AND MANAGING LIQUIDITY

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In its work on the supervision of liquidity, the Basle Committee has focused on developing a greater understanding of the way in which international banks manage their liquidity on a global basis, on the premise that supervision of liquidity is particularly effective if based on a dialogue between bank and supervisor. This paper brings together practice and techniques currently employed by major international banks in a single analytical framework. While no bank may follow this framework precisely, it is a model which is believed to be an example of current sound management practice and which could provide useful guidance to all banks.

The seventh ICBS provides an opportunity for other supervisory authorities to contribute to this work and it is the Committee's intention to prepare a revised version of this paper taking account of comments made at Cannes which could then be circulated to supervisory authorities worldwide with the possibility of it being made available through them to commercial banks.

I. Purpose of the analysis

Measuring and managing liquidity are among the most vital activities of commercial banks. By assuring a bank's ability to meet its liabilities as they come due, liquidity management can reduce the probability of an irreversible adverse situation developing. Even in cases where a crisis develops because of a problem elsewhere at a bank, such as a severe deterioration in asset quality or the uncovering of fraud, or where a crisis reflects a generalised loss of confidence in financial institutions, the time available to a bank to address the problem will be determined by its liquidity. Indeed, the importance of liquidity transcends the individual institution, since a liquidity shortfall at a single institution can have system-wide repercussions. For this reason, the analysis of liquidity requires bank managements to measure not only the liquidity positions of banks on an ongoing basis but also to examine how funding requirements are likely to evolve under crisis scenarios.

This paper sets out in general terms the main elements of a model liquidity measurement and management framework. The framework strikes a balance between quantitative and qualitative factors used to assess liquidity, and provides a methodology for analysing balance sheet and off-balance-sheet activities consistently.

While this paper focuses on the use of the framework by large banks, the approach it describes appears to have broad applicability to bank liquidity measurement and control, even for small, strictly domestic banks. In particular, good management information systems, central liquidity control, analysis of net funding requirements under alternative

scenarios, diversification of funding sources, and contingency planning are crucial elements of strong liquidity management at a bank of any size or scope of operations. The information systems and analysis needed to implement the approach, however, can probably absorb fewer resources and be much less complex at a smaller institution or one that is active in fewer markets than the large, internationally active banks contemplated in this paper.

II. Policy issues

A. Information and reporting arrangements

Virtually every financial transaction or commitment has implications for a bank's liquidity. Moreover, the transformation of illiquid assets into more liquid ones is a key activity of banks. Thus, a bank's liquidity policies and liquidity management approach should form key elements of a bank's general business strategy. Understanding the context of liquidity management involves examining a bank's *managerial approach* to funding and liquidity operations and its *liquidity planning under alternative scenarios*.

In particular, all banks should have an *articulated and specific liquidity policy* setting out the general importance management places on liquidity. Such a policy should also enunciate specific policies on particular aspects of liquidity management, such as the relative reliance on the use of certain financial instruments and the encouragement of closer relationships with supervisors. This general policy should be approved by a bank's board of directors.

An important element in such a policy will be a *liquidity reporting structure* designed to provide senior management with timely information and to be flexible enough to deal with various contingencies that may arise during crises. Banks that stress the importance of liquidity assign *ultimate responsibility* for setting liquidity policy and reviewing liquidity decisions to the bank's highest level of management, and their decisions need to be reviewed periodically by the board of directors.

A bank's *investment in information systems* designed to gather and analyse detailed information on assets and liabilities may need to be substantial. Because market conditions and a bank's own liquidity needs change constantly, extensive computer systems are often necessary to provide management with relevant information on an accurate and up-to-date basis. Such systems can also be helpful in projecting the bank's liquidity positions under a variety of conditions. Sometimes these systems are integrated into information systems monitoring other activities or risk exposures of the bank.

Finally, a schedule of frequent routine *liquidity reviews* and less frequent, but more in-depth reviews should be provided for. These reviews provide the opportunity to re-examine and refine a bank's liquidity policies and practices in the light of a bank's liquidity experience and developments in its business.

B. Treatment of foreign currencies

For banks with an international presence, the treatment of assets and liabilities in multiple currencies adds a layer of complexity to liquidity management for two reasons. First, banks are often less well known to liability holders in foreign currency markets. In the event of market concerns, especially if they relate to a bank's domestic operating environment, these liability holders may not be able to distinguish rumour from fact as well or as quickly as domestic currency customers. Second, in the event of a disturbance, a bank may not always be able to mobilise domestic liquidity to meet foreign currency funding requirements.

Hence, when a bank conducts its business in multiple currencies, its management must make two key decisions. The first concerns *management structure*. A bank with funding requirements in foreign currencies will generally use one of three approaches. It may completely centralise liquidity management (the head office managing liquidity for the whole bank in every currency). Alternatively, it may decentralise by assigning operating divisions responsibility for their own liquidity, but subject to limits imposed by the head office or frequent, routine reporting to the head office. For example, a non-European bank might assign its London office responsibility for the liquidity management for its European operations in all currencies. As a third approach, a bank may assign responsibility for liquidity in the home currency and for overall coordination to the home office, and responsibility for the bank's global liquidity in each major foreign currency to the management of the foreign office in the country issuing that currency. For example, the treasurer in the Tokyo office of a non-Japanese bank could be responsible for the bank's global liquidity needs in yen. All of these approaches, however, provide head office management with the opportunity to monitor and control worldwide liquidity.

The second decision concerns the *liquidity strategy in each currency*. In the ordinary course of business, a bank must decide how foreign currency funding needs will be met. To what extent, for example, will a bank fund foreign currency needs in domestic currency and convert the proceeds to foreign currency through the foreign exchange market or currency swaps? How will a bank manage the associated risk that exchange markets will cease to be available? A bank's assessment will depend on the size of its funding needs, its access to foreign currency funding markets, and its capacity to rely on off-balance-sheet instruments (e.g. standby lines of credit, swap facilities, etc.).

A bank must also develop a back-up liquidity strategy for circumstances in which its normal approach to funding foreign currency operations is disrupted. Such a strategy will call for drawing either on home currency sources and converting them to foreign currency through the exchange markets or drawing on back-up sources in particular foreign currencies. For example, back-up liquidity for all currencies may be provided by the head office using the home currency, based on an assessment of the bank's access to the foreign exchange market and the derivative markets under the conditions in which the original liquidity disturbance is likely to occur. Alternatively, a bank's management may decide that certain foreign currencies

make up a sufficient part of its liquidity needs to warrant separate liquidity back-up. In that case, either the home office or the regional treasurer for each specific currency would develop a contingency strategy and negotiate liquidity backstop facilities for those currencies.

III. A framework for measuring and managing liquidity

The framework for assessing and managing bank liquidity presented here has three major dimensions: (A) *measuring and managing net funding requirements*, (B) *managing market access*, and (C) *contingency planning*.

A. Measuring and managing net funding requirements

The analysis of net funding requirements involves the construction of a maturity ladder and the calculation of a cumulative net excess or deficit of funds at selected maturity dates. A bank's net funding requirements are determined by analysing its future cash flows based on assumptions of the future behaviour of assets, liabilities and off-balance-sheet items, and then calculating the cumulative net excess over the time frame for the liquidity assessment.

(i) The maturity ladder

A maturity ladder should be used to compare a bank's future cash inflows to its future cash outflows over a series of specified time periods. Cash inflows arise from maturing assets, saleable non-maturing assets and established credit lines that can be tapped. Cash outflows include liabilities falling due and contingent liabilities, especially committed lines of credit that can be drawn down. In Table 1, the maturity ladder is represented by placing sources and amounts of cash inflows on one side of the page and sources and amounts of outflows on the other.

In constructing the maturity ladder, a bank has to allocate each cash inflow or outflow to a given calendar date from a starting point, usually the next day. (A bank must be clear about the clearing and settlement conventions it is using to determine its initial point.) As a preliminary step to constructing the maturity ladder, cash inflows can be ranked by the date on which assets mature or a conservative estimate of when credit lines can be drawn down. Similarly, cash outflows can be ranked by the date on which liabilities fall due, the earliest date a liability holder could exercise an early repayment option, or the earliest date contingencies can be called. Significant interest and other cash flows should also be included. The difference between cash inflows and cash outflows in each period, the excess or deficit of funds, becomes a starting-point for a measure of a bank's future liquidity excess or shortfall at a series of points in time.

It is this net funding requirement that requires management. Typically, a bank may find substantial funding gaps in distant periods and will endeavour to fill these gaps by influencing the maturity of transactions so as to offset the gap. For example, if there is a significant funding requirement 30 days hence, a bank may choose to acquire an asset

maturing on that day, or seek to renew or roll over a liability. The closer a large gap gets, the more difficult it is to offset. Thus, banks will typically collect data on relatively distant periods so as to maximise the opportunities to close the gap before it gets too close. Most banks would regard it as important that any remaining borrowing requirement should be limited to an amount which experience suggests is comfortably within the bank's capacity to fund in the market.

(ii) Alternative scenarios

Evaluating whether a bank is sufficiently liquid depends in large measure on the behaviour of cash flows under different conditions. Analysing liquidity thus entails laying out "what if" scenarios. Three scenarios provide useful benchmarks: a bank's "going-concern" condition, a bank-specific crisis, and a general market crisis. Under each scenario, a bank should try to account for any significant positive or negative liquidity swings that could occur.

(a) The *going-concern* scenario establishes a benchmark for the "normal" behaviour of balance sheet-related cash flows in the ordinary course of business at a bank. This scenario is useful in managing a bank's use of deposit and other debt markets. By establishing such a benchmark, a bank can manage its net funding requirements so that it is not faced with very large needs on any given day, so avoiding the impact of temporary constraints on its ability to roll over liabilities because of market disruptions or concerns about its condition.

(b) Assessing liquidity under the second scenario, a *liquidity crisis at an individual bank* that remains confined to that bank, provides one type of "worst-case" benchmark. The key underlying assumption in this scenario is that many of the bank's liabilities could not be rolled over or replaced and would have to be repaid at maturity so that the bank would have to wind down its books to some degree. This is the scenario implicit in many existing bank supervisory liquidity measures. While a severe liquidity crisis at an individual bank usually stems from a fundamental, bank-specific problem not related to its liquidity, a bank's ability to honour its deposit maturities under such conditions can provide the time that the bank would need to address the underlying problem. If a bank can weather such a "worst-case" scenario, it can almost certainly survive less drastic firm-specific problems.

(c) The last scenario is some form of *general market crisis* where liquidity is affected at all banks in one or more markets. The key underlying assumption that banks need to make in this scenario is that severe tiering by perceived credit quality would occur, so that differences in funding access among banks or among classes of financial institutions would widen, benefiting some and harming others. Although some banks may believe that central banks would ensure that key markets would continue to function in some form, severe market disruption would not necessarily be prevented. For bank management, this represents a second type of "worst-case" scenario that a bank would wish to weather. A supervisor or central bank may find this scenario to be of particular interest when surveying the liquidity profile of the entire banking sector. The collective results would suggest the size of the total

liquidity buffer in the banking system and the likely distribution of liquidity problems among large institutions if the banking system as a whole experiences a shortage of liquidity.

A bank will need to assign the timing of cash flows for each type of asset and liability by assessing the probability of the behaviour of those cash flows in the scenario being examined. These decisions about the specific timing and the size of cash flows are an integral part of the construction of the maturity ladder under each scenario. For each funding source, for example, a bank would have to decide whether the liability would be: (1) repaid in full at maturity; (2) gradually run off over the next few weeks; or (3) virtually certain to be rolled over or available if tapped. The bank's historical experience of the pattern of flows and a knowledge of market conventions could guide a bank's decisions, but judgement often plays a large role, especially in crisis scenarios. Uncertainty is an inevitable element in choosing between possible behaviour patterns, and that dictates a conservative approach that would bias a bank toward assigning later dates to cash inflows and earlier dates to cash outflows.

Hence, the timing of cash inflows and outflows on the maturity ladder can differ between the going-concern approach and the two crisis scenarios, as shown in Table 2. In constructing the *going-concern* maturity ladder, conservative assumptions need to be made about the behaviour of cash flows that can replace the contractual cash flows. For example, many maturing loans would be rolled over in the normal course of business and some proportion of transactions and savings deposits would also be rolled over or could be easily replaced.

In a *bank-specific crisis* scenario it is assumed that a bank will be unable to roll over or replace many or most of its liabilities, and that it may have to wind down its books to some degree. The assumptions under the third scenario, a *general market crisis*, may differ quite sharply from the assumptions made for a bank-specific crisis. For example, a bank may believe, based upon its historical experience, that its ability to control the level and timing of future cash flows from a stock of saleable assets in a bank-specific funding crisis would deteriorate little from normal conditions. However, in a general market crisis, this capacity may fall off sharply if few institutions are willing or able to make cash purchases of less liquid assets. On the other hand, a bank that has a high reputation in the market may actually benefit from a flight to quality as potential depositors seek out the safest home for their funds. Banks may also anticipate that central banks would ensure that key markets continue to function but not necessarily without significant disruption.

(iii) Measuring liquidity over the chosen time-frame

The evolution of a bank's liquidity profile under one or more scenarios can be tabulated or portrayed graphically, by cumulating the balance of expected cash inflows and cash outflows at several time points. A stylised liquidity graph can be constructed enabling the evolution of the cumulative net excess or deficit of funds to be compared under the three scenarios in order to provide further insights into a bank's liquidity and to check how consistent and realistic the assumptions are for the individual bank. For example, a high-

quality institution may look very liquid in a going-concern scenario, marginally liquid in a bank-specific crisis and quite liquid in a general market crisis. In contrast, a weaker institution might be far less liquid in the general crisis than it would in a bank-specific crisis.

It is important to note that the relevant time-frame for active liquidity management is short, generally extending out no more than a few weeks. While most banks would not actively manage their net funding requirements over a period much longer than four or five weeks, managements may consider information on requirements beyond that time frame to be useful. Clearly, banks active in markets for longer-term assets and liabilities will need to use a longer time-frame than banks which are active in short-term money markets and which are in a better position to fill funding gaps at short notice. However, even this latter category of banks may find it worthwhile to tailor the maturity of new transactions to offset gaps some time off.

A longer time horizon may also generate useful information on which to base more strategic decisions on the extent to which a bank may rely on particular markets.

(iv) Assumptions used in determining cash flows

Since a bank's future liquidity position will be affected by factors that cannot always be forecast with precision, assumptions need to be reviewed frequently to determine their continuing validity, especially given the rapidity of change in banking markets. The total number of major assumptions to be made, however, is fairly limited. This section attempts to catalogue the liquidity assumptions under four broad categories: (a) assets, (b) liabilities, (c) off-balance-sheet activities, and (d) other.

(a) Assets

Assumptions about a bank's future stock of assets include their potential marketability and use as collateral of existing assets which could increase cash inflows, and the extent to which maturing assets will be renewed, and new assets acquired, thus reducing contractual cash inflows.

Determining the level of a bank's *potential assets* involves answering three questions:

- what proportion of maturing assets will a bank be able and willing to *roll over* or renew?
- what is the expected *level of new loan requests* that will be *accepted*?
- what is the expected *level of draw-downs of commitments to lend* that a bank will need to fund? These commitments may take the form of committed commercial lines without material adverse change (MAC) clauses, which a bank may not be legally able to turn away even if the borrower's financial condition has deteriorated; committed commercial lines with MAC clauses which some customers could draw down in crisis scenarios; and other commercial and consumer credit lines.

In estimating its normal funding needs, some banks use historical patterns of roll-overs, draw-downs and new requests for loans; others conduct a statistical analysis taking account of seasonal and other effects believed to determine loan demand (e.g., for consumer loans). Alternatively, a bank may make judgmental business projections, or undertake a customer-by-customer assessment for its larger customers and apply historical relationships to the remainder.

Roll-overs, draw-downs and new loan requests all represent potential cash drains for a bank. Nevertheless, a bank has some leeway to control many of these items depending on the assumed scenario. In a crisis situation, for example, a bank might decide to risk damaging some business relationships by refusing to roll over loans that it would make under normal conditions, or it might refuse to honour lending commitments that are not binding.

In determining the *marketability of assets*, the approach segregates the assets into three categories by their degree of relative liquidity:

- the most liquid category includes components such as cash, securities, and interbank loans. Some of these assets may be immediately convertible into cash at prevailing market values under almost any scenario (either by outright sale, or for sale and repurchase, or as collateral for secured financing), while others, such as interbank loans or some securities, may lose liquidity in a general crisis;
- a less liquid category comprises a bank's saleable loan portfolio. The task here is to develop assumptions about a reasonable schedule for the disposal of a bank's assets. Some assets, while marketable, may be viewed as unsaleable within the time frame of the liquidity analysis;
- the least liquid category includes essentially unmarketable assets such as loans not capable of being readily sold, bank premises and investments in subsidiaries, as well as, possibly, severely troubled credits;
- assets pledged to third parties are deducted from each category.

The view underlying the classification process is that different banks could assign the same asset to different categories on the maturity ladder because of differences in their internal asset-liability management. For example, a loan categorised by one bank as a moderately liquid asset - saleable only late in the liquidity analysis time-frame - may be considered a candidate for fairly quick and certain liquidation at a bank that operates in a market where loans are frequently transferred, that routinely includes loan-sale clauses in all loan documentation and that has developed a network of customers with whom it has concluded loan-purchase agreements.

In categorising assets, a bank would also have to decide how an asset's liquidity would be affected under different scenarios. Some assets that may be very liquid during times of normal business conditions may be less so during a time of crisis. Consequently, a bank may place an asset in different categories depending on the type of scenario it is forecasting.

(b) Liabilities

To evaluate the cash flows arising from a bank's liabilities, a bank would first examine the behaviour of its liabilities under normal business conditions. This would include establishing:

- the normal level of roll-overs of deposits and other liabilities;
- the effective maturity of deposits with non-contractual maturities, such as demand deposits and many types of savings accounts;
- the normal growth in new deposit accounts.

As in assessing roll-overs and new requests for loans, a bank could use several possible techniques to establish the effective maturities of its liabilities, such as using historical patterns of deposit behaviour. For sight deposits, whether of individuals or businesses, many banks conduct a statistical analysis that takes account of seasonal factors, interest rate sensitivities, and other macroeconomic factors. For some large wholesale depositors, a bank may undertake a customer-by-customer assessment of the probability of roll-over.

In examining the cash flows arising from a bank's liabilities in the two crisis scenarios, a bank would examine four basic questions:

- which sources of funding are likely to stay with a bank under any circumstance, and can these be increased?
- which sources of funding can be expected to run off gradually if problems arise, and at what rate? Is deposit pricing a means of controlling the rate of runoff?
- which maturing liabilities or liabilities with non-contractual maturities can be expected to run off immediately at the first sign of trouble? Are there liabilities with early withdrawal options that are likely to be exercised?
- does the bank have back-up facilities that it can draw down?

The first two categories represent cash-flow developments that tend to reduce the cash outflows projected directly from contractual maturities. In addition to the liabilities identified above, a bank's capital and term liabilities not maturing within the horizon of the liquidity analysis provide a liquidity buffer.

The liabilities that make up the first category may be thought to stay with a bank, even under a "worst-case" projection. Some core deposits generally stay with a bank because retail and small business depositors may rely on the public-sector safety net to shield them from loss, or because the cost of switching banks, especially for some business services such as transactions accounts, is prohibitive in the very short run.

The second category, liabilities that are likely to stay with a bank during periods of mild difficulties and to run off relatively slowly in a crisis, includes core deposits that are not already included in the first category. In addition to core deposits, in some countries, some level of particular types of interbank and government funding may remain with a bank during such periods, although interbank and government deposits are often viewed as volatile.

A bank's own liability roll-over experience as well as the experiences of other troubled institutions should help in developing a timetable for these cash flows.

The third category comprises the remainder of the maturing liabilities, including some without contractual maturities, such as wholesale deposits. Under each scenario, this approach adopts a conservative stance and assumes that these remaining liabilities are repaid at the earliest possible maturity, especially in crisis scenarios, because such money may flow to government securities and other safe havens. Factors such as diversification and relationship building are seen as especially important in evaluating the extent of liability run-off and a bank's capacity to replace funds. Nevertheless, in a general market crisis, some high-quality institutions may find that they receive larger-than-usual wholesale deposit inflows, even as funding inflows dry up for other market participants.

Some banks, for example, smaller banks in regional markets, may also have credit lines that they can draw down to offset cash outflows. While these sorts of facility are somewhat rare among larger banks, the possible use of such lines could be addressed with a bank's liability assumptions. Where such facilities are subject to material adverse change clauses, of course they may be of limited value, especially in a bank specific crisis.

(c) Off-balance-sheet activities

A bank should also examine the potential for substantial cash flows from its off-balance-sheet activities (other than the loan commitments already considered), even if such cash flows are not always a part of banks' current liquidity analysis.

Contingent liabilities, such as letters of credit and financial guarantees, represent potentially significant cash drains for a bank, but are usually not dependent on a bank's condition. A bank may be able to ascertain a "normal" level of cash outflows on an ongoing concern basis, and then estimate the scope for an increase in these flows during periods of stress. However, a general market crisis may trigger a substantial increase in the amount of draw-downs of letters of credit because of an increase in defaults and bankruptcies in the market.

Other potential sources of cash outflows include *swaps, written over-the-counter (OTC) options, and other interest rate and forward foreign exchange rate contracts*. If a bank has a large swap book, for example, then it would want to consider the circumstances under which the bank could become a net payer, and whether or not the potential net payout is significant. For example, if a bank is a swap market-maker, the possibility exists that in a bank-specific or general market crisis, customers with in-the-money swaps (or a net in-the-money swap position) would seek to reduce their credit exposure to the bank by asking the bank to buy back swaps. Similarly, a bank would need to review its written OTC options book and any outstanding warrants, together with any hedges against these positions, since certain types of crises may stimulate an increase in early exercises (for American-style options) or requests that the bank repurchase options. These exercises and repurchase requests

could result in an unforeseen cash drain, if hedges either cannot be quickly liquidated to generate cash or provide insufficient cash.

(d) Other assumptions

The discussion has centred so far on assumptions concerning the behaviour of specific instruments under various scenarios. Looking solely at instruments, however, may ignore some factors that may significantly impact a bank's cash flows.

Besides the liquidity needs arising from business activities, banks also require excess funds to support other operations. For example, many large banks provide clearing services to correspondent banks and financial institutions that generate significant and not always easily predictable cash inflows and outflows, the amounts of which depend on the clearing volumes of the correspondent banks. Unforeseen fluctuations in these volumes can deplete a bank of needed funds.

Net overhead expenses, such as rent and salary, although generally not significant enough to be considered in banks' liquidity analyses, can in some cases also be sources of cash outflows.

B. Managing market access

Some liquidity management techniques are viewed as important not only for their influence on the assumptions used in constructing the maturity ladders, but also for their direct contribution to enhancing a bank's liquidity. Thus, it is important for a bank to review periodically its efforts to maintain the *diversification of liabilities*, to establish *relationships with liability-holders* and to develop *asset-sales markets*.

As a check for adequate diversification of liabilities, a bank needs to examine the level of reliance on individual funding sources, by *instrument type*, *nature of the provider of funds*, and *geographic market*. In addition, a bank should strive to understand and evaluate the use of intercompany financing for its individual business offices.

Building strong relationships with some providers of funding can provide a line of defence in a liquidity problem and form an integral part of a bank's liquidity management. The frequency of contact and the frequency of use of a funding source are two possible indicators of the strength of a funding relationship.

Developing markets for asset sales or exploring arrangements under which a bank can borrow against assets is the third element of managing market access. The inclusion of loan-sale clauses in loan documentation and the frequency of use of some asset-sales markets are two possible indicators of a bank's ability to execute asset sales under adverse scenarios.

C. Contingency planning

A bank's ability to withstand a net funding requirement in a bank specific or general market liquidity crisis can also depend on the calibre of its formal contingency plans. Effective contingency plans should address two major questions:

- does management have a strategy for handling a crisis?
- does management have procedures in place for accessing cash in emergency?

The degree to which a bank has addressed these questions realistically, provides management with additional insight as to how a bank may fare in a crisis.

(i) Strategy

A game plan for dealing with a crisis should consist of several components. Most important are those that involve managerial coordination. A contingency plan needs to spell out procedures to ensure that *information flows* remain timely and uninterrupted, and that the information flows provide senior management with the precise information it needs in order to make quick decisions. A clear *division of responsibility* must be set out so that all personnel understand what is expected of them during a crisis. Confusion in this area can waste resources on certain issues and omit coverage on others.

Another major element in the plan should be a strategy for taking certain *actions to alter asset and liability behaviours*. While assumptions can be made as to how an asset or liability will behave under certain conditions (as discussed above), a bank may have the ability to change these characteristics. For example, a bank may conclude that it will suffer a liquidity deficit in a crisis based on its assumptions regarding the amount of future cash inflows from saleable assets and outflows from deposit run-offs. During such a crisis, however, a bank may be able to market assets more aggressively, or sell assets that it would not have sold under normal conditions and thus augment its cash inflows from asset sales. Alternatively, it may try to reduce cash outflows by raising its deposit rates to retain deposits that might otherwise have moved elsewhere.

Other components of the game plan involve *maintaining customer relationships* with borrowers, trading and off-balance-sheet counterparties, and liability-holders. As the intensity of a crisis increases, banks must often trade off relationships with some customers for liquidity in order to survive. By classifying borrowers and trading customers according to their importance to the bank, a bank can determine which relationships it may need to forgo at different points in a crisis. At the same time, relationships with lenders become more important in a crisis. If a bank's strategy requires liability managers to maintain strong ongoing links with lenders and large liability-holders during periods of relative calm, the bank will be better positioned to secure sources of funds during emergencies.

An additional, pragmatic element that may be important is how a bank *deals with the press and broadcast media*. Astute public relations management can help a bank avoid the spread of public rumours that can result in significant run-offs by retail depositors and institutional investors.

(ii) Back-up liquidity

Contingency plans should also include procedures for making up cash flow shortfalls in emergency situations. Banks have available to them several sources of such funds, including previously unused credit facilities and the domestic central bank. Depending

on the severity of a crisis, a bank may choose - or be forced - to use one or more of these sources. The plan should spell out as clearly as possible the amount of funds a bank has available from these sources, and under what scenarios a bank could use them.

Table 1
The maturity ladder based on contractual maturities

DAY 1: Cash Inflows		Cash Outflows		Excess/(Shortfall)
Maturing assets	100	Maturing liabilities with contractual maturities	50	
Interest receivable	20	Interest payable	10	
Asset sales	50	Other deposit runoffs	30	
Drawdowns on Com. Lines	10	Drawdowns on Com. Lines	10	
Total	180	Total	140	40
DAY 2: Cash Inflows		Cash Outflows		Excess/(Shortfall)
Maturing assets	100	Maturing liabilities with contractual maturities	70	
Interest receivable	25	Interest payable	20	
Asset sales	55	Other deposit runoffs	40	
Drawdowns on Com. Lines	10	Drawdowns on Com. Lines	50	
Total	190	Total	180	10
DAY 3-DAY 15: Cash Inflows		Cash Outflows		Excess/(Shortfall)
Maturing assets	130	Maturing liabilities with contractual maturities	90	
Interest receivable	50	Interest payable	30	
Asset sales	60	Other deposit runoffs	40	
Drawdowns on Com. Lines	20	Drawdowns on Com. Lines	60	
Total	260	Total	220	40
DAY 16-DAY 30: Cash Inflows		Cash Outflows		Excess/(Shortfall)
Maturing assets	160	Maturing liabilities with contractual maturities	130	
Interest receivable	80	Interest payable	60	
Asset sales	90	Other deposit runoffs	80	
Drawdowns on Com. Lines	40	Drawdowns on Com. Lines	80	
Total	370	Total	350	20

Table 2
Day 1 of the maturity ladder under alternative scenarios

Cash inflows	Normal business conditions (1)	Institution-specific crisis (3)	General market crisis (2)
Maturing assets	100	100	90
Interest receivable	20	20	10
Asset sales	50	60	0
Drawdowns	10	0	5
Total	180	180	105
Cash outflows			
Maturing liabilities	50	50	50
Interest payable	10	10	10
Deposit runoffs	30	100	60
Drawdowns on lending commitments	50	60	75
Total	140	220	195
Liquidity Excess/(Shortfall)	40	(40)	(90)