1 Liquidity and Risk: Some Basics

The term 'liquidity' is anything but well defined. In any meaningful discussion with treasury colleagues in other banks or with controllers on liquidity, one can be confident that everybody will have a solid knowledge of liquidity and risk as terms. Often, however, it is well into the discussion before one encounters a common understanding of the specific elements on liquidity being addressed. This is somewhat surprising given the fact that the issue has been around for a very long time. Back in the nineteenth century, Knies (1876, page 249) stressed the necessity for a cash buffer to bridge negative gaps between payment inflows and outflows in cases where their timing cannot be completely regulated. In the last century the issue was also taken up and intensely discussed, as for example initiated by Stützel (1959, pages 622–629). The further discussions primarily centred on basic considerations such as the relationship between liquidity and level of solvency (Stützel, 1983, page 33f.) or the distinction between the level of liquidity reserves and its structure (Witte, 1964, page 770f.), for example.

Around the mid-1990s a new wave started, became intensified after the turn of the millennium and is still continuing. It is clearly distinct from former discussions. Its focus is on specific issues of liquidity management, but only touches policy issues related to liquidity. A selection of publications covering wider aspects, in addition to the numerous papers on very specific issues, may illustrate the point made: namely, Matz (2002), Zeranski (2005), Matz and Neu (2007) and Bartetzky, Gruber and Wehn (2008).

1.1 SOME UNDERSTANDING OF LIQUIDITY

Why then can we not relate to clearly defined terms after the subject has been dealt with for well over 100 years? The long intervals certainly have not helped. More importantly, however, banks, as one of their basic functions, are collecting points of money for the various groups within society. Thus, for most of the time, getting funds has been of little concern in itself, and this especially so if compared with employing these funds as assets in a secure and profitable manner. Furthermore, liquidity has many dimensions. The term is used to express a specific condition for a product, an institution, a market segment or even an economy, just to mention some important applications, as can be seen in Figure 1.1.

As a starting point we take the basic and most narrow definition (Box 1.1).

Liquidity thus is neither an amount nor a ratio. It rather expresses the degree to which a bank is capable of fulfilling its respective obligations. The opposite would be 'illiquidity', i.e. the lack of the respective capability to fulfil them. In this sense, liquidity represents a qualitative element of the financial strength of a bank (Duttweiler, 2008, page 30).

1.1.1 What do we know about liquidity?

The understanding of how liquidity is affected under different circumstances has improved significantly within the last decade. This is not so much because many of the aspects have been

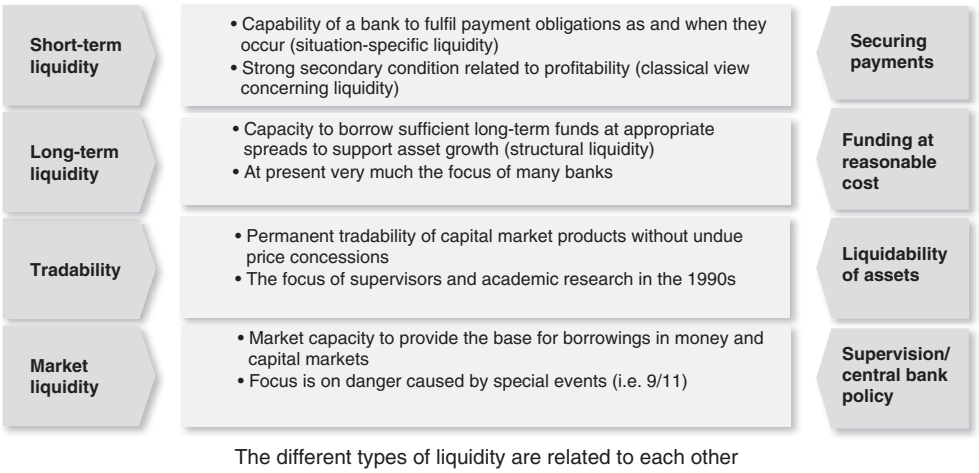

Figure 1.1 Different meanings of liquidity
(*Source*: Adapted from Bartetzky, 2008, page 9)

Box 1.1 Definition of liquidity

- Liquidity represents the capacity to fulfil all payment obligations as and when they fall due – to their full extent and in the currency required.
- Since it is done in cash, liquidity relates to flows of cash only. Not being able to perform leads to a condition of illiquidity.

known for much longer, but it is only relatively recently that methods have been developed that allow a more precise quantification. By following a selected and illustrative list of known facts, a commonly used segregation into risk types can be made:

- Volume and tenor of assets depend largely on business policy.
- The more the long-term assets are financed with short-term liabilities, the bigger the liquidity gap will be.
- The more stable deposits do come from the retail sector, but they are structurally short term in nature. Usually, their volume is not sufficient to finance all assets on the balance sheet.
- Banks do write options to their customer base. They can differ in name, like committed lines of credit; backup lines for issuers in the commercial paper (CP) market; drawdown facilities in the mortgage finance sector; or early repayment facilities. But they are similar in character: the option may or may not be executed, or partly only; and the timing of the event is very much open to an agreed timeframe.
- If one allows for liquidity gaps to stay, the initial funding matures before the respective asset falls due. Thus, the bank will have to go into the market at a later date to finance the old asset for the remaining time till maturity.
- How easy the later financing can be executed in the market and the price one has to pay at that date in the future are not known in advance.

- Some assets are generally marketable, i.e. they can be turned into cash through selling or entering into a repo transaction for example. As conditions of instruments and markets can change, their value as liquidity is subject to alterations.
- The willingness of the market to provide funding will depend on the financial solidity of the borrowing institution, as assessed by the market at that future date.
- The financial status of a bank itself, as well as its perception by the market, are made up of various interrelated business data such as quantity and quality of risk taken on the book, capital and capital ratio, earning power and expected future trend, to mention just a few.
- There is no guarantee that one can forecast today what one's own financial status will be a few years down the road. Furthermore, one does not know how this status will be perceived by the market at that time.

When it comes to the characteristic of liquidity sources, the following distinctions are generally made: availability, maturity structure, cost structure and liquidity risk. Structurally they are usually grouped into the following four blocks:

1. Call liquidity risk: This relates to both assets and liabilities. Drawings under an option facility may be executed. Deposits can be withdrawn heavily at the earliest date possible instead of being prolonged.
2. Term liquidity risk: Payments deviate from the contractual conditions. Repayments may be delayed for example.
3. Funding liquidity risk: If an asset has not been financed congruently, the follow-up financing may have to be done under adverse conditions, i.e. at a higher spread. In extreme cases, funds may even be withdrawn heavily as explained under call risk.
4. Market liquidity risk: Market liquidity relates again to assets and liabilities. Adverse market conditions may reduce the capacity to turn marketable assets into cash or to fund the required quantity. A combination of both effects is possible as well.

Furthermore, we know that liquidity is just one element to be watched and managed within a bank. Applying a categorisation as is common in the business literature, one can start with business risk, go to customer risk, add the trinity of market, credit and operational risk, and close the circle with auxiliary risks (Figure 1.2).

As all the other items have a formative influence on liquidity status, it follows that liquidity is not a driving element but is of a subsequent nature. The question then arises about the importance of its role within the large frame of issues and risks.

1.1.2 What is the issue about liquidity?

Experience shows that most of the time it is plentiful. There are periods when it is somewhat scarce and thus at a premium pricewise. As soon as we start to consider longer periods, these differences in price will average out. Movements in spreads are not dissimilar from what a bank may experience in its other market segments. This cost is sustainable by a bank and rather a question of optimising return than securing survival.

However, it is a characteristic of liquidity that it has to be available all the time and not on average or most of the time. Payments have to be executed on the day when they are due, or the bank is declared illiquid if it fails to perform. Statistically, the chances of this happening are very low. But if it happens, the effects will be severe and could be fatal to the bank. No manager can sensibly take such a risk and play with the investments of shareholders.

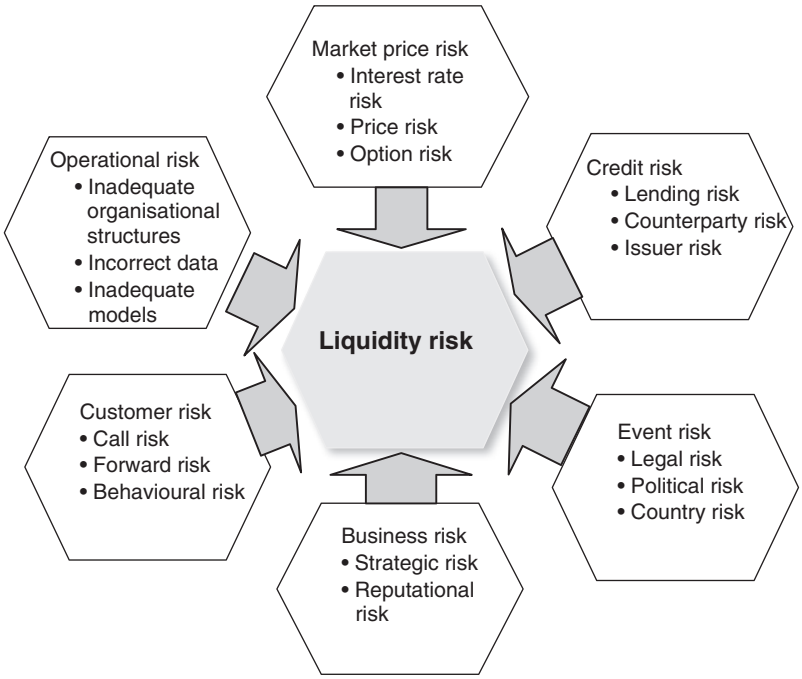

Figure 1.2 Liquidity risk as one element of banking risk
(*Source*: Adapted from Bartetzky, 2008, page 11)

When talking about potential illiquidity, one should not concentrate on just the extreme case. Clearly, the ultimate stress model one can think of has to be analysed. However, this case should not be the main concern of a liquidity manager for the following reasons:

- Firstly, it is hard to imagine a single liquidity controller who would miss this. The ultimate stress case is definitely on the risk report.
- Secondly, the chances are that this stress will closely resemble something like the biblical Flood. Should one therefore build the financial equivalent of Noah's ark for this?
- Thirdly, if one did, business would be greatly restrained and earnings curtailed. This again cannot be in the interest of management.
- And lastly, liquidity strains occur more frequently on a level less severe than the Flood but still sufficiently dangerous to interrupt business for a while, making it necessary to alter the business strategy of the company, or at least elements of it.

Those people and committees responsible for securing an appropriate liquidity status in a bank will aim to keep the various types of risk at acceptable levels as well as in the form of a weighted equilibrium. Taking these goals into account, any liquidity policy has to consider the aspect of securing payment obligations on the one hand as well as allowing a subsequent earning-related business strategy on the other hand. In other words, the extremes of total neglect and the equivalent of the Flood cannot be part of the policy applied.

In the process of formulating any policy it is helpful if one can refer to the experience of similar institutions, or, better, to adapt generally agreed rules. For some aspects of banking

significant progress has been made in this respect. On the question of capital adequacy, the systematic to rate customers that the bank is exposed to or the principles applied to assess market risk for example, rules exist which are comparable beyond national borders. As these rules are similar, it helps banks to refer to an accepted standard while allowing them to compare institutions against each other. Unfortunately, that stage has not yet been reached regarding liquidity. National rules applied by the respective supervisors can still differ greatly from country to country. Endeavours towards reaching an effective and comparable systematic for liquidity as well are on their way, but for the time being it means adhering to national rules and, in case they do not keep up with the complexity of one's own institution, developing liquidity concepts which appropriately cover in-house needs.

1.1.3 How to look at liquidity

As stated earlier, liquidity represents a qualitative element of the financial strength of a bank or institution. Although true, management looks at liquidity in a more practical way and generally differentiates the following aspects (Figure 1.3).

1.1.3.1 Level of aggregation

In our case, aggregation incorporates several dimensions (Box 1.2) such as amount, currency and time factor. Which level to choose is not easy to advise. Supervisors or controllers seem to have a preference for rules on an aggregated level. No doubt the latter has the advantage of concentrated information with few figures to deal with. It is almost inevitable that the highest possible level will be aggregated if one wishes to use ratios. They have become very popular. Ratios are relatively easy to benchmark and to compare. Moreover, there is no need to look at many details. What weight do we then put on the question of currency mix?

- For a bank hardly extending its activities outside its own currency area the answer is easy. There will be the odd payment in foreign currency. It has to be taken care of within the frame of correspondent banking. Moreover, we do not seriously distort reality if small amounts are shown in local currency equivalents.
- It is a different matter in the case of large multi-currency banks. They may have sufficient liquidity overall, but concentrated in one or a few currencies. As long as markets work in

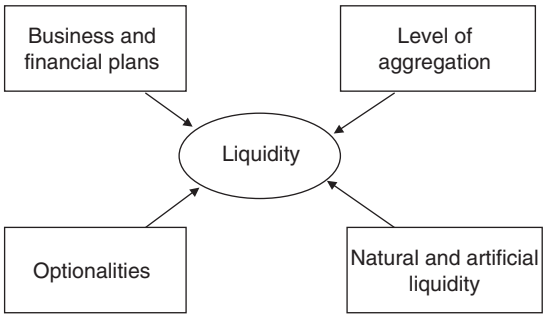

Figure 1.3 Aspects of liquidity

Box 1.2 Principle to be applied for aggregation

Keeping all the possibilities and the respective implications in mind, one can only advise maintaining information on liquidity as detailed as possible, even if it is not required by supervisors and controllers.

a satisfactory way, balances can be closed in time through short-dated foreign exchange transactions. At the moment disturbances occur, the system may no longer work smoothly, however.

- In cases where geographical locations are far apart, we may be acting in two different time zones. Clearing deadline in Tokyo tends to be at midnight in New York, i.e. outside working hours. Furthermore, amounts may be out of the general pattern from time to time. In both cases a proper infrastructure as well as working relationships with banks in foreign centres are required to cover larger liquidity needs in a short period of time.
- The potential danger of illiquidity is not limited to main currencies. Failing to perform can also stretch to modestly used currencies and still be followed by severe repercussions.

1.1.3.2 Natural and artificial liquidity

Natural in this sense relates to flows from maturing assets or liabilities. Artificial liquidity is created through the capacity to transform an asset into cash before the maturity date is reached. The process can be achieved, for example, through a sale or a repo transaction with the market or by using the instrument as collateral with the central bank. Technically, it is known as shiftability and marketability. Assets with these characteristics are thus generally called 'marketable'.

There are two points which we should introduce now. They will be important when we address the question of forecasting implications under various scenarios:

- For most of the time a specific security may easily be transformed into cash. The market for this product is mostly deep and wide. As long as a single firm wishes to turn a security into cash the market is capable of absorbing the transaction. Even the price of the security will not be negatively affected. As soon as large groups of investors are faced with the same needs, the market may become out of balance. It may take longer to execute the desired volume. At the same time, sellers may be faced with a shift in pricing against them.
- Natural liquidity refers to the legal maturities. Especially in banking, a transaction with a customer at maturity is often rolled over, either for the same amount or a smaller/larger one. The customer base in total behaves mostly in a rather predictable way. For specific portfolios one will experience a pattern in prolongation. This is true not only for assets but also for liabilities.

The main point is that customers expect certain behaviour from their chosen institution. They want to be sure they can reinvest or borrow again after the prior transaction has matured. Commercial customers need working capital. The nature of each drawing may be short term but the line will be used frequently. The relationship they keep with the specific bank includes a basic understanding of reliability: namely, that business will be continued. The legal view

Box 1.3 The term 'optionalities'

The term 'optionalities' expresses the commitment of a bank equal to that of an option seller.
Optionalities can relate to assets or liabilities; on- or off-balance-sheet transactions.

on maturities to assess future gaps in liquidity neglects all these expectations. Leaving your customers out in the rain undermines your franchise and thus your own future as a bank. If any liquidity policy aims at surviving not only as a legal entity but also as a bank with its customer base intact, a different approach is required. We call it the 'business view', in contrast to the legal or accounting perspective, an approach which takes into account that the franchise is too valuable to be neglected.

1.1.3.3 Optionalities (Box 1.3)

The option market, whether exchange traded or over the counter (OTC), has increased impressively in the last few decades. The number of option buyers has spread through all markets. They are willing to pay a premium for the right to choose whether or not to execute the contract at the agreed respective date. Simultaneously, their counterparts have grown in numbers as well. Ready to wait for the decision of the buyer, they receive compensation from the buyer in the form of a premium. The magnitude of some markets has reached levels which have made it advisable for supervisors to introduce controls and some restrictions.

The risk is asymmetric between counterparts in options. The buyer of a contract for paying a premium can choose whether to execute the deal or not. The buyer's maximum cost is defined by the premium paid. The earning potential, if the market goes the buyer's way, is only limited by the extent of the market move. For the seller of an option it is the reverse. First the seller gets a premium but then price movements of the respective product determine the seller's earnings or losses. Such earnings are limited to the premium received. Losses are a result of market moves against the seller. That is the principle, although any position will be managed and not left to the mercy of the market.

Liquidity in this segment can be affected in three ways:

1. The pure cash element: Whatever is 'paid' for premiums or losses, it will be an outflow of cash. And whatever is 'received' as premium or profit is an inflow of cash. To compute the effects on liquidity after options have been revalued may be cumbersome but is not difficult. To assess the future flows to be generated by options is, however, a challenge. Flows will depend on market price behaviour, which in itself is not predictable. The best one can go for is approximation. Today there are techniques available to do this. They are not perfect but give an acceptable degree of information on what might happen.
2. The seller of options may feel uncomfortable with the position held and thus will try to reduce or even square it. The principle one is working with is based on the assumption of moving quickly and with negligible loss, i.e. assuming a perfect or at least an absorbing market. A tightening in the derivative market could pass through to the cash market if too many position takers were to undo their exposure at the same time. The reason could also lie in the cash market itself due to systemic liquidity problems. Either way, risk parameters are no longer the same. It will take longer to get out of a position and almost certainly

prices will move against the seller. As a consequence we will have to cater not only for normal but also for stressed market conditions as well.

One may argue that the respective implications on profit and loss just mentioned should not be related to liquidity but to earnings. This is a valid point, but only in principle. Where margin calls are standard there is a specific injection of liquidity required, be it at the end of the day or during the day. It does not help to create earnings somewhere in the bank and compensate them with margin requirements. Earnings may not be followed by a corresponding flow of cash. Depending on bookkeeping and market rules, accounting for earnings may deviate from the actual flow of cash in timing. Furthermore, even if cash does actually flow, it may not be available at the place and time needed. Thus margin accounts have to be managed properly and separately to avoid failing to fulfil payment obligations. This point was addressed earlier when we discussed the proper level of aggregation (1.1.3.1).

3. For many institutions it is the third aspect related to liquidity which can alter cash flows significantly as well as abruptly. Banks and in particular commercial banks support and service their client base with standby facilities. Clients need them for possible and unforeseeable events when cash need rises beyond the normal credit lines granted. Lines of credit for working capital are one channel. Depending on seasonal fluctuations in sales of goods and services as well as payment patterns, utilisation of the line may oscillate within a wide band. The movements may be smooth or jumpy and volatile. Standby letters of credit and CP backup lines belong to the same group of standby facilities. It is common to both that they are not used for primary financing. Utilisation of these lines will be triggered only when the channel of primary financing is closed for whatever reason. Over the years banks have rarely been called to back up. To provide and develop this kind of service became attractive. Without actually lending and using much capital, income was still received in the form of fees. However, the magnitude of the risk involved for many a bank materialised during preparations for Y2K (switching computers to the year 2000). On looking into the matter it soon became apparent how a simple technical failure in IT could trigger an injection of liquidity by the guaranteeing bank. And the potential sums involved often were not at all small.

   Security settlement and clearing as well as correspondent banking services are further areas. Within limits customers can draw on the bank at their discretion and debit or credit their account respectively. In various countries borrowers in the mortgage market are given the right to early amortisation and repayment. In other words, the cash can flow earlier than originally agreed.

From a purist's point of view, this definition may have stretched the term 'option' somewhat. There are, however, good reasons for putting all these banking products under a single heading. They have one thing in common: once the bank has agreed to provide the service, it has largely put itself into the position of an option seller. Whether or not, when and to what extent the option will be utilised are solely at the discretion of the option buyer – the bank's customer. The amounts of required cash can be very substantial, but hardly predictable.

1.1.3.4 Business and financial plan

Within the planning process of a firm, strategic decisions concerning short-, medium- and long-term goals are made. Elements can be enlarging or reducing investments, entering new markets or market segments, or changing finance-related business activities on assets as well

Box 1.4 Liquidity and business policy

Business policy impacts strongly on the liquidity structure of a bank. The former has thus to be looked at as a 'driving' force.

as liabilities. They are an important source and should not be neglected when anticipating future needs for liquidity (Box 1.4).

For our later analysis we must stress two vital principles that we get from this process:

- Firstly, liquidity is too often looked at from a static point of view. To a certain extent it has to do with both the need to collect data and to report them to banking supervisors. What one gets is the outlook based on the accounting data from yesterday or the last month end. It is similar to planning a trip and basing the weather forecast on the conditions prevailing during the previous week. However, what is needed is a dynamic approach where actions affecting the future status of liquidity are incorporated to the largest extent possible. The process of business and financial planning supports this need – at least for effects derived from management decisions.
- Secondly, when net earnings are calculated a firm will follow accounting rules. Accruals, revaluation earnings/losses on assets and liabilities, amortisation, just to mention some of the items, are taken to arrive at the result. Not all of them trigger a corresponding flow in cash. In fact it works in two ways: some of the income and cost of the accounting period presented will induce a flow in cash at a later date. In the case of long-term credit lending, for example, earnings are calculated on an accrual basis. In accounting terms, for each day and thus each month, the precise income is computed and shown. According to the contract, interest will be paid in intervals of 3 or 6 months. Cash thus flows only in longer intervals and not daily or monthly. When bought securities are revalued, the result is reflected in the profit and loss statement of the period under consideration. The cash will flow later, either at maturity or when the security is sold. Conversely, we will recognise cash from payments made and received from transactions already considered by accounting in earlier periods. As a consequence, as much as integrating planned activities help to assess future flows, a high-level view is not sufficient. One has to work with a precise time schedule.

1.2 THE MEANING OF LIQUIDITY RISK

In the previous section we looked at liquidity and some of its major determinants. We recognised how important it is to be clear about the strategic goals: the franchise one wishes to protect puts limits on flexibly adjusting exposures in order to lower the cash needed. Acting as an option seller opens up a whole range of channels through which cash may be drawn. Whether or not, to what extent and when cash is called for are largely open. Planning in the sector of option-related products requires the use of methods of approximation and probability. We also fully appreciated that liquidity is flow of cash. The term does not include any monetary value if it is not turned into cash in the period under consideration. The change in one's status of cash and flow of cash does not, however, necessarily imply any risk at all. As an institution you may still be in a position to fulfil your obligations to pay as, when, where and in the currency and amount needed.

Box 1.5 Definition of liquidity risk

Liquidity risk represents the danger of not being able to fulfil payment obligations, whereby the failure to perform is followed by undesirable consequences.

So the danger is that you cannot fulfil your obligations and the failure to perform may have undesirable consequences. The term 'danger' has been used on purpose, although the condition is usually expressed by the term 'risk'. The expression 'risk' in many understandings simply means a deviation from the expected outcome. The concern in our case is limited to an undesirable deviation, because, if it were not undesirable, why should we concern ourselves? Thus, our general understanding will be: liquidity risk is the possibility that the capacity may not be sufficient to fulfil payment obligations when and where they fall due (Box 1.5); that not performing the duties in full will have undesirable consequences up to and including company failure.

Before entering more deeply into liquidity risk let us review some strongly related items, namely solvency, interest rate risk and market risk. Each one has its own characteristics. At the same time they correspond partly to each other but definitely with liquidity risk. In later chapters we will refer to them time and again. Therefore, we will start with a common understanding of how to use these terms.

1.2.1 Liquidity versus solvency

To be solvent signifies being able to cover losses. They may occur for various reasons like too high a cost base compared with earnings (business risk); loans may not be repaid as some of the customers have failed (credit risk); trading positions may have gone wrong (market risk). On the operational side (operational risk) significant costs may have occurred through legal compensation or fallout from technical systems, to mention a couple of possibilities.

The risks may materialise singly or in combination. In any case, if for any of these reasons the profit and loss account turns negative, payments have to come out of a buffer, which is the capital of the company. The Basel Committee emphasises the importance of capital in particular as it declares the ratios of credit and market risk to capital as key elements of supervisors' control. Does that mean the lower the risk ratios and thus the bigger the capital buffer, the better the quality of solvency and hence the smaller the liquidity risk? Is it a possible chain reaction?

In a certain way, yes it is, but with some reservations. Reserves in the form of capital are available to bear for the losses. As long as capital can cover losses the company is solvent. Can it also pay the bills? Not necessarily. Capital may be invested in assets which cannot be turned easily into cash. Payments are to be made in cash, however. If payments cannot be fulfilled the bank will be illiquid, with all the consequences following that situation. Obviously, a company can be solvent and illiquid at the same time.

What then is the relationship between solvency and liquidity (Box 1.6)? Solvency is a condition of having sufficient capital to cover losses. In a narrower sense solvency is an expression of capital adequacy. In a wider sense solvency requires additionally having ready money available when payments have to be fulfilled. In other words, a sound capital base is a necessary condition but is not sufficient in itself. A link also exists the other way around. To be liquid requires being solvent in the first place. If a firm is left without capital it will not have ready money to pay the bills.

Box 1.6 The relationship between solvency and liquidity

A positive status of solvency is a precondition for being liquid. As liquidity, in contrast to solvency, is solely cash related, it is possible to be solvent and illiquid at the same time.

There is a third link as well. Liquidity as flows of cash is very much determined by the behaviour of the customer base and business counterparts in general. For them, the status of solvency indeed influences their relationship with the bank. This is not limited to their considerations of whether to invest with your bank in whatever form, e.g. deposit with you, buying bonds issued in your name or holding shares in your company. Your status also affects your asset side. The customer base, for the sake of its own financial stability, inevitably watches and assesses a bank in respect of willingness and ability to secure their own financial needs – at least within a certain framework.

In one way or another, we touched upon these elements when dealing with the customer franchise. The angle then was a different one. There we put forward the question of how flexibly management can act on restricting cash outflow, when it wants to protect its customer franchise. This time, we will have a look at the customer base and ask how it will react in the light of status regarding solvency.

How then do counterparts form a view about the condition of solvency and liquidity? It is too early to go into details at this time. At the moment there is only one fact we should keep in mind. No outsider, whether customer or market, knows the liquidity status of an institution. A view will be formed based on various information but not on detailed knowledge. Thus one could say that it is not so much the actual status, but the perceived status, which directs their actions. Whether or not the perception reflects the truth has no immediate impact on their behaviour. As we stated earlier, liquidity is neither an amount nor a ratio. It is a qualitative element of a firm's financial position.

1.2.2 Liquidity versus interest rate risk

We covered this subject briefly when referring to the business and financial plan (1.1.3.4), stressing why focusing on cash is crucial.

At first sight, both liquidity and interest rate risk can be viewed in a similar way when it comes to gapping. If, from lending to customers, one has got an interest exposure 6 months long in an amount of 20 million euros, the risk manager has various choices on how to handle the risk. But let us assume that the decision enters into a compensating transaction, e.g. borrowing the same amount for 6 months. Now the interest rate (IR) risk position is fully closed. That is the example on interest rate risk. On liquidity it works the same way. As long as borrowing and lending are equal in amount, currency and tenor, the positions are closed and any gap is eliminated. In a way, a systemic relationship exists between gaps in interest rate and in liquidity, given certain conditions. We will now evaluate the conditions by adding further instruments related to on- and off-balance-sheet transactions.

In the following example (see Figure 1.4 and Table 1.1) we enter into a few money market transactions in cash and compare the gaps in the interest rate and liquidity positions respectively.

In order to distinguish clearly the effects on the liquidity and interest rate sensitivity reports respectively, we will address the issue in three steps. We start with some short-term transactions

Assets:	(1) 100 units 6 months of advances to customers (2) 50 units 3 months of CP bought (3) 30 units 5 years of floating rate loans with 6 months of rollovers (4) 20 units 2 years of floating rate loans with 3 months of rollovers
Liabilities:	(5) 70 units 3 months of customer deposits (6) 20 units 3 months of customer deposits (7) 80 units 1 month of interbank deposits (8) 30 units 6 months of CP
Hedge:	(9) FRA bought 100 units 1–6 months
Current:	(10) The sum of assets to be financed, i.e. (1) till (4) (11) The sum of liabilities to be financed, i.e. (5) till (8)

Figure 1.4 The transactions used

and later add long-term commitments with interest rates adjusted during the lifetime of the contract. Finally, we hedge part of the interest rate position with a derivative contract (FRA = Future Rate Agreement).

We recognise the gaps on both sides as being equal. The lack of deviation derives from the fact that interest rates are fixed for the same period as applies for liquidity. If we take transaction 5, for example, the interest rate is fixed for the period of 3 months. In this case it coincides with the contractual period, which is the determinant for liquidity.

In Example 2 (Table 1.2) we continue using cash transactions only, with one alteration added. Some of the transactions are of longer maturities with interest rates fixed in shorter intervals (so-called floaters).

Although we still stick exclusively to cash transactions, the systemic relationship recognised in the prior example is broken. Gaps are not equal. While liquidity is using as its parameter the tenor when cash actually flows, interest rate gaps are determined by the structure of interest payments. When taking transaction 4, for example, the underlying commitment relevant to liquidity is for 2 years; the interest rate is, however, fixed for 3 months only.

When interest rate risk is managed in a commercial or financial institution it is not done with cash instruments alone. Very often cash may not even be used primarily. Interest derivatives such as futures, swaps, options, swaptions, etc., play an accepted role in risk management.

Table 1.1 Example 1: transactions 1, 2, 5 and 7

Month	**Liquidity Report**		**Net**	**IR sensitivity Report**		**Net**
Current	−150 (10)	+150 (11)	0	−150 (10)	+150 (11)	0
			—			—
1		−80 (7)	−80		−80 (7)	−80
3	+50 (2)	−70 (5)	−20	+50 (2)	−70 (5)	−20
6	+100 (1)		100	+100 (1)		100
			—			—
Balance			Nil			Nil

Table 1.2 Example 2: adding transactions 3, 4, 6 and 8

Month	Liquidity report		Net	IR sensitivity report		Net
Current	− 200 (10)	+ 200 (11)	0	− 200 (10)	+ 200 (11)	0
			——			——
1		−80 (7)	−80		−80 (7)	−80
3	+ 50 (2)	−70 (5)	−40	+ 50 (2)	−70 (5)	−20
		− 20 (6)		+ 20 (4)	−20 (6)	
6	+ 100 (1)			+ 100 (1)		100
		−30 (8)	70	+ 30 (3)	−30 (8)	
2 years		+ 20 (4)	20			
5 years		+ 30 (3)	30			
Balance			Nil			Nil

Irrespective of their risk behaviour, when utilising them, no payments of principal are involved. The differences between interest rate and liquidity gaps may thus be even more accentuated.

For illustrative purposes we leave physical deals as in Example 2. However, to reduce the interest rate risk, the interest rate gaps beyond 3 months' maturity are to be closed with a derivative transaction (Table 1.3).

The interest hedge of transaction 9 has eliminated all gaps in interest exposure beyond the 3 months' period. As no principal and thus no cash are flowing, the liquidity status has not been affected at all.

The three examples tell us that the systemic relationship between risk in interest rates and liquidity exists under very restrictive conditions only. Transactions need to be in cash and with the interest rate fixed for the whole contractual period. Adjustments of rates during the lifetime of the contract and using derivatives cause gaps to differ.

In the extreme case where interest rate risks were created solely through derivatives, no position of payments of principal would occur on the liquidity balance sheet. Would that also mean that no cash would flow at all? Not necessarily, as there may be subsequent flows of cash. Transactions after conclusion undergo changes in value whenever the actual market price moves up or down. The trading instruments are usually valued mark to market on a daily

Table 1.3 Example 3: hedging part of IR position of Example 2

Month	Liquidity report		Net	IR sensitivity report		Net
Current	− 200 (10)	+ 200 (11)	0	− 200 (10)	+ 200 (11)	0
1		− 80 (7)	−80	+ 100 (9)	− 80 (7)	20
3	+ 50 (2)	− 70 (5)	−40	+ 50 (2)	− 70 (5)	−20
		− 20 (6)		+ 20 (4)	− 20 (6)	
6	+ 100 (1)	− 30 (8)	70	+ 100 (1)	− 30 (8)	
				+ 30 (3)	− 100 (9)	N/L
2 years		+ 20 (4)	20			
5 years		+ 30 (3)	30			
Balance			Nil			Nil

basis. Contractual agreements between the parties involved may demand compensation to each other daily for the balances accrued. To do so, cash payments are involved. Official exchanges have worked on this principle since the inception of derivative contracts. In the OTC market, compensating positive and negative values during the lifetime of a deal is not obligatory. Many participants nevertheless see the benefit in joining netting systems with margin calls attached. In this way credit risk exposures may be significantly reduced.

However, under any circumstance and if no intermediate compensation had been agreed, the required payments have to be fulfilled at the end of the contractual period, and this has to be done in cash. True, the amounts are small compared with volumes generated by cash instrument, where the principal is exchanged as well. With many of the big players the sum of cash changing hands every day due to margin calls alone can still be substantial and thus relevant for liquidity management.

There are further asymmetric conditions one can find when optionalities come into play.

We do not refer to the standby facilities, the group of options which, when utilised, trigger an outflow of cash. Assume that a customer suddenly and quite unexpectedly can no longer draw funding from the CP market. For this case the customer would have gained an assurance from the bank of a backup line. The customer will now utilise his or her right and the bank will pay on the basis of the agreement. In this case the bank's interest position will immediately be affected according to the specifications of the transaction. So also will the liquidity position, as the loan is a cash outflow with the specifications of the same transaction. Both the interest and the liquidity balance sheets carry risk as shown in Example 1 where the condition is a symmetric one.

What we are referring to is an asymmetric pattern as, for instance, with early amortisation. The mortgage loan may have been granted many years previously. Final maturity is still some years ahead. The bank at the beginning of the contract had secured funding and eliminated any interest rate risk. If the mortgage is paid back earlier, the bank has a new risk position in interest rates. The financial implications will depend on how far the present rates for the remaining period differ from the contractual ones. It could result in unexpected income or cost. Early amortisation also means having the cash back already, although the related funding has still not matured. In our definition of liquidity risk, there is none in this case. We certainly have the capacity to fulfil the payment obligation when it falls due, as cash has already been returned. In the short term, or till the maturity date of the funds borrowed, we are indeed over-liquid.

To sum up: based on typical bank transactions we compared implied risk on liquidity and interest rate in some detail. We found singular types of transactions where a symmetric condition is inherent. Indeed, there are also many types where it is not. What does this imply? Let us visualise a typical balance sheet of a bank, consisting of short- and long-term assets as well as liabilities. Then we look at the lines below the balance sheet with all the derivatives to hedge the interest rate risks and at the optionalities granted and properly listed. What are the chances of arriving at a predictable relationship between the two risks? One would say close to zero. Thus again it is advisable to have separate and detailed calculations. One should not be tempted to derive liquidity from interest rate gaps, for the sake of simplicity only.

1.2.3 Liquidity risk versus market liquidity risk

When we asked about how to look at liquidity, among other issues we differentiated between natural and artificial liquidity (1.1.3.2). The latter, we concluded, is created through the capacity to transform an asset into cash before the maturity date is reached. The term used to state the level of how easy or difficult the transformation may be is 'level of marketability'. Depth,

breadth and resilience of a market seem to be helpful indicators to judge a market's capability of turning assets into cash at negligible cost (Schwartz and Francioni, 2004, page 60f.).

The market size is a good first indicator. Marketable securities for example, be it stocks or bonds, generally are held by a large number of investors. The more there are, the greater is the interest declared to buy and sell close to above and below the prevailing price. The markets for German Bunds and US Treasury Bills fit well into this category. If larger orders are put into the market there are sufficient bids and offers in the pipeline to restore a reasonable market value.

Even if markets are liquid, prices are affected by specific determinants. A large portfolio manager for example or a group of market participants may decide to buy or sell an influential portion of a financial commodity over a very short period. The disparity in supply and demand will cause prices to move up or down. As long as a new level of market price equilibrium is found within a short space of time, the market has proven to be liquid.

More likely, markets are affected by news. Economic data may indicate future pressure on interest rates. Committee members of a central bank's policy body talk in a hawkish manner. A company's chief executive is delighted to announce increased earnings beyond market expectations. Whatever is said, the information will be analysed, digested and the new market price will incorporate the news. Indeed, most likely not at the level it was before.

To call an asset liquid does not imply a stable value irrespective of the period under consideration. Even the most liquid markets over time will see prices rise and fall. Nevertheless, the market has depth and width all the time. Larger sums could be placed short term.

Negligible in our understanding refers to execution cost. These costs are expressed in small or wide spreads and the accepted size of a single transaction. In other words, they reflect the level of liquidity of the market. When spreads are low, the market is liquid and capable of absorbing larger orders. Whether the market price stays at historic highs or lows is not the point. In a large market with no dominant or oligopolistic groups, the process of making decisions is widely decentralised. Whenever prices deviate from equilibrium a new sustainable level will be found. In a large, decentralised and transparent market the process of reaching the new equilibrium will take a short period of time. In other words, the market is resilient as new orders are soon available.

The shorter the period that the market maker has to wait for other orders, the more he or she will feel comfortable in quoting and holding resulting positions temporarily. In these market conditions the market maker can then lower his or her risk protection, of which the tightening of the bid-offered spread is one indicator. The volume of orders taken follows the same principle. A market maker who can assume the ability to replace larger volumes quickly in the market can also offer a fixed price for larger orders. If spreads are thus tight and transaction volumes large, a market can be said to be highly liquid. Execution cost then is low and therefore negligible for a liquidity manager.

But how liquid is liquid? Up to now we have referred to market liquidity in relative terms. Our assessment was based on how much the market can absorb in a given period of time. Implicitly one talks about a share or a percentage of the market volume outstanding: 1%, 2% or 5%? When it comes to volumes, equity markets cannot be compared with large debt markets. Even the company with the largest market value is small in comparison, and one has to look at each single stock. The same is true for regional debt markets or segments like small sovereign and company debt markets. In addition, when we consider that only a fraction of the total outstanding is available in the marketplace at any given time, we are talking about significant differences in amounts. Liquidity managers at times require large quantities, however. Here again the restriction applies: to hold assets of markets which are liquid is a necessary condition;

however, this requirement may not be sufficient when considering the volumes demanded and compared with the absorptive capacity.

From experience everybody will accept that small markets with only a few participants and low average daily turnover in relation to total outstanding are not liquid. If it takes days and weeks to absorb the holding it is definitely not prime liquidity in the view of a liquidity manager. The chances that this may change for the better soon are quite slim. What about liquid markets then – may they change for the worse all of a sudden?

The bigger the market and the better the quality of the issuer(s), the less likely this is to happen. However, it cannot be fully excluded. For a liquidity manager this is especially critical if the need for cash is primarily triggered by general market circumstances, such as a crash. In extreme conditions it may affect this manager's funding capability as well as using marketable assets in order to create cash. In such a case the problem is caused by the segments on which the liquidity manager relies for cash.

1.2.4 Ways to close the gap

Liquidity gaps do arise in the normal course of business activity. Referring to the examples presented above**,** we considered some normal business transactions to illustrate the respective effects on both the liquidity and the interest risk position. Now we will address the question of the form in which they may present themselves and how to deal with them.

1.2.4.1 General observations

Liquidity risk was defined as the possibility that the capacity may not be sufficient to fulfil payment obligations when and where they fall due, and that not performing the duties in full will have undesirable consequences up to company failure.

For commercial companies it is natural to have a surplus of assets over self-created liabilities in the form of capital, reserves and retained profits. In a stage of growing the business fast it would hardly be possible to accumulate in-house financing at the speed and volume necessary to keep up with assets. Even if it were possible, management in these companies would have learnt a long time ago not to do so for economic reasons. Going for capital is an expensive way to get financed. Mixing the company's own means with external financing from the market or a bank produces improved return on capital, at least for companies with a reasonable level of profitability.

Is this method of argumentation applicable to banks as well? When one raises the point with colleagues in the banking sector the answers are mixed. There are three basic lines of argumentation leading to the answers, as follows.

Many bankers are of the opinion that applying the argument to banks would be like comparing apples with pears. The reasoning refers to the different types of products employed. A chemical company buys the raw materials and sells chemical products. A car maker largely buys semi-produced components and sells finished cars. Even the travel industry partly buys hotel rooms for a season as well as airline tickets and sells holiday packages. The banks, in contrast, buy 'money' (borrow) and sell 'money' (lend). The distinction between money as a product and money as a part of finance is blurred and applying the argument to banking is thus not useful, so they say.

Representatives from large and in particular internationally active banks understand the distinction between money as a product (borrowing/lending as part of business in operating

units) and money as a part of finance (closing the remaining gaps through shareholder capital and wholesale funding). They tend, however, to disagree with the conclusions, i.e. to search for the optimal mix. Their business-induced balance sheet also carries assets that are much larger than the self-created liabilities. They argue that their product is money and not goods, but just like commercial companies they have to secure their financing through third parties because capital is too small a part to close the gap.

Savings banks, the third group, usually cannot follow this chain of argumentation. They stress their special client base in the retail sector. According to their experience, they claim that the behaviour of retail customers is stable. Deposits placed with them can be relied on. In fact, if they are driven at all, they are rather liability driven, quite in contrast to large and international banks.

If by and large the assessments of the various factions in the banking industry are correct concerning the position they are in, the majority in terms of numbers, i.e. the savings banks, would be in a comfortable position. Liquidity for them seems to be a non-event. Large banks on the other hand seem to be in the same boat as industrial companies. If this is indeed true, we may learn from the long experience from the latter.

1.2.4.2 The liability approach

The Comptroller of the Currency's handbook (2001, page 13f.) calls it liability liquidity. The institutions in this case are asset driven. Typically, their loan portfolio is a large, if not a dominant, item on the balance sheet. To close the financial gap, the banks refer to external financing. To do this, various channels and numerous products are available for tapping. Basically, one distinguishes between private customers, corporate customers and the financial market. Products range from savings accounts to money-market-related deposits, from CDs (Certificates of Deposits) and CPs to bonds and equities issued. In order to avoid becoming dependent on a single market segment, any funding policy has to be based on diversification. It might be done by products or investor type (Box 1.7).

When it comes to investor behaviour the funding sources available cannot be taken as one coherent group. The sensitivity to credit risk and interest rates, the reaction to economic and market conditions, as well as to the financial conditions of the funding bank, differ. The line drawn from experience is between retail and wholesale. The latter comprises funds from corporate customers and the markets. Tapping a specific market largely determines the maximum tenor of funds available. In the money markets a maturity of longer than 3 months is available but the vast majority of deals and volumes is performed in the short end. Investor sensitivity and maturities of funds will now be considered in more detail.

Retail funding Retail bankers and liquidity managers both value retail funds highly, but not for the same reasons. For the retail banker they are an important element of customer franchise. Once a customer keeps funds with the bank a relationship exists. Information at least about some of the means available for possible investments in securities or funds is at

Box 1.7 Determinants of liability funding

Liability funding is determined by the behavioural attitudes of the types of lenders. They may respond to name or institution as well as market-related conditions.

hand. In addition, these types of liabilities are relatively cheap and a source of income to the manager of the operative unit, if an interbank-related transfer price system with the treasury exists. Nevertheless, the natural focus of a retail banker is not funding.

The retail banker will endeavour to offer clients attractive investment products. They may be funding vehicles of the banker's own institution and thus mean only a liability switch. In all other cases, funds are redirected to third-party issuers or investment funds, causing a reduction in liability liquidity. As markets change, so do attractive investment opportunities. In periods of booming markets parts of retail funds will find their way into alternative products. On the other hand, when markets turn negative the more secure deposits may become attractive again – even at the price of lower nominal return.

Liquidity managers value retail funds for their relative stability and resilience. No doubt the market cycles just mentioned do affect the volume available, but over periods and usually not all of a sudden. The cost factor as well presents itself as somewhat different for liquidity managers. Funds may be cheaper for the retail manager, but if transferred at market-related prices the advantage to wholesale funds is rather negligible for liquidity management. Conversely, retail customers are less likely to withdraw deposits or fail to renew them because of some adverse developments or publicity at the bank. The reasons for this behaviour are manifold, whereby the deposit insurance scheme existing in many countries definitely plays a part which should not be underestimated. For the liquidity manager this relative stability is important as it provides a basis for assessing funding need.

On the other hand, it would not be appropriate to take the stability for granted. The rules set by German supervisors, for example, define a possible outflow for saving deposits under severe circumstances of up to 10%, although they are included in the deposit insurance scheme. We have to assume further that intensity of customer contact and geographical proximity have an impact as well. Retail customers in regions where the bank is less known will probably act faster than those in its prime domain where it may have been established and present for a hundred years or more.

The policy of attracting new retail customers has intensified in the last few years. In Europe, for example, interest rate levels at one point were extremely low, persisting over a long period of time. To attract this customer base, some of the banks offered deposit rates above the level in the interbank market. The volumes accumulated in a short period of time were impressive. Even a strongly performing equity market was not detrimental to the trend in Germany. Nevertheless, it poses some questions for the liquidity manager: What is the probability that rapidly accumulated retail flows will be as resilient as normal retail deposits? Can one put them in the same category as the traditional stock of retail funds? From a liquidity manager's point of view, a distinction and separation is crucial. A customer segment that has already shown a high level of flexibility is very likely to be equally agile.

In the introduction to this section we referred to diversification of funding by products or investor type. Regional proximity and intensity of relationship indicate an emphasis on customer type rather than on products. The application of this principle nevertheless requires detailed analyses and differentiated application.

Wholesale funding For many banks it is the wholesale market from which they get most of their funding. Their business strategy involves accumulation of assets for which there is not sufficient retail funding or their own means available. Providers of wholesale funds typically are large industrial and commercial corporations, banks and other financial institutions, government agencies and some smaller groups.

Using the wholesale market has benefits for the liquidity manager. The markets are made up of professionals and amounts offered can be large. It is an easy and quick way to cover substantial needs. Having to deal with professionals requires knowledge and consideration of the prevailing rules and specifications. Compared with the retail sector, specifications are more complex and often structured.

Professional managers act on behalf of their institution (commercial or financial corporation or bank) or their clients (funds). Being assessed on net return, they are highly sensitive to any deterioration in credit quality of the institution they invest in. Adverse movements in interest rates will also reduce the value of financial assets. Especially with the principle of valuing mark to market of more and more items on the balance sheet, the sensitivity to changes in interest rates has grown simultaneously.

Actual drops in wholesale funding can be substantial, even fatal. According to studies, including one from the Federal Reserve Bank of New York, four of the banks analysed each lost sensitive funding in the region of 25% of total liability within about 6 months (Matz, 2002, page 83f.). In the end all of them failed. This demonstrates that wholesale funds can be highly volatile and the consequences extremely harsh. We will thus follow up the question of whether there are marked differences and, if the answer is positive, how they impact funding policy:

- Unsecured funding: Depending on the bank, much if not most of the funding is done on an unsecured basis. Money market maturities range up to 2 years, but concentrate on periods up to 3 months. Most of the flows stem from daily cash management of companies and banks. In the process of managing daily payment in- and outflows, positive and negative balances do occur. What is required is an efficient and uncomplicated market where the balances can be squared without large administrative effort.

  The market for unsecured funds covers this need. The credit risk is managed and monitored through limits. Whether they are set generously or tightly is determined by the financial health of the institution one is ready to place deposits with. The nature of business requirements does not allow for accepting larger risks. Any deterioration in credit standing will immediately cause a respective downward adjustment in limits set for that institution. From a borrower's point of view, this type of funding can thus diminish rapidly.

  Unsecured funding can also be obtained by tapping the capital market, be it in the form of medium-term notes or bonds. The main purpose is not to use them as an instrument for managing cash but to finance longer term assets on the balance sheet. Because of the long maturities it will take years until repayment of these assets is due. Assessing the future financial health of the borrower so many years ahead is more difficult than gaining a perception of the money market instruments with a range of up to 3–6 months. The element of uncertainty as well as anticipation of the borrower's trend in financial strength is compensated by the spread to be paid. As a benchmark top-rated issues like Bunds and US Treasuries are taken. The more the perceived quality of a borrower deviates negatively from the benchmark, the wider the spread and the higher the interest to be paid will be.

  Textbooks usually list the credit quality of the borrower and also developments of interest rates as qualitative elements. Our observations indicate that interest rate moves no longer play such a vital role. True, if interest rates rise, bonds acquired before and at a lower rate will face a drop in market value. Their price will fall below the issue price. Portfolio managers for this reason do not invest as much in rates as in spreads. By hedging the underlying risk with a swap transaction, for example, their position is neutral and not subject to interest rate

fluctuations. The attitude of asset managers with a view to total return might be different. The value of their portfolio suffers whenever there is an interest rate hike. But take the case of a pension insurance company. Its long-term assets are set against long-term liabilities. Whenever interest rates move either way during their lifespan, at maturity, when payments have to be made to the insurer, the investment will be repaid at nominal value.

For a liquidity manager tapping the capital markets, interest rates do not seriously impair his or her funding capability. If the quality of the manager's institution is still perceived to be sound, he or she will get the funds. Indeed, because of higher rates, funding costs will not be as advantageous as before. Although wider spreads are thought to compensate for the higher risk, deterioration in the financial health of the respective institution is a different matter. This is especially so if the market perceives the deterioration to be the beginning of a trend to the worse; the willingness to invest in this borrower will diminish or even completely disappear. Even offering higher spreads may not compensate for the anticipated risk of the company failing.

- Secured funding: In the case of unsecured funding it is the status of the issuer which counts. In contrast, secured funding primarily relates to an asset which contains a risk value of its own, independent of the institution issuing it. The generic term 'asset-backed securities' (ABS) covers a wide range of assets and structures. Securitisation of credit cards, commercial loan portfolios or mortgage financing are just some of them. The issue may be plain or structured. The principles and effects will be explained using the commonly known and internationally actively used mortgage-backed securities.

  A bank financing borrowers in the property market inevitably will carry mortgage loans as an asset on its balance sheet. Without any further steps being taken they will be funded like any other general asset of the bank. Spreads to be paid will depend on the financial health, expressed as a rating. The mortgage loan itself is covered by the property it is financing. Its risk quality depends on the value of the underlying property. First-tranche mortgages (e.g. in Germany up to 60% of the property value) are assessed as a high-quality asset for which the market asks a low-risk premium and accordingly a small spread.

  A bank can choose whether or not to put secured assets into specific portfolios and get direct financing for it. Whenever the standing of the bank is rated as inferior to the security, it then makes economic sense to securitise the asset and not finance it through general, unsecured liabilities. In this case, costs for secured funding are lower, which is a benefit in itself. Improved price competitiveness is a further advantage, permitting the bank to grow without suffering in margin income. Benefits also exist even for highly rated banks. Markets for secured and unsecured funding are segregated. The bigger the part of the balance sheet financed on a secured basis, the lower the need for general financing in the unsecured market. For this reason many a bank enhances the rating of riskier portfolios in order to reach specific investors. The amounts may still be large but could be excessive otherwise.

  Despite the benefits the liquidity manager would do better to watch the particularities involved. As we have learned, a securitised portfolio gets its financing and the terms related to it on the back of its quality. It follows that deteriorating economic conditions of the bank will impair its funding capability in the unsecured market. As long as the assets in the securitised portfolios are still sound, their funding should not be negatively affected in any serious way. Actual cases support this conclusion. But what about the other way around? The market condition may decline in the segment that the securitised portfolio belongs to. Its funding may become negatively affected in price and also in quantity. If this is serious the bank will have to step in. As ultimate owner of the portfolio it may also be affected

economically and its unsecured financing may suffer as well. As we can see, segregating markets do bring benefits; if things become tight, however, it is not a universal remedy.

- Rating-related funds: It is a generally practised policy of investors to relate volume and duration of limits to the financial health of the borrowing institution. The stronger the borrower in financial terms, the higher the volume and the longer the maturities are the general principles applied. Within a wide band the scales usually follow a gradual line. There are exceptions, however.

  Supervisory boards and boards of directors may decide to put a threshold at the lower end to reduce credit risk further. The policy can often be observed in state-related firms but equally in commercial and financial companies. The threshold is expressed in a form of the minimum rating acceptable. If a borrower falls below the required rating level, the borrower's name is deleted from the credit limit list.

  A comparable system exists in the US CP market. It is firmly structured according to the ratings of agencies like Moody's and Standard & Poor's. The top market segment which demands top short-term ratings (e.g. A1/P1) combines the vast majority of all CPs invested in. The remaining grades get the small balance. In all of these cases the process is no longer gradual but dualistic. Above the threshold the borrowing capacity is large. If one falls below, the source will be drastically reduced or even dry up completely.
- Additional considerations: Funding, as one of the means to get liquidity, cannot be regarded in absolute terms. It would be wrong to believe that any strategy could ensure the protection of a company against adverse liquidity conditions irrespective of the severity and length of negative circumstances. It is particularly obvious when we define minimum growth and acceptable profitability as indispensable goals.

  The absolute best one could achieve would be to fund all assets congruently. The funding of each single transaction would be secured till maturity. But if the worse came to the worst, we could not replace maturing assets fully or even at all, depending on the severity of the condition. Thus, at best, one could be liquid at any point but at the same time be permanently taking assets off the balance sheet. In an extreme case, a skeleton of a legal entity would remain, but the bank as an active institution would surely have gone.

  Any liquidity policy therefore should aim at bridging short-term strains. In the case of prolonged negative conditions it should give management time to make and implement business decisions which are aimed in the long run at convincing the market to invest again.

  The terms 'secured' and 'unsecured' funding do not at all imply any maturity spectrum. The timeframe ranges from overnight to, say, 30 years. In a serious liquidity crisis, from experience the first week is the most critical period. If one can get through the first 90 days, the chances of survival increase. The aim therefore has to be to secure locked-in funding for these periods. On the liability side three measures are at the forefront to support the endeavour:
  - Since retail funds are to be judged as relatively stable, it pays to put management effort into keeping the share of retail funds to the total as large as possible. Finding ways of making it attractive for the retail manager to focus not only on assets but also on liabilities will benefit the liquidity manager at the same time.
  - Most liabilities from third parties are based on a contractual obligation to keep them invested till maturity. It is therefore very much in the hands of the borrower to decide on the periods to be locked in. Admittedly, there is a price to be paid for liabilities with longer maturities. However, it is a way of gaining time, either to bridge short-term disturbances or to allow management to take the necessary steps in case of prolonged negative economic conditions.

– When dealing with optionalities we discussed standby facilities. Liquidity might be scarce for any institution under specific conditions. Many of these conditions are not foreseeable and the need for additional funds might suddenly arise. To conquer such circumstances it helps to have reserves in place. In contrast to commercial companies, a bank should abstain from relying on backup lines committed by other financial institutions. If the trigger is caused by market-related circumstances they may be of a nature which is also affecting the provider of the facility.

It would be a serious misunderstanding to believe that the measures discussed above could be the solution to any liquidity problem potentially facing a liquidity manager. They are elements to support the *endeavour*, to prevent and if necessary to overcome a liquidity crisis.

Much will depend on whether difficulties are restricted to a single institution or concern wider market segments, such as in the case of a flight to quality, i.e. when flows are directed to best qualities only, even avoiding good quality expressed as an investment grade.

It is a comfort to know that reserves in the form of marketable assets are available in case of difficult circumstances. But will they still qualify to be turned into cash in the actual event?

One should aim to diversify funding and even consider having it balanced in such a way that not too many sources respond in the same way under a specific market condition. But how well does this anticipate potential occurrences and behaviour?

Before dealing with these aspects in detail we will first take a closer look at the assets side and evaluate its contribution in respect to closing the gaps.

1.2.4.3 The asset approach

Liquidity gaps are not just determined by actions on the liability side. Assets play an equally important part. In many, if not most, cases assets are the primary force behind gaps. How does this come about?

The overall and supreme goal of a private company is to produce net earnings. Banks are no different in this respect. Moreover, in banks earnings are primarily attributable to asset and fee income. Business policy is thus a driving force in determining the volume as well as the type and maturity structure of assets. As self-created liabilities (own means and liabilities collected by operating units) do not match assets, and in the case of international banks they miss it by far, the commercial-related balance sheet is one-sided. In other words, once all transactions of operating units are transferred to the liquidity manager, he or she will be faced with a funding gap which needs to be closed.

If one could assume the immediate availability of funds all the time and in the structures and maturities required in relation to liquidity management, funding could be called a non-event, of interest to a liability manager only, who would have to find ways and means to keep funding costs as low as possible. Unfortunately, the analyses of the various types of funding do not support the assumption of unlimited and stable funds under all circumstances.

After this short detour we will now focus on the assets themselves (Box 1.8). We deal with them in two ways. Firstly, as business policy is a driving force in determining the vital aspects of the asset structure on the balance sheet, the aspects will be dealt with separately. The following assets will be segregated according to their degree of being liquefiable.

Business-policy-induced assets Most probably, the biggest single impact derives from business decisions. The board may decide to strengthen the firm's market penetration on a

Box 1.8 Behavioural attitudes of asset liquidity

Within the asset structure, which is predominantly determined by business policy, the degree of asset liquidity is additionally influenced by market-related conditions.
Protecting the core business and thus the franchise defined by business policy will clash with liquidity related to maturities.

diversified basis. One way to achieve this is through a strategy of growth. The focus may be on a region not yet covered or on a segment often reserved for specialised institutions like direct banking – offshore or mortgage banking, for instance. Whatever the way taken, the more pronounced the path of growth, the greater the need for additional funds. Most probably, part of the gap might be covered through issuing additional equities in order to keep the capital ratio at an acceptable level. The larger part has to be obtained from the market, however. The implications are similar if the expansion concentrates on regions and product groups that are already part of business policy. As assets grow, so do the liquidity gaps and hence funding need.

Naturally, the contractual maturities are important. How does the tenor of the new business compare with the relative stability of liability segments? When assessing and monitoring liquidity risk it makes a difference whether the new demand for funding hits a stable or a highly volatile funding segment. In the process of evaluating proposals and taking business decisions these questions have to be analysed and answers must be integrated into the planning process.

From a wider perspective there is a further aspect worth analysing. It is one we touched on earlier when we discussed the meaning of liquidity: customer franchise. It would be brave to assume that all business activities relate automatically and exclusively to the group of core clients. Even with a sound and coherent strategy, there will be opportunistic business done to increase earnings. Opportunistic in this context means that business is done outside the formally defined and declared group of core customers. The opportunity will be attractive from a financial point of view as there is room on capital and funding to pick up the additional earnings. At times the amounts involved can be substantial, and can tie up remarkable resources. A securitised loan where one takes over a portion from the arranging bank is a classic example. No core relationship can be built in this way as the borrower has no contact with the ultimate investor. Conversely, when funding becomes extremely difficult there are these investments which are potentially available for reducing assets as no core relationship will be endangered. No doubt earning implications will be felt, but the franchise with core customers will not be touched.

There may even be some room with selected core customers. With normal funding conditions a bank may be willing to offer substantial sums for cash management purposes to large corporations on an uncommitted basis. If it gets tight the question is then: can we reduce the volume? As we deal with uncommitted facilities the answer is definitely yes, we can. If we do, what is the risk of endangering the relationship? The answer may be: it depends.

We can sensibly assume that a customer will be happier if the bank acts generously. The various degrees of contentment will hardly affect the bilateral relationship established. Producing a feeling of being dissatisfied on the other hand will probably have negative consequences. Within this range there is some room for manoeuvre, when push comes to shove. The degree of flexibility will differ from customer to customer. It must be sounded out in a sensitive manner if this route is to be followed.

Cash and marketable assets At first sight both cash and marketable assets could be decisive tools for any liquidity manager. Cash in hand can be employed to fulfil payment obligations at any time. Marketable assets can either be sold without delay or be repossessed in the market and generate cash on a secured basis. As for liquidity status, selling the asset makes funding obsolete and repossession means getting it financed through a repurchase agreement whereby the asset serves as collateral for the benefit of the lender. Either way, to the extent realised it will reduce the liquidity gap and thus present funding needs; that is, if all other things are unchanged.

In order to get a sound level of equilibrium, based on our present information we could derive the following principles.

Paid-in capital and accumulated reserves (own means) can be utilised for funding without restrictions. We also understand that a large part of (short-term) retail funds can be called stable – not absolutely stable and not under all circumstances, but with a high probability. In addition, funds with a long maturity locked in are stable funds till the final date.

The principle for equilibrium could therefore be as expressed in Box 1.9:

Box 1.9 'Long-term' funds versus 'long-term' assets

$$\text{Own means} + \text{Longer-term funds} \geq \text{Non-marketable longer-term assets.}$$

The expression indicates a simple correlation: as long as liabilities with a longer-term character are equal or exceed longer-term assets, funding for the period under consideration is secured. The period defined can be shorter than the lifespan of the contracts. For practical reasons we will apply a separation at the 1-year level, which is a commonly used period for segregating long from short term. Funding sources can be longer term due to contractual specifications, because they stay most probably longer term despite being contractually of a shorter-term nature, or simply stay as no automatic payback is envisaged.

Or we can address it from a different angle, which is more appropriate as we are presently dealing with assets. Shorter-term funds should not exceed the sum of primary liquidity and marketable assets combined. The reasoning behind this relates to the following consideration: in case liabilities maturing within the defined timespan are not prolonged or cannot be replaced with other funds, assets need to be converted to cash in one way or another. Three alternative routes are open to achieve the required effect: the bank already holds cash; it can rely on short-term assets maturing soon and not being prolonged; or marketable assets can be turned into cash before the maturity date is reached. That is, concluding in Box 1.10 from the expression above:

Box 1.10 'Short-term' funds versus 'short-term' assets

$$\text{Short-term funds} \leq \text{Primary liquidity} + \text{Marketable assets.}$$

This expression states that if the equation is fulfilled, any reduction in short-term funds can be compensated by utilising primary liquidity or taking marketable assets as a means to create the cash needed. The principles contain an element of logic. However, at this stage

we will not enter into details, although the delineation of each parameter would be quite a challenge. Instead, for the time being we will accept the principle and focus on the types of assets involved and their behaviour.

Primary liquidity What we called cash or ready cash is known under the technical term 'primary liquidity'. It is defined as reserves from cash in hand and all the deposits due which are held with central banks and other banks. As banks are not generally known to hold substantial quantities of banknotes in their vaults, we will neglect them in the further discussion. Cash is deposited with the institutions mentioned on the basis of being available on call. For practical purposes we will thus treat primary liquidity and cash/ready cash as equivalent.

Holding cash is not a way to employ resources in a profitable way. Maturities are the shortest one can imagine, and cash is placed with professionals and monetary authorities and not with customers ready to pay a credit spread. Cash holdings for these reasons are kept at a minimum level. Regulatory requirements and clearing needs are the two main elements which determine the volume to be held.

Some impact arises from the clearing process. Banks can clear either directly with the respective central bank or indirectly via another bank with the licence to do so. In either case one has to keep appropriate amounts with them as both of them execute payment orders within a strict regime of rules. Limiting credit or counterparty risk is one of them. Apart from a relatively small overdraft limit granted, orders will only be executed if cash is in the account. If payments received from third parties are not sufficient to fulfil the bank's own orders, cash has to be kept at or injected to the level necessary to guarantee the outgoing payments. In countries where minimum reserve requirements are applicable the regulatory amount held may exceed the one for clearing because, for the latter, the larger part of holdings with clearers is kept in the form of marketable assets. Furthermore, 'window dressing' also plays its part. The term means demonstrating to the community that the bank has got sufficient cash at hand. Thus at external reporting days, month end, quarter end and even more at year end, the amounts held are lifted for external purposes.

The cash amounts so employed during the day are already quite substantial for normal conditions. Earning considerations prevent banks from keeping significantly bigger volumes and thus from covering stressed situations as well. As a result, in case of lack of new funds the liquidity manager should not utilise this pot for asset financing. If so, he or she risks endangering the fulfilment of payment obligations with the potentially severe consequences up to illiquidity and failure of the institution.

From a practitioner's point of view, one may object to defining primary liquidity so rigidly. The question could be posed of whether including deposits due from parties other than central banks and banks as well would be more appropriate. When all is said and done, cash is cash, irrespective of the source.

But is cash really cash irrespective of the source? Technically speaking it would be, if it were not for the customer franchise. The money market among banks serves very much as the vehicle for cash management. Surpluses are deposited and shortages are borrowed among the community within the limits granted to each other. There, no relationship exists comparable with the one between a bank and its commercial clientele. Broking and electronic broking have established themselves as strong pillars in this market. Anonymity among the dealers involved is relatively high. Needs are covered with whoever in the community has got a matching requirement. The system works because of the multitude of participants and not because there are established financing agreements.

The commercial clientele, whether corporate or private, expects to be served according to its needs – at least within an agreed and established frame. The strategically defined core group makes up the bank's franchise. Individual demand for overnight money will fluctuate daily as it concerns a specific client. Looking at the group, however, the behaviour is rather predictable. Generally, the liquidity manager will sensibly integrate this portfolio into the planning process. To reduce the amount would imply the bank's declining at least part of the new customer requests. If that is done the franchise established over many years will suffer immediately. For this reason it is not advisable to touch this portfolio for urgent asset reduction – at least not as long as sustainable earnings is a policy goal.

Secondary liquidity or marketable assets Secondary liquidity reserves combine the stock of marketable assets that the bank or institution holds. The term 'secondary' declares marketable assets as the second most liquid asset class. In volume terms it is much bigger than primary liquidity.

There is a wide range of marketable assets known on the balance sheet. As products they can be equities, bonds, money market instruments like CDs and CPs, consumer lending, corporate loans, etc. They can be sold, used for repo transactions or taken as collateral. The transactions can be concluded with the market or with central banks. The assets can be kept on the bank's own balance sheet or put into a special purpose vehicle (SPV).

Marketable assets are the generic term for assets which are near cash, and can be switched into cash if required. Unfortunately, this does not say much about the time factor required to turn an instrument into cash. Some of them, like Bunds, US Treasuries, CDs, CPs, etc., are trading products with a respectable local or even global market. In case of need, the asset can be sold or repossessed. The same is true for other sovereigns (i.e. state issues), company bonds, etc. The market size of a product will differ depending on the quantity issued. So will the amount one can turn in a functioning market at negligible cost.

This latter point is very pronounced when it comes to equities. The size of the total equity market, expressed either in market value of the companies registered on an exchange or as the daily turnover of the shares, can be enormous. However, the market is very much fragmented. What counts is the volume available for a single equity, which is only a fraction of the total market. The amounts to be turned at negligible cost are thus significantly lower than in the case of Bunds and US Treasuries, for example. If one holds equities of non-registered companies, a bilateral buyer has to be sought. This will prolong the time to execution even more. There may be a comparable condition even if the company is registered on an exchange. If larger portions are held by strategic investors as in the past in Germany (the so-called Deutschland AG), very little of the total will find its way onto the market. Thus, despite potentially large volumes based on equities issued, the relevant ones meeting the marketplace can still be mediocre or small.

Declaring securitised loans as marketable in some cases can also be misleading. In certain parts of Asia, for example, it has not been uncommon to structure a simple loan as a securitised one, because it fitted the client's balance-sheet structure. The contract at the same time was enhanced with an understanding not to sell the securitised loan into the market. So-called 'lock-up' agreements have also been known in the CD market. In all these cases the label does not match what it promises.

Marketable assets can be of a plain vanilla (straightforward) or a structured nature. The structure may contain a range of credit qualities and/or derivatives. The less straightforward a portfolio, the more difficult it is for the potential buyer to assess the risk involved. Assets

with low ratings pose similar uncertainties. The assessment of risk takes time. Additionally, the market of potential investors for these types of assets usually turns out to be small. For these reasons the liquidity manager has to keep in mind that marketable assets of complex structures and thus of higher risk will not find a deep and wide market. To create liquidity from this source is most likely to be time consuming.

The diverse aspects of marketable assets regarding time needed and volumes possible, when it comes to creating liquidity, have to be considered in the course of ordinary business. True, this asset class is substantial in size but cannot be taken as one single block for all purposes. When setting up a liquidity grid with the gaps in the different time periods, one cannot assume structured assets to be available to cover short-term or even daily needs. If we wish to place collateral with the central bank to secure the execution of payment orders, we need sufficient assets of the type, minimum risk quality and to the extent required. These considerations already apply for normal conditions in the ordinary conduct of business.

If it were just for normal conditions, the amount of marketable assets generally kept would not be as large as it is. At times, liquidity may be extremely short. This may happen abruptly, triggered, for example, through larger amounts of standby credits drawn or a sudden reduction in deposits available to the bank in the market. In any case, it would be a bank-specific and not a systemic problem of the market itself. In such cases the liquidity buffer in the form of marketable assets would come into use. Which assets to choose is then a question of availability on the balance sheet and amounts required.

The picture presents itself differently if the market is faced with a systemic problem. Fortunately, such crises occur rarely. Nevertheless, even in the recent past we have seen a lemming-type flight to quality. Best qualities were assessed as good enough to get and keep; lower-rated marketable assets were avoided by almost everybody. In such cases a large part of the assets kept for creating liquidity when needed may no longer be marketable in reality. Such a systemic crisis, if lucky, may be short-lived. But even this is not much consolation to a bank if it coincides with its own specific needs.

To round off this section, marketable assets with all the considerations and restrictions can help to overcome or at least smooth the effects caused by short-term liquidity stress. In the case of any longer-lasting imbalance their utilisation at best can serve as a supporting measure, but the solution to the problem has to come from different quarters. Besides, any marketable asset needs to be of an unencumbered nature to be usable as a cash generating vehicle.

1.2.5 Intermediate Summary

The goal of this chapter was to constitute the basis for the subjects to come: liquidity as part of financial policy, followed by liquidity policy and management. In order to get a common understanding we had to go into considerable detail. It is an experience liquidity managers are used to. The terms ‘liquidity’ and ‘risk’ are used in various segments of banking and their interpretation has many facets. As far as possible we have tried to use terms that are commonly understood. We may not have succeeded in every instance.

As explained earlier, liquidity and liquidity risk still have not yet been developed into a coherent framework with generally accepted terms and methods. To penetrate the subject and get a better understanding of it resembles mapping hardly known territory. It is not so much the management aspect which has been neglected. This subject has been the focal point of recent publications mentioned at the beginning. Management of any subject cannot stand alone but has to be embedded in a frame of strategy and policy, as emphasised by Duttweiler (2008,

Box 1.11 Summary of relevant parameters affecting liquidity status

- Cash and its flow are the decisive items to compute and assess. They have to be brought into a frame of time sequences. Neither net earnings nor interest rate gaps correctly reflect balances from actual payments and receivables in the period considered.
- Liquidity risk concerns the future and not the past. Any concept or method applied needs to integrate prospective developments, whether directly or indirectly related to liquidity. From today's perspective some of them are predictable with a relatively high level of certainty, e.g. contracts falling due. Others can only be assumed, e.g. customer response, investor behaviour.
- Business policy is easily the most impacting single issue determining asset volume. The effects are not predictable but at least can be planned.
- In this context optionalities like standby facilities etc. are a special case. They are of a dichotomist nature, which means the effects are neither predictable nor able to be planned. Most probably, one will have to use scenarios.
- The power to attract liabilities for funding purposes depends partly on the price offered. In case the prospective credit risk perceived by the investor falls below a certain threshold, and which cannot be predicted, even wider spreads offered may not convince investors to take on the risk. Key business data such as capital ratio, sustainable earnings and asset quality will be taken as indicators to build perception.
- Liquidity policy ought to be integrated into the framework of business and financial decisions. Liquidity management can and must support the endeavour to achieve business goals.
- Any liquidity policy needs to focus on both assets and liabilities. Each one determines the size and shape of liquidity gaps. In the end, both sides of the balance sheet have to match, which is the minimum required.
- Not all groups of investors respond in the same manner to the problems of a bank. Retail customers react in a less volatile manner in speed and volume, but they do react. The group of wholesale fund providers, i.e. corporate and financial institutions, responds quickly and sometimes drastically. Nevertheless, some funds will remain stable and be prolonged. To enlarge the more stable segment and diversify funding in the second pillar should be envisaged in any policy.
- Stress on liquidity can arise from various sources and corners. Thus, one should not aim for a standard solution to the diverse problems. Specific situations require specific approaches. For example, having to deal exclusively with a bank-specific problem is a matter to be distinguished from dealing with it within a systemic crisis at the same time.
- Lengthening the maturities on market funding is a way to buy time. It does not solve the problem in the case of any long-term distress. Yet, gaining time gives management the opportunity to take and implement measures with the aim of rectifying the underlying cause.

pages 39–44). This framework has hardly been touched when it comes to banks, either by academia or otherwise. Yet personal experience has shown it to be of the utmost importance, for liquidity management is just one of the elements to be performed in a bank. As such it has to fit into a general business concept. Above all, its double function as protector and supporter of business as a going concern requires its integration in a balanced way. It is for this reason that understanding the basics has to be achieved.

Going forward we have to keep in mind the essential knowledge gained when discussing the basics. In order to have a comprehensive and easily readable set of parameters for reference, we attempt to filter them from the multitude of detailed observations discussed (Box 1.11).

Even when discussing basics only, it is obvious that business policy plays a part that is largely underrated in liquidity management. Experience leads to an attitude where being involved in business and financial planning is step number 1. Whatever the outcome of this process, it determines the basic liquidity structure in the future; that is, the structure which can be assumed to arrive within liquidity management from the activities of the operating units. Advancing the subject in this way allows a forward-looking approach to be applied on the one hand, and assessing the feasibility of such a route, given the funding capacity applicable to the institution, on the other hand. Liquidity management then has to follow and relate more to the proper doing, given a business-determined liquidity structure and possible conditions facing the liquidity managers.

Integrating the subject of liquidity into the business and financial framework of a bank has not been one of the strong elements in banking. Corporate finance is much more advanced in this respect. The following chapter will thus evaluate the possibilities to apply proven knowledge in the corporate sector to our question. Although we cannot assume to formulate a theoretical framework, we may at least be in a position to arrive at a practical perception.