MILLIMAN WHITE PAPER

Liquidity risk management:

An area of increased focus for insurers

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Section 1: The liquidity risk challenge

INTRODUCTION

Life insurers focus much of their attention on managing the risks they are exposed to that might impact their available capital. This makes sense, as maintaining adequate capital is important for insurers to instil confidence with all stakeholders that they have sufficient funds to continue doing business and meet policyholder obligations. However, the fact that a firm holds adequate capital does not guarantee a position of adequate liquidity.

In a similar way that an individual may be 'asset rich' (for example owning a valuable property) but 'cash poor' (not having any cash to spend right now), it is possible for an insurer to have an adequate solvency ratio and in spite of that run into problems from a liquidity perspective.

It is therefore important for firms to consider and manage their risk exposures from a liquidity perspective and not just from a capital perspective. Managing liquidity requires a different approach from managing capital and must often be considered over different, typically much shorter, time horizons. It can also require a different toolbox of management actions to address stressed liquidity conditions compared to what a firm might use to address capital concerns.

Despite the importance of effectively managing liquidity, guidance from insurance regulators in terms of their expectations of firms' liquidity management is less developed than is the case for capital. However, the International Association of Insurance Supervisors (IAIS) produced guidance to group supervisors in 2014 on how they might assess liquidity for Global Systemically Important Insurers (G-SIIs).[1] More recently, activity has increased and in November 2018, the IAIS issued a consultation on systemic risk that included a more detailed liquidity risk management framework.[2] In addition, in March 2019, the Prudential Regulation Authority (PRA) in the UK issued a consultation paper (CP) on liquidity risk management for insurers.[3]

In this paper, we provide some context for a discussion of insurer liquidity risk, exploring sources of that risk and providing some examples of where it has challenged insurers in the past.

We note that the incidence of major liquidity problems among insurers over recent history has been relatively low. However, as the standard investment warning goes—past performance is not necessarily a reliable guide to the future.

In that vein, it is important to keep abreast of the liquidity implications of evolution in many facets of the environment in which insurers operate. For example: product mixes are changing as unit-linked offerings predominate, investment strategies are changing to target more exposure to illiquid assets, increasing use is being made of central clearing for derivatives and there are shifts in the liquidity characteristics themselves of the underlying asset markets. The marked increase recently in regulatory activity around liquidity risk indicates to us that these 'shifting sands' are very much on the radar of the IAIS and PRA. In the latter part of the paper we have laid out a description of a liquidity management framework (LMF), cognisant of the regulatory guidance, but in a form that appeals intuitively to us and provides a platform for expansion. In future papers we will look in more detail at individual areas.

To illustrate how liquidity issues can affect an insurer, we consider the case of a US insurer, General American ("GA"), which experienced serious liquidity-driven problems in 1999.[4]

GA had significant exposure to short-term funding agreement contracts with institutional investors—deposit investment contracts used by US money market mutual funds. Many of these contracts had provisions whereby investors had the right to seek the return of their funds at any time with just seven days' notice. The chain of events ultimately leading to GA's demise was broadly as follows:

- The short-term funding agreement business written by GA was 50% reinsured to ARM Financial Group (ARM). Deteriorating financial strength led to a ratings downgrade for ARM.
- GA recaptured the reinsurance with ARM but suffered a ratings downgrade itself.
- Institutional clients became concerned and in August a number exercised their options to redeem funds.
- GA could not liquidate sufficient assets in the short time permitted by the contracts and found itself unable to meet the demands of its clients.
- GA was placed into 'administrative supervision' by the Missouri insurance regulator and was subsequently acquired by Met Life.

[1] IAIS (22 October 2014). Guidance on Liquidity Management and Planning. Retrieved 26 June 2019 from https://www.iaisweb.org/file/47800/liquidity-guidance-final (PDF download).

[2] IAIS (14 November 2018). Public Consultation Document: Holistic Framework for Systemic Risk in the Insurance Sector, Annex 2: Liquidity Risk Management (DRAFT). Retrieved 26 June 2019 from https://www.iaisweb.org/file/77862/holistic-framework-for-systemic-risk-consultation-document (PDF download).

[3] PRA (March 2019). Consultation Paper 4/19 Liquidity Risk Management for Insurers. Retrieved 26 June 2019 from https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/consultation-paper/2019/cp419.pdf.

[4] General American: A Case Study in Liquidity Risk – Moody's Investors Service, Liquidity Management for Life Insurers with Institutional Business - SOA.

There were a number of risk factors that contributed to the outcome:

- Very large exposure to a product embedding onerous contract terms on return of funds
- A concentrated client base of institutional investors
- Under-appreciation of the risk of the liquidity option and the extent to which its exercise might be correlated across the client base
- Use of a reinsurance partner with exposure to relatively illiquid assets
- The events occurred in the summer holiday period (August) when trading in the financial markets tends to be less active

The GA story provides an illustration of a sort of 'butterfly effect,' with a chain of unanticipated events eventually causing the insurer's downfall—in this case not due to issues of solvency but of liquidity.

THE LIQUIDITY CHALLENGE

When thinking about managing liquidity it can be helpful to visualise, at a high level, the system and the flows within it. Figure 1 provides a simplified illustration.

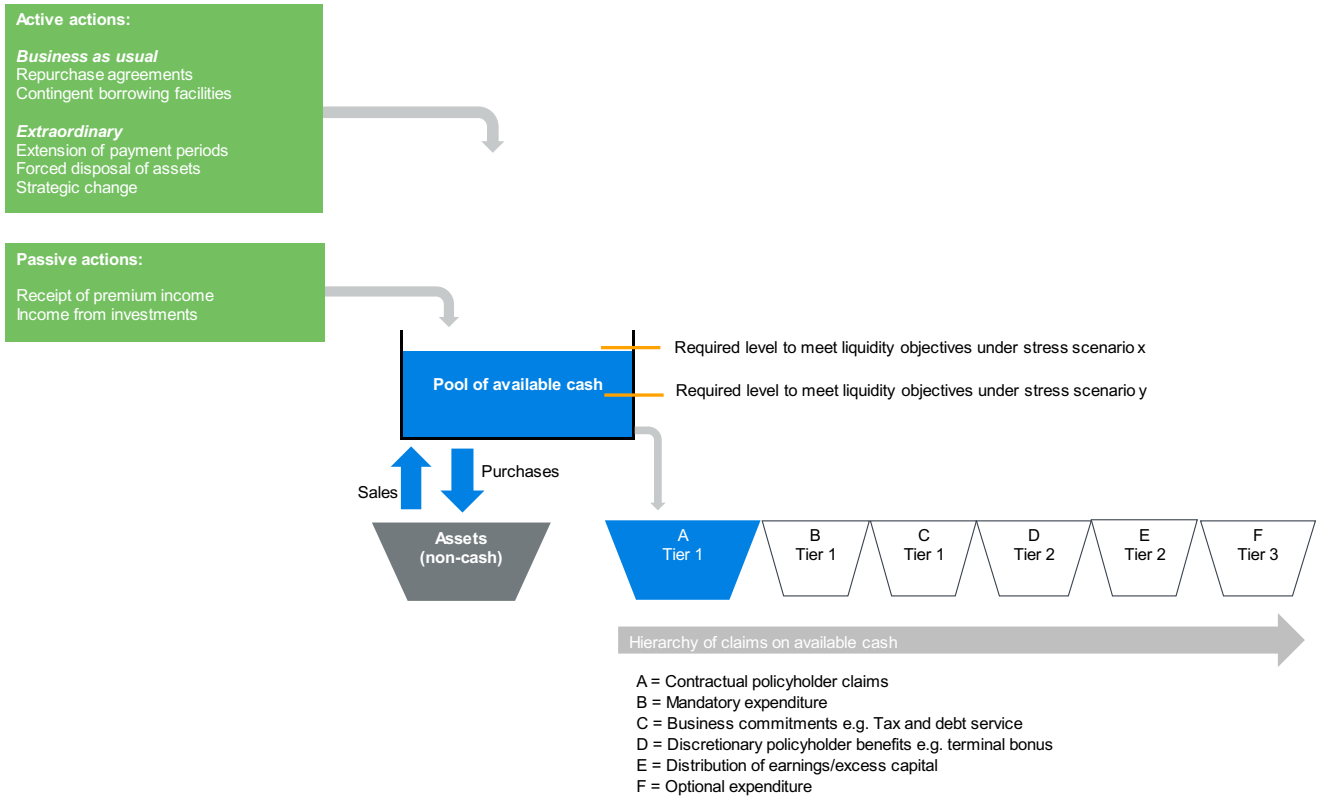
The challenge faced by a firm is to maintain the available cash pool at such a level that allows the various claims on cash to be satisfied. If the level falls too low some claims will go unmet, for a period of time at least, and there will be negative consequences from this. On the other hand, if the firm is too cautious and the level is kept excessively high then cash demands may be very secure, but adverse consequences will arise in other ways via opportunity costs. The objective, therefore, is to determine an appropriate level for the firm, understand how that level may vary over time and as circumstances change and establish a framework within which actions are identified, prioritised and executed to keep the level in the right place.

In particular, a firm needs to understand:

- When do the cash demand buckets get bigger or less stable?
- When do the 'passive action' flows get smaller or less predictable?
- When are the 'active actions,' considered under business as usual, inadequate?
- What are the adverse consequences of taking 'extraordinary actions'?
- How are all the above affected by any changes in the liquidity characteristics of our own assets and liabilities and investment markets in general?

When describing liquidity risks and particular scenarios to which firms might be exposed, we will refer back to Figure 1.

FIGURE 1: THE LIQUIDITY CHALLENGE



Claims on available cash

As individuals, we all need cash (or electronic equivalent) to carry out our day-to-day activities. However, some activities are more critical than others. For example, having the cash to buy food and water is essential, whereas having the cash to fund a planned holiday is something that can be sacrificed with less severe consequences.

Similarly, life insurers are reliant on cash to satisfy a range of operational and business demands. These demands can also vary in terms of how 'critical' they are. Meeting policyholder claims as they fall due will likely be considered 'highly critical' even in situations of severe stress. In Figure 1, this is shown as a 'Tier 1' demand item, indicating it ranks as a top priority call on the pool of available cash. On the other hand, the payment of shareholder dividends in stress conditions takes a lower-priority 'Tier 2.' Liquidity demands can therefore be broadly categorised into different 'liquidity demand buckets' with respect to how 'critical' they are to the business.

Under normal conditions, an insurer would be able to meet all demands with one (or a combination) of the cash holdings and other sources of liquidity it has available to call on. However, when considering scenarios where there may be inadequate liquidity to meet all demands, defining these buckets can help provide clarity around priorities, support decision making and avoid unpleasant surprises. In extremis, dividend payments could be reduced or postponed to mitigate cash demands but it is useful to understand the circumstances which might result in such action being necessary.

When setting out the liquidity risk challenge it can therefore be helpful for insurers to distinguish between the essential 'food and water' buckets which must always be filled and the less critical 'holiday' buckets the firm can potentially afford not to fill when there is limited available liquidity.

The investment in non-cash assets is a 'special' case of a liquidity demand bucket. A firm will seek to invest in non-cash assets to boost investment returns and to match the currency and duration of its investment portfolio to its liabilities (thereby reducing its exposure to interest rate and currency movements). Unlike the other demand buckets, the 'non-cash assets' bucket can convert back to cash by selling the assets or at redemption. How quickly and easily this is to do will be determined by the liquidity characteristics of the assets that have been invested in and of the markets within which these assets trade. Of critical importance will be how resilient the liquidity of the relevant markets is expected to be in the context of scenarios that contemplate varying degrees of stress impacting the financial system.

Making cash available

As individuals, to meet our liquidity demands we typically hold cash in the bank and in addition we have different sources for generating more cash (salary income, income from investments). There are also other sources of cash that could be used if needed but might only be called upon in exceptional circumstances (selling a car, taking out an unsecured loan or borrowing from a friend or family member).

Similarly, insurers typically hold a pool of available cash and 'cash-like' assets to meet their liquidity demands. Insurers are also often able to call upon other sources of liquidity which act as 'taps' to 'top up' the pool of available cash the insurer has. Some of these 'taps' might 'passively' top up the pool of available cash without any special action being required, such as receiving premiums from policyholders or income from investments (e.g., coupon payments from bonds). For the purpose of this report, we will refer to these sources as the 'passive' provision of liquidity. Other sources of liquidity need to be invoked by specific actions, which must be considered and planned in advance, such as the execution of repurchase agreements (repo) or drawing on borrowing facilities—we will refer to these sources as the 'active' provision of liquidity. Within this category some actions might be considered more 'business as usual' while others might only be contemplated under circumstances of an extreme liquidity deficit (cash demand is greater than cash available). We will refer to the latter as the 'extraordinary' provision of liquidity. Such sources may include the forced and premature sale of assets contrary to asset-liability matching (ALM) requirements, suspension of major projects and the reduction or cessation of new business, if it requires initial cash support.

When we need to resort to an extraordinary provision of liquidity and are contemplating the sale of assets to raise additional cash, we need a clear view on the relevant features of different asset classes and the markets within which they trade. Such a view can allow the assets to be allocated into 'Tiers' supporting decisions around the order of sales (e.g., sell Tier 1 first, then sell Tier 2 etc.). Firms will have their own approaches but fundamentally this requires an assessment of how liquid the market is for each major asset type and critically how resilient that liquidity is likely to be under scenarios of market stress. In turn, this will indicate:

- How quickly that type of asset might be sold
- How stable prices are expected to be
- What the costs of sale are likely to be, e.g., bid-offer spreads

Whatever assets an insurer sells to generate liquidity during a stressed liquidity scenario, maintaining a specific record is useful such that when the crisis passes the insurer has a clear view of the asset position it will likely seek to revert to under 'normal' circumstances. In practice, a reversal of all prior sales may not make sense or be practically possible, but the previous investment position should serve as a useful guide at least.

The need to tap into the extraordinary provision of liquidity can bring negative consequences for the business, and they should be taken into account when planning the order in which actions will be taken. Such consequences might take different forms, for example:

- Additional costs incurred by the firm from paying interest on borrowed money.
- A loss of value from selling assets at depressed prices and/or high spreads.
- Crystallising a capital gain and creating a tax liability, which may then result in further liquidity demands.
- Increased capital requirements from a deterioration of the ALM position.
- Opportunity cost from constraints on the ability to pursue the desired business strategy, e.g., rein back new business volumes, delay or suspend projects.
- Market perception (with potential impact on reputation and perceived creditworthiness).
- Not a cost as such but certainly a factor to consider is how quickly a measure can realistically be taken. If we need cash tomorrow a measure taking weeks or months to implement is clearly not a suitable response.

Getting the balance right

In this paper, we consider liquidity risk as uncertainty in relation to the adequacy of an insurer's cash supply to meet its cash demands over a defined time horizon.

Failure to ensure this can have significant consequences which can ultimately bring the whole viability of a firm into question. For example:

- If debts are unpaid, or paid late, it can impact the firm's credit rating and future access to borrowing and its associated cost.
- Delayed payments to service providers might result in costs from litigation and operational disruption.
- Not paying dividends can affect the share price and shareholders' willingness to inject further capital into the organisation in the future.
- Delayed payment to policyholders might result in reputational damage bringing increased policyholder lapses and loss of market share for new business. In addition, regulatory intervention may be forthcoming, perhaps involving redress, increased scrutiny and possibly constraints on future business activity.

As a start point, we might thus ask the question 'Do we have sufficient cash—both now and going forward?' Whilst this is the essence of the problem, to address the question we need to break it down and seek greater precision over what we really mean and what we wish to achieve, so:

- For what purpose(s)? Are we seeking cash to cover all demands or some subset according to a recognised hierarchy of priorities?
- If we do not meet all cash demands what are the consequences?
- In what circumstances? Adequacy must be judged in the context of a range of circumstances that might arise to impact both the timing and scale of cash demand.
- Where can we get additional cash from if we need it?
- How much cash is available, what are the costs and timescales needed to access it and how variable are all these factors in the face of certain stress events occurring?
- Over what time period are we considering the above questions?

Addressing such questions in a clear and coherent way is challenging but, in our view, essential to the effective management of liquidity risk.

When considering capital needs, many firms explore potential outcomes through the creation and evaluation of many thousands of scenarios encapsulating changes to the key risks and their codependencies. One day we may be in a position to apply a similar approach to the assessment of liquidity risk. In the meantime, our view is that deterministic scenario analysis on a much smaller, more focused and tractable scale will better support the development of increased understanding and communication of liquidity risk. When taking such an approach it is important to consider a wide enough range of scenarios to provide rich and meaningful insight into the dynamics of liquidity and to identify the key drivers of liquidity risk. As an illustration, let us contemplate a pandemic type of scenario. What would happen if something like the Spanish flu outbreak were to occur now?

- Claims on protection business (death and possibly disability covers) increase significantly as policyholders fall ill and die equals cash demand up.
- Premium income falls as policies are terminated due to claims or perhaps, in the case of savings contracts, lapsed to conserve funds by those now unable to work due to illness or caring for others who are ill equals cash supply down.
- Expenses are likely to increase, due to a need for temporary staff at increased cost to cover for absentees. That equals cash demand up.
- Asset prices may well fall as lost production impacts the economy and adversely affects assessments of company valuations and creditworthiness. If there is a severe imbalance of sellers versus buyers then market liquidity may

dry up with asset sales only possible at deeper and deeper discounts to prestress levels. In today's increasingly connected investment markets, perhaps diversification by geography and asset class provides little protection.

- The mark-to-market values of the insurer's derivative positions may move against it, requiring additional collateral to be posted to cover variation margin calls—for cleared positions this will require cash. Should the insurer suffer a credit rating downgrade then there may be another round of increased collateral demands.

Such a scenario may be extreme but it is not impossible. Contemplating such events can help develop a picture of the possible interrelations between factors that drive liquidity demand and supply and so inform a plan of the actions that might mitigate the impacts.

We have structured the remainder of this paper as follows:

Cash demand: A consideration of the areas likely to drive an insurer's cash outgo.

Cash supply: A look at some typical sources of cash generation.

Section 2, Managing liquidity risk: Outlining a framework to manage an appropriate balance between demand and supply.

Finally, in Appendix 1, we provide brief details of some real-life examples of where firms have suffered significant liquidity-related challenges.

CASH DEMAND

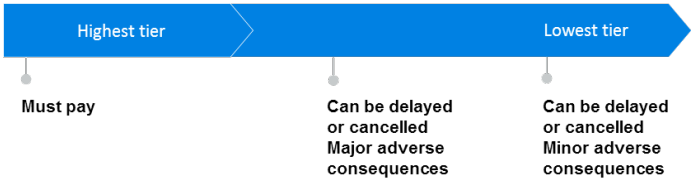
As discussed in the Introduction above, when assessing liquidity risk it can be helpful for insurers to distinguish between their essential 'food and water' liquidity demand buckets, which must always be filled, and the less critical 'holiday' buckets the firm can afford not to fill for a period of time when there is limited available liquidity. This exercise provides the business with cash priorities aligned to the firm's strategy, as well as insights into the characteristics of the liquidity demands it faces. Our suggested approach for understanding a liquidity risk profile in order to develop a liquidity management framework (LMF") focuses on understanding both the demand-side and supply-side liquidity profiles and any dependency between the two. An LMF can then be aligned with the liquidity dynamics studied, and the insurer's risk profile identified through scenario analysis.

Understanding the demand-side profile involves determining all possible material cash outflows, including both those that are expected, for example claims, and those that are unexpected, for example major operational losses. It is then necessary to determine the criticality of these cash demands.

Priorities will be determined by a mixture of business strategy and legal and regulatory requirements. For example, a firm may say that it will always prioritise the needs of its customers, and therefore it will pay all claims within a timeframe of X. Indeed, paying claims is critical to the ongoing functioning of the business, and this would mean that demand for cash to pay claims would always be the priority, and therefore categorised as a 'Tier 1' bucket in Figure 1 above. Other factors that might determine the criticality of a demand are: considerations of the firm's reputation; incentive to avoid legal or regulatory breaches; preservation of credit rating; and the ability to attract and retain staff.

Priority will be given to demands that cannot be delayed and are crucial to the operation of the business. In simple terms, not paying 'Tier 1' claims would result in severe adverse consequences, not limited to business closure. In contrast, the lowest-level tiers should not carry material adverse implications, at least in the very short term.

FIGURE 2: PRIORITISING DEMANDS ON CASH



Once an insurer has identified the main areas of criticality of each demand and assigned them to a tier, it can then more thoroughly assess the contents of each demand tier through considering, in detail, a number of 'secondary' characteristics. Examples of these characteristics are:

Volatility: How uncertain are we about the level and/or timing of the cash requirement?

Malleability: How readily can the level and/or timing of the demand be modified and what are the consequences of doing so?

Frequency: How frequent are the demands?

Given that demands have been allocated a criticality tier, the above factors are then relevant in terms of understanding the nature of the risks to be managed and what area the management should focus on.

Such analysis, in combination with similar analysis for the supply of liquidity, forms the basis of an understanding of liquidity exposure, a key piece of the puzzle in terms of understanding and managing liquidity risk.

In Figure 1 above, we showed a simplified example of the typical cash outgo items for an insurer and how they might be organised in terms of priority. In the remainder of this section, we consider their key liquidity characteristics.

Nondiscretionary claims outgo

As the primary area of liquidity outgo for insurers, claims outgo is likely to be a Tier 1 demand. Typical nondiscretionary guaranteed life insurance policy benefits include death, disability and permanent health insurance (PHI) claims, as well as benefits paid on surrender of a policy.

Whilst the incidence of individual claims is very uncertain, claims outgo may well be reasonably stable in aggregate, assuming that the insurer has a large block of well-diversified business. Therefore, in 'normal' circumstances, the claims should be relatively predictable; though issues appear in times of stress when the usual dynamics break down. Examples include pandemics or an event triggering a mass surrender. This can result in claims outgo departing significantly from the stable business-as-usual experience. In parallel, limited ability to defer these claims limits the measures the insurer is able to take to manage the stress.

Mass surrender events, such as those caused by market panic or reputational issues, cause uncertainty for the insurer about the amount of claims that could occur in a short time period. Group protection products could be exposed to a mass outgo in the context of a catastrophe event, possibly because risks are concentrated in a particular geographical area, exposing the insurer to the risk of a single event impacting multiple beneficiaries.

Some liquidity strains may be mitigated by an ability to defer claims. In some cases, such a deferral arises automatically from the terms of the insurance contract without the need for any direct action from the insurer. For example, disability benefits where the presence of a deferred period provides some breathing space before benefit outgo actually commences. For other contract types, while the ability to defer may be present, actually invoking it would be more exceptional and require the insurer to make a specific decision. As an example, many unit-linked products have contractual terms and conditions giving the insurer the option to defer paying surrenders in times of stress, in order to give them a suitable period in which to liquidate the underlying unitised fund assets. However, for many products, deferring the payment of claims is unacceptable from regulatory, legal and reputational perspectives.

In cases where an insurer does not have a large diversified block of business, claims outgo may be volatile even under 'normal' conditions.

Discretionary claims outgo

Insurers have discretion over the payment of certain benefits, primarily in relation to bonuses on with-profits business. These types of benefits can be classified as slightly lower criticality than nondiscretionary benefits, given the fact that they are not guaranteed. However, ability to cancel, reduce or defer payments may be limited by the terms set out in the Principles and Practices of Financial Management (PPFM) and any preexisting policyholder expectations over the level of bonus received. If the insurer does not pay bonuses in line with the PPFM and policyholder expectations, there is a risk of regulatory consequences.

Mandatory operational expenses

Regular business expenses such as marketing costs, broker commissions, staff salaries, rent, and utilities etc. are sources of demand for liquidity which are likely to be fairly certain in amount and timing. Expenses are generally contractual and therefore insurers have a high level of certainty over their amount and timing for the period of the contract. Insurers may have the ability to reduce or delay certain expenses in times of liquidity strain, for example through negotiating supplier terms and extending payment deadlines. Typical day-to-day operational expenses, whilst important to the running of daily business, may be considered slightly lower priority to claims payments. given the ability to adjust the timing of some of them, and that the consequences of such actions are likely to be less severe than failure to pay claims on time.

However, events causing operational disruption and their associated costs do have the propensity to cause unplanned expenditure of an uncertain amount. Whilst all insurers will experience operational issues to some degree, they could range from the very minor to the highly onerous. These types of expenses could be critical if an operational event requires immediate action to resolve the issue. For example, anything which compromises data security or the safety of the workplace environment will require immediate remedial action—such action may be very costly but the consequences of delay would be far more so in terms of the potential for fines and reputational damage.

Finally, some expenses such as defined benefit pension contributions can be both variable and onerous. However, the timing of contribution reviews should at least be known in advance and there may be scope to adjust the contribution schedule in the event of a severe liquidity stress.

Business commitments

Business commitments include demands such as payments to service debt, equity dividends, regulatory levies and tax payments. For most of these items, the insurer will know the amount and timing of the outgo well in advance of payments having to be made. However, with the exception of equity dividends, there will be little scope to flex payments under stressed conditions without significant consequences.

Derivative collateral

Use of derivatives within investment strategies is commonplace amongst insurers to help mitigate certain capital market risks and the associated capital requirements. However, the use of derivatives brings with it exposure to liquidity risk through the need to collateralise positions where the mark-to-market value of the instrument represents a liability to the insurer. Following the implementation of the European Markets and Infrastructure Regulations (EMIR) there is an increasing requirement to centrally clear derivative products, in particular vanilla products such as interest rate swaps typically used by insurers.

However, under central clearing, there is a requirement that the variation margin is posted, essentially, in cash. Thus, derivative exposures have the potential to give rise to cash demands that are both volatile and sudden.

The requirements for clearing relate to new positions and the Bank of England noted in its November 2018 Financial Stability Report that insurers currently clear only about 20% of exposures on single currency interest rate derivatives—this implies significant headroom for the growth of this particular source of liquidity risk.

For non-cleared derivatives, the landscape is also changing, and any insurer in Europe with derivative exposures (notional amounts) of more than EUR 8 billion will be required to post initial margin on its existing positions from September 2020. The liquidity impact of this requirement could be significant, although the obligation can fortunately be met with a range of assets in addition to cash, for example corporate and covered bonds may be used.

Optional expenditure

More strategic actions insurers choose to carry out might include: acquisitions; writing new business; developing new products; or improving infrastructure. The liquidity demands associated with such activities can be thought of more as liquidity 'wants' rather than liquidity 'needs.' In other words, they are carried out when liquidity is sufficient to allow them, whilst day-to-day liquidity needs, such as claims, expenses and collateral calls on derivatives, take priority in terms of using liquid resources.

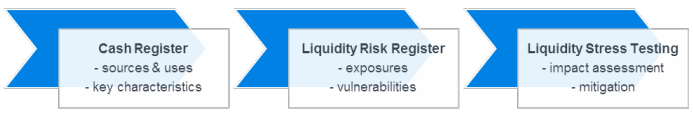
Cash and liquidity risk registers

The IAIS (22 October 2014) observed that 'a comprehensive understanding of the insurer's sources and needs of liquidity and the interplay thereof are instrumental in liquidity management.'

To this end, and in order to classify their liquidity demands, an insurer could list and classify its cash demands and its potential cash sources on a 'cash register.' This is a useful mechanism for considering, analysing and documenting the liquidity risk dynamics of each of the buckets, as well as the different items in those buckets.

Building on the information provided in the cash register, an insurer may also find it helpful to document the different areas of risk that may give rise to liquidity strains in a liquidity risk register. We think of the relationship between these risk management tools in the way shown in Figure 3.

FIGURE 3: BUILDING BLOCKS FOR EVALUATING LIQUIDITY RISK



We discuss each of these in more detail in Section 2 of this paper below.

CASH SUPPLY

Liquidity demands are met by a pool of available cash that an insurer holds. The insurer's exposure to liquidity risk is therefore determined by its capacity to maintain this pool of available cash at a level adequate to meet its liquidity demands. The following sections describe the principal sources of cash supply.

Available cash

For the purpose of this report, we define 'available cash' to mean cash held in a bank current account readily accessible by the insurer—we exclude other 'cash-like' investments from this definition.

For insurers, almost all liquidity demand buckets must ultimately be met by the firm's pool of available cash and cannot be met directly by other asset classes. For example, it is not normally possible to pay out a claim to a policyholder directly with a government bond. Investments, or any other sources of liquidity, therefore need to be converted into cash first in order to meet a liquidity demand. An exception to this is the ability to use selected noncash assets to meet liquidity demands for some collateral calls on derivatives (initial margin and variation margin for instruments not yet subject to central clearing).

As liquidity demands are fulfilled over time, the available cash will reduce and therefore the liquidity pool must be 'topped up.' It will often be the case that cash inflows from the in-force business will naturally replenish the pool of available cash (a 'passive' source of liquidity). However, under certain circumstances it might be necessary to sell assets or turn on other liquidity supply taps in order to maintain sufficient available cash. When considering which sources of liquidity to utilise, insurers might ask:

- How quickly can a particular source be turned on to generate 'available cash'?
- How certain are we as to the amount of available cash that the source can provide? In particular, is this likely to be adversely impacted by stressed liquidity scenarios which will also trouble us, i.e., an incidence of so-called 'wrong-way risk'?
- What are the costs associated with tapping a particular source?
- Are there any other consequences to 'turning on' the tap (e.g., asset-liability mismatching from selling a long-term investment, reputational damage from perceived weakness)?

We have broadly categorised the different sources into:

- Passive sources
- Active actions (short term)
- Active actions (medium term)

In the case of the active actions, some will be considered 'business as usual,' with other measures deemed more 'extraordinary' and reserved for times of particular liquidity stress.

Passive sources

Some liquidity sources automatically generate cash over time. For these sources of liquidity there tend to be few 'active' decisions required by the insurer. Some examples include:

Premium income: The premiums received from policies serviced by the firm. It can also refer to reinsurance receivables and commissions received from a reinsurance counterparty.

In the case of receiving premium income, this cash generation represents the natural conversion of the value of 'future premiums' reflected in the Best Estimate Liability (BEL)—an illiquid asset—into actual cash on the Solvency II balance sheet. For large and diversified blocks of business, premium income tends to be predictable, although certain events, such as a mass lapse shock, might result in less cash generation than was expected.

Another aspect to this is new business. Whether this is net positive or negative to liquidity will depend on the mix of business written—regular or single premium, conventional or unit-linked. Ex ante, we would expect the response of new business flows to liquidity stress events to be strongly positively correlated with existing business premium flows. In fact, they may well be more sensitive, in particular if funneled through a relatively small number of intermediaries who are likely to follow an insurer's fortunes more closely than the average policyholder is.

Whilst premium income is likely to be a significant source of liquidity for an insurer, it unfortunately offers limited scope for active management. At best, new business might be reduced, albeit with a lag, via price increases or even product withdrawal but these actions will not be taken lightly as there is no guarantee of a successful reversal once the stress has passed. The longer-term implications for the business are likely to be linked to whether the insurer has been forced to act in isolation due to an idiosyncratic event or is simply following a more general market response to a systemic event.

Investment income: This includes income from coupon payments or maturities from bond holdings and dividend income from equity holdings. Different investments yield different levels of cash, with differing degrees of regularity over the course of the invested period. Most bonds provide relatively predictable levels of cash through coupons (unless the bond defaults). The level of equity dividends received will be more volatile due to its dependence on the earnings of the firms invested in. Nevertheless, many firms do aim to 'smooth' dividends to reduce this volatility. When investing, insurers should therefore consider the amount and predictability of the passive income to be received from different asset classes. In cases where firms invest in equities through a collective investment fund, the dividend income may be automatically reinvested in the fund and therefore would not generate available cash for the firm until the holdings are sold.

When considering the reliability of income flows under stressed conditions, it is worth considering the extent of exposure to financial firms. The rationale is that a liquidity stress that affects a particular insurer might also influence financial sector firms more generally, e.g., banks. Thus, there is a risk that income flows from this source are reduced at the same time the insurer is most in need of them.

Active actions: Short-term measures

In addition to the 'passive' sources of supply, insurers are often able to call upon a number of additional liquidity sources which can be accessed when required to increase the available cash that the firm holds.

Over the short term, this can include actions like selling investments (discussed further below) or utilising contingent liquidity facilities such as overdrafts, repo arrangements or other short-term lending facilities at the insurer's disposal. The insurer may also seek to defer some claims by suspending redemptions on certain unit-linked funds when asset markets are under stress, e.g., as occurred for property funds following the UK's decision in June 2016 to leave the European Union. Under normal conditions, overdrafts and short-term lending tend to be reliable and have a degree of flexibility over the amount of cash that can be generated. There is typically a cost to taking these actions so it makes sense to weigh up the costs against the benefits when deciding which liquidity sources to tap in a given situation. For example, using contingent liquidity facilities such as overdrafts and repos can have direct financial costs (interest charges) to the firm. Selling investments will incur trading costs and possibly a loss of value if the speed of liquidation required pushes sales above typical deal sizes for the market. Furthermore, there might be capital consequences if the insurer's ALM position is disrupted.

To invoke these actions may also have other repercussions if it fosters a market perception of weakness. Consequently, whatever actions are taken, it is always important to consider how they should be communicated to external stakeholders and the wider market—negative perceptions can cause damage irrespective of their validity.

Active actions: Medium-term measures

Some other active actions to raise cash take longer to implement. These include approaches to monetize the value embedded in a portion of the existing business by sale, securitization or, for unit-linked business, implementation of a unit-shorting programme. Other actions an insurer may consider are: issuing debt and/or equity or entering into a financial reinsurance arrangement. Issuing debt comes with a cost of borrowing, the rate of which will be determined by general current market conditions (which may well be unfavourable in a broad-based liquidity stress event), coupled with insurer-specific factors such as credit rating and the duration of the bond. Note that the event(s) giving rise to the liquidity issues may also impact the creditworthiness of the firm, making issuance more difficult or at the very least increasing the spread required. Issuing equity will by definition result in the dilution in the value of existing shares in the firm.

Entering a financial reinsurance arrangement normally comes at a cost and might have capital implications such as an

increase in the counterparty risk element of the Solvency Capital Requirement (SCR).

Given the 'longer-term' nature of these actions, they would tend to be utilised for significant strategic moves (such as acquiring a block of business, making investments in the infrastructure of the business or scaling up sales operations) rather than to meet the insurer's day-to-day liquidity needs.

Investments

Typically, an insurer will hold assets providing a regular inflow of cash that are in general alignment, in terms of amounts and incidence, with the expected cash outflow requirements of the liabilities. This is particularly the case where the cash flow profiles of the assets and liabilities are both stable and predictable.

For example, it is very common for firms to use bonds to back in-payment annuities, with the bond portfolio constructed such that the coupons and redemption payments match up with the expected annuity payments (at least on an annual basis). The more uncertain the liability cash flows, either in terms of potential short-term variation or scope for major unexpected spikes in experience, the harder it will be to find assets that generate matching cash flows. This drives a need to hold a greater level of cash or other highly liquid assets that can be readily realised at times when a cash flow deficit would otherwise emerge.

FIGURE 4: BALANCING LIQUIDITY WITH COMPETING BUSINESS OBJECTIVES

If there were no other factors to consider, a firm could effectively eliminate all liquidity risk by just 'warehousing' cash equal to the undiscounted value of expected future claims and expense outgo (net of any recognisable future premium or charge income) plus any additional amount to cover the SCR of the in-force business. Of course, such an extreme strategy is expected to deliver poor investment returns to stakeholders. Therefore, an investment strategy focused purely on mitigating liquidity risk is suboptimal from other perspectives. Furthermore, even if a firm's board or senior management viewed such an investment strategy as desirable, there are barriers, such as policyholders' expectations and regulatory requirements, which would prevent or severely constrain its implementation.

At the other end of the spectrum, an insurer should not ignore liquidity or naïvely assume it will always be able to access enough. Unavoidably, insurance liability cash flows are uncertain, and so firms must always maintain some degree of cash buffer and highly liquid investments and cannot rule out the possibility that they may, at certain points, need to sell other assets to meet liquidity needs. Insurers must also consider how different liquidity strategies would fare under both normal and stressed conditions.

For example, while it is common for firms to hold a high proportion of investments in corporate and government bonds, some firms seek to invest in more illiquid asset classes (such as infrastructure debt) to increase returns. In such cases, to compensate for the reduced liquidity of part of its portfolio, the firm may need to apply a counterweight and seek increased liquidity elsewhere—possibly via a higher cash holding. These cash holdings will reduce returns of the portfolio of investments and partially offset any extra returns gained by the illiquid investments. Under 'normal' conditions, this strategy (illiquid + cash) might actually be more effective from a liquidity risk management perspective, as it results in a greater holding of cash. However, should the firm experience a prolonged period of stressed liquidity conditions, the position should be carefully considered—could the cash be depleted, leaving a rump of very illiquid assets and a significant challenge in terms of restoring a satisfactory liquidity position?

In developing or reviewing the appropriateness of the investment strategy, every insurer therefore needs to factor in the liquidity characteristics of the assets under consideration alongside other key criteria such as their investment return potential and contributions to capital requirements. Much as higher-yielding assets typically carry higher capital charges, many higher-yielding asset classes have relatively low liquidity (compared to cash), and so a balance between the various criteria needs to be struck based on the insurer's own objectives and appetite for risk.

Section 2: Managing liquidity risk

INTRODUCTION

In the previous section, we outlined a broad introduction to liquidity risk and described how it might manifest in the context of an insurance operation. In Section 2, we aim to formalise the discussion and consider the key elements of an overall framework to manage liquidity risk in a comprehensive and coherent way.

A robust liquidity management framework (LMF) provides guidance to insurers on the various tools and procedures to be utilised in order to manage their exposure to liquidity risk. While insurers may not actively seek liquidity risk in an investment strategy, it is often a component of insurance business that cannot be totally avoided. This section will outline a suggested framework we feel is generally aligned to the PRA's expectations as set out in CP4/19 and can sit alongside insurers' current capital management frameworks for a more comprehensive risk management strategy.

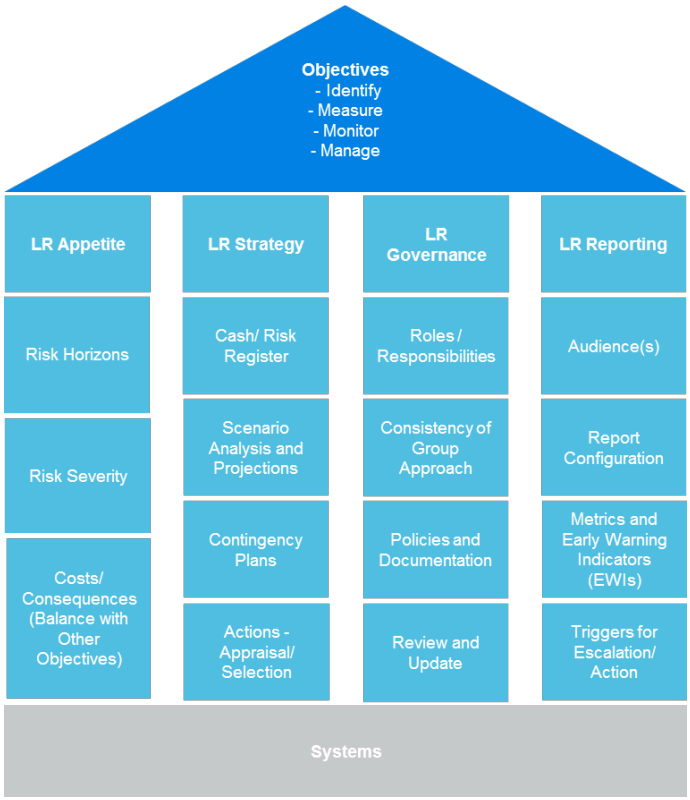
The main aims of the LMF are to identify, measure, monitor and manage liquidity risk. Four pillars will support these objectives for liquidity risk (LR):

1. **Liquidity risk appetite:** The duration, types and severity of risks that the firm aims to be able to withstand under normal and stressed scenarios, while considering the balance of its liquidity needs with other business objectives.
2. **Liquidity risk strategy:** A well-defined set of procedures that detail the firm's approach to managing its liquidity risk, which is consistent with its stated risk appetite.
3. **Liquidity risk governance:** Clear delegation of responsibilities and reporting lines along with proper documentation of liquidity risk policies that are consistent across the group.
4. **Liquidity risk reporting:** Configuration of reports on liquidity, including metrics and tools used as warning indicators, that support the execution of certain mitigating actions that are appropriate for the given situation.

Technical and administrative systems will have to be put in place by the firm to underpin the four pillars of the LMF and provide a foundation for effective, ongoing liquidity management.

The exact composition of each pillar will be unique to each company or group, but may broadly be in line with the components shown in Figure 5.

FIGURE 5: FOUR PILLARS OF A LIQUIDITY MANAGEMENT FRAMEWORK



The remainder of this section provides detail on each of the pillars of our suggested liquidity management framework.

LIQUIDITY RISK APPETITE

The key first step to managing liquidity risk is to understand your 'liquidity universe.' In other words, a firm should have a comprehensive grasp on its exposures to liquidity risk through understanding the sources of demand and supply for cash, and how the dynamics of demand and supply could change under different scenarios. The next step is to decide a level of risk (for each source) the insurer has an appetite to seek or accept.

While the board will approve the liquidity risk appetite, its development will likely be delegated to the relevant first-line functions such as treasury, with support from the risk function.

For the majority of insurance firms, seeking liquidity risk is not a strategic aim, but one that still inherently arises through writing insurance business. Most firms will therefore seek to manage their exposure to liquidity risk rather than to seek liquidity risk or avoid the risk entirely. Risk appetite should then be centred on setting limits to ensure that liquidity risk is within the range of outcomes acceptable to the board. That being said, as insurers move towards reliance on investments in illiquid assets in search of higher yields, risk appetite should be critically reassessed to ensure that the effective management of liquidity risk is not being compromised.

Setting risk appetite might involve setting thresholds and limits to ensure:

- At a minimum, the critical Tier 1 liquidity demand buckets should always be met even under extreme situations.
- The position of the lower tier demand buckets is carefully considered—there may be an acceptance that in the most severe scenarios contemplated the insurer may be unable to satisfy them fully. However, this should be an explicit and conscious decision.
- In all but the most severe scenarios the insurer is not required to turn to extraordinary provisions to tap the required liquidity.
- In severe scenarios, where either not all liquidity demands can be met or extraordinary provisions are used, there is clarity on the nature and scale of the consequences and that they do not exceed a certain cost or other measure of severity.

To bridge the gap between setting objectives, such as the above, and setting a risk appetite that can be comprehended by a range of stakeholders across the business, requires a set of metrics that can be clearly defined and whose data requirements can be realistically supported by the insurer's management information systems. The measures should also be widely accepted as meaningful, in that changes in their levels have readily explainable linkages to variations in the health of the insurer's liquidity position. Finally, there must also be sufficient relevant data to enable 'normal ranges' of the metrics to be calibrated. Stress and scenario testing, covered later in this paper, will yield insight into the level of cash buffer required to fill the liquidity demand buckets under a range of stresses varying by severity and duration, which will allow target levels of the liquidity coverage metrics to be set.

A risk appetite should be clear about the severity of stress the insurer aims to withstand. The PRA notes in CP4/19 that it 'expects the insurer's risk appetite statement to define the duration, types and severity of liquidity stresses it aims to survive.' Types of stresses assessed are relevant in that a robust risk appetite will be set with reference to the firm's ability to survive a comprehensive range of liquidity type scenarios. For example, scenarios should include idiosyncratic events affecting the insurer in isolation as well as more market-wide systemic events and indeed scenarios that contemplate combinations of both. Liquidity stress testing should not be deemed an isolated exercise but integrated with the stress testing performed for capital purposes as scenarios developed to assess capital implications may also imply adverse liquidity characteristics. An integrated approach will make for better overall coverage of the risks and also allow the insurer to contemplate the trade-offs and interactions between the capital and liquidity risk drivers and thus stimulate thinking around responses that balance potentially competing aims.

Alongside this testing, a firm should provide for its key liquidity metrics to be assessed within each scenario and then used within the risk appetite statement. Typically, insurers use some form of liquidity coverage ratio (LCR) and excess liquidity measures. There are no universal definitions of these metrics but, for the purpose of this paper, we adopted the definition of the LCR shown in Figure 6. Nevertheless, however we define the metric, there should be clarity on how the insurer will evaluate assets, with a view to determining those deemed the most liquid and thus having the greatest utility in the event of a liquidity stress. Finally, an important area to consider is the time horizon over which the risk appetite is set. Some liquidity stress events can arise over very short periods while others will be far more prolonged, so there is a need to target both short-term and longer-term horizons. In CP4/19 the PRA highlights that a risk appetite statement should identify the timescales over which particular risks are expected to arise.

FIGURE 6: DEVELOPING QUANTITATIVE LIMITS: SCENARIO ANALYSIS RESULTS

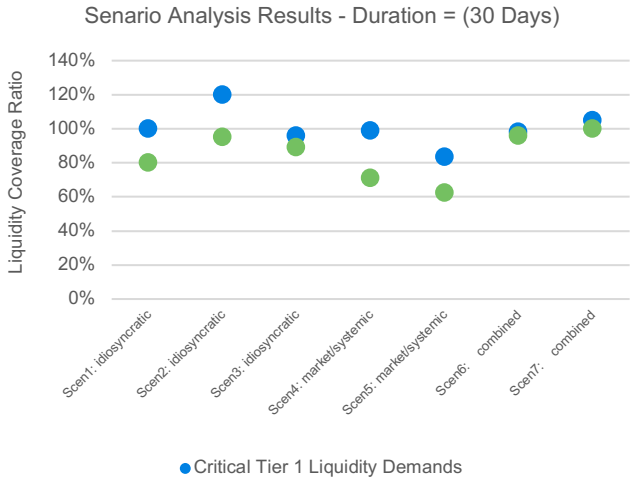


Figure 6 indicates how the setting of a liquidity risk appetite might be supported with reference to stress and scenario testing. The results show the LCR under each of a range of short-term liquidity shocks.[5] We have defined the LCR as follows:

LCR = (Liquidity Buffer + Cash Inflows) / Cash Outflows

Where:

Liquidity Buffer—is a pool of highly liquid assets specifically available to cover deficiencies of cash inflows to meet cash outflows over the relevant scenario horizon.

Cash Inflows/Outflows—are projected values over the relevant time horizon, e.g., one week, one month.

Figure 6 shows the LCR with the liquidity buffer initially set to zero, and therefore compares the ability of the insurer to meet its cash outflows using only its cash inflows. Each dot on the graph represents the liquidity 'low point' in each scenario, i.e.,

the lowest LCR observed throughout the period of stress. Two different levels of liquidity comfort are targeted:

1. Only Tier 1 outflows, or critical liquidity demands, are included in the LCR denominator (blue markers).
2. All liquidity outflows are included in the denominator of the LCR (orange markers).

The next step is then to set the liquidity buffer so that there are sufficient liquid resources to cover liquidity demands under each scenario the insurer has a desire to protect against. The insurer may decide against covering all scenarios. For example, if it does not have the appetite to hold liquidity to cover the most extreme scenarios modelled, they would be excluded when calculating the buffer.

As a simple example, we consider in Figure 7 some hypothetical results that might represent our contrived Scenario 5.

FIGURE 7: DEVELOPING QUANTITATIVE LIMITS: SCENARIO 5

Scenario 5 - Detail

Case 1 - No LCP Actions

Time Period (Weeks)	Cash Inflow (GBP)	Tier 1 Cash Outflow	Lower Priority Cash Outflow (GBP)	LCR (Tier 1) No Buffer	LCR (Total) No Buffer	Cumulative Deficit To Fund (GBP)	Risk Appetite (Tier 1)	Risk Appetite (Total)	Liquidity Buffer (GBP)	Impact Of LCP Action (GBP)	LCR (Tier 1)	LCR (Total)
0							150%	105%	3		164%	105%
1	5	4	2	125%	83%	1			2	0	200%	133%
2	5	6	2	83%	63%	4			-1	0	117%	88%
3	5	1	2	500%	167%	2			1	0	400%	133%
4	5	3	2	167%	100%	2			1	0	200%	120%

Case 2 - No LCP Actions

Time Period (Weeks)	Cash Inflow (GBP)	Tier 1 Cash Outflow	Lower Priority Cash Outflow (GBP)	LCR (Tier 1) No Buffer	LCR (Total) No Buffer	Cumulative Deficit To Fund (GBP)	Risk Appetite (Tier 1)	Risk Appetite (Total)	Liquidity Buffer (GBP)	Impact Of LCP Action (GBP)	LCR (Tier 1)	LCR (Total)
0							150%	105%	5		179%	114%
1	5	4	2	125%	83%	1			4	0	250%	167%
2	5	6	2	83%	63%	4			1	0	150%	113%
3	5	1	2	500%	167%	2			3	0	600%	200%
4	5	3	2	167%	100%	2			3	0	267%	160%

Case 3 - Allow For LCP Actions

Time Period (Weeks)	Cash Inflow (GBP)	Tier 1 Cash Outflow	Lower Priority Cash Outflow (GBP)	LCR (Tier 1) No Buffer	LCR (Total) No Buffer	Cumulative Deficit To Fund (GBP)	Risk Appetite (Tier 1)	Risk Appetite (Total)	Liquidity Buffer (GBP)	Impact Of LCP Action (GBP)	LCR (Tier 1)	LCR (Total)
0							150%	105%	3		164%	105%
1	5	4	2	125%	83%	1			4	2	200%	133%
2	5	6	2	83%	63%	4			1	0	150%	113%
3	5	1	2	500%	167%	2			3	0	600%	200%
4	5	3	2	167%	100%	2			3	0	267%	160%

Starting with Case 1, we can see that without support the LCR falls to low levels in some periods, with a low point of 63% recorded for total cash demands as the orange marker for this scenario in Figure 6 above. The risk appetite proposed in this case is that:

- The LCR for Tier 1 cash demands should not fall below 150%—these are the most business-critical demands and a high level of security is deemed appropriate.
- The LCR for Total cash demands should not fall below 105%—the aim being to cover all demands with a small safety margin.

If the LCR is considered over the whole 30-day scenario period then provided the insurer has a liquidity buffer of at least GBP 3, the minimum levels of LCR are met (164% and 105% for Tier 1 and Total, respectively). However, inspection of the projected results on a period-by-period basis indicates a deficiency in week 2—the available liquidity buffer becomes negative due to a spike in Tier 1 cash outgo.

Case 1 illustrates the importance of considering liquidity scenario results on as granular a basis as possible, particularly if cash flows can be volatile—in our example, note that the cash demand for Tier 1 does display significant volatility.

Case 2 illustrates that, if the insurer is to remain above its LCR minima at all times, then a higher liquidity buffer of at least 5 is needed.

Case 3 illustrates that the insurer may choose not to increase its liquidity buffer but to invoke some other actions set out in its liquidity contingency plan (LCP).[6] In relation to the use of LCP actions, we note:

- In our simple example, the LCR itself would not provide a reliable indicator to trigger the required action, as the problem arises suddenly.
- If our insurer chooses to rely on the LCP action and so accepts a lower liquidity buffer, it is important that early warning indicators are developed and closely monitored such that there will be some advance notice of the spike in

[5] Note that Figure 6 shows contrived values purely for illustration.

Tier 1 outgo and thus time to execute the required actions before the risk crystallises.

- Depending on what the action is, there may be a need to consider its reversal, e.g., short-term borrowing will have to be repaid. Care is needed to ensure that reversal is managed without precipitating subsequent liquidity shortfalls. Such considerations will form part of the planning focused on post-stress recovery and should be included within the scope of the LCP.

The results of the stress and scenario analysis may also indicate other limits that may then form part of the insurer's risk appetite. In our example, it is the volatility of the Tier 1 outgo that creates challenges. Recognising this might result in the placement of quantitative limits upon the insurer's exposure to some or all of the Tier 1 components to mitigate this at source. This aligns with comments made by the PRA in CP4/19 that firms should consider 'prudent risk limits for each material source of liquidity risk to which they are or could be exposed.' For example, the PRA particularly points to setting limits on liquidity risks arising from off-balance sheet items, insurance and noninsurance liabilities and concentrations of liquid assets and funding sources. The expectation is that these limits are reviewed regularly.

Of course, in reality, the execution and analysis of the scenario testing results will be considerably more involved, with the insurer having to consider:

- A variety of different stress scenarios
- A range of stress periods
- Potentially a more granular decomposition of cash outgo by tier of priority and/or currency
- Perhaps a complex set of interplays between exposure limits, the level of liquidity buffer and the use of various LCP actions

Finally, we note that liquidity risk appetite should be considered in the context of other business objectives. If liquidity is considered on its own, an obvious solution to minimise liquidity risk is to hold all assets as cash. In practice, firms do not wish to hold too much liquidity to avoid adversely affecting other business objectives. Firms therefore need to consider at what level their liquidity pool is 'overflowing' and so set an upper limit on liquidity provision as well as a lower limit. Thus, judgement is needed to ensure that the limits and targets within the liquidity risk appetite are cognisant of the tensions between:

- Managing liquidity risk
- Managing capital requirements
- Overall profitability

[6] See page 20 for further explanation of the LCP.

LIQUIDITY RISK REPORTING

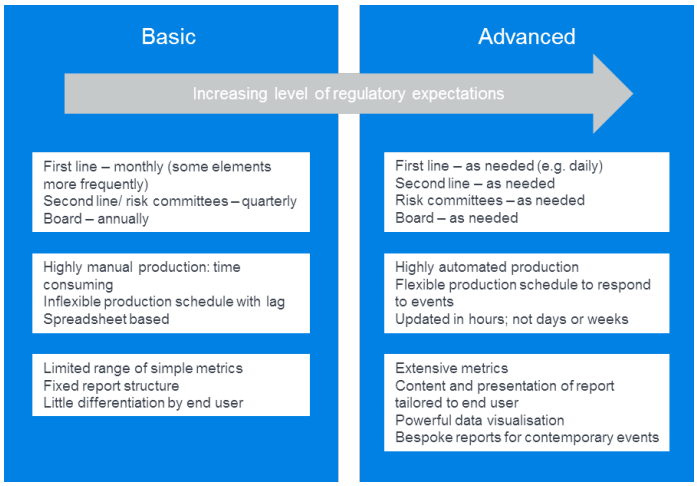
To operationalise a firm's liquidity risk management strategy requires the devotion of careful thought to define the information that is needed to underpin decision making and to determine how, when and to whom that information should be communicated and decide what form that communication should best take.

In this section, we consider the following questions:

1. What are the objectives of liquidity risk reporting?
2. To whom should liquidity risk information be provided?
3. What information is to be provided and how should it be presented?
4. When should liquidity risk reports be generated?

In our view, there is no single right answer and, while the objectives may be very similar, approaches can differ widely as illustrated in Figure 8.

FIGURE 8: ALTERNATIVE APPROACHES TO LIQUIDITY RISK REPORTING



The example approaches described in Figure 8 are stylised and the reality for most firms will be something in between these extremes. Ultimately, the most appropriate approach remains a judgement for the firm in light of the nature of its business and the consequential range and scale of liquidity risks to which it is exposed. Having said that, there is mounting pressure for improvement and increased sophistication from a number of directions:

- In its November 2018 Financial Stability Report, the Financial Policy Committee (FPC) of the Bank of England considered the liquidity risk posed by nonbank financial institutions and noted 'it is not clear whether pension funds and insurers pay sufficient attention themselves to liquidity risks.'
- More recently, in March 2019, the PRA issued CP4/19 laying out its expectations with regard to liquidity risk reporting and management more generally. This CP contains greater detail than has hitherto been the case.

With this in mind, the remaining comments in this section contemplate liquidity reporting closer to the 'advanced' end of the scale.

Objectives (why)

The basic aim of liquidity reporting is to place the right information into the hands of the right people within the firm in order to support informed and timely decision making. The reporting should provide a comprehensive view of the firm's current experience and position, making clear any unusual features or concerns. A forward-looking view is also necessary to warn of dangers ahead and articulate how the firm plans to cope with them.

Who

This will vary by firm to a degree and should be aligned with the allocation of roles and responsibilities within the broader liquidity management framework. Nevertheless, the usual suspects are likely to appear:

Treasury function: Responsible for day-to-day cash management. May also have direct control of the assets comprising the liquidity buffer in terms of the ability to realise these assets to meet any cash flow shortfalls.

Investment management function: Responsible for asset allocation generally and the overall liquidity characteristics of a firm's portfolio will be part of this. The assets comprising the liquidity buffer may be held in a separate fund with its own investment mandate reflecting the very specific intended use case for these assets. Within the constraints imposed by the liquidity management framework, the investment management function will seek to optimise the return on the buffer assets.

Risk function: Responsible for checking that liquidity risk policies and procedures are being followed.

Risk committee: Tasked with specific oversight of the firm's risk management framework and it is important to integrate the LMF into this. Reporting should enable the committee to monitor the firm's exposures and performance via the liquidity risk metrics as well as raise awareness of emerging risks. Results will inform advice to the board around possible changes to liquidity risk appetite and aspects such as the LCP.

Board: Ultimately responsible for the LMF of the firm and will require a clear concise summary of liquidity performance.

What and how

Each user will have a different focus and so flexibility to tailor both content and presentation can increase both the impact and effectiveness of the reporting. Some reports for 'hands-on' users will include significant detail to support further analysis and investigation. Those for senior management and the board will aim to provide a rounded view of overall liquidity conditions, a summary of the firm's experience over the period and future expectations alongside key metrics versus risk limits and commentary to explain the results. Data visualisation tools are used to create a varied presentation of results from simple tables to myriad charts, heat maps etc. Such tools can also allow end users to drill down into or filter the report data and represent it to align precisely with specific current requirements.

In terms of content, some reports will reflect near-term metrics, almost on a real-time basis, at a granular level. Detailed analysis of actual cash inflows and outflows by type versus expectations and versus prior periods reveal trends.

Cash flow projections might use a daily granularity for an initial period, e.g., the next month followed by weekly or monthly time steps beyond that. Projected outflows and inflows may be broken down by key sources such as:

- Insurance liabilities: Deaths, surrenders, sickness and premiums.
- Funding: Debt service and dividends.
- Derivatives: Collateral flows.
- Investments: Coupons, dividends and maturities.
- Other: Salaries, supplier payments and tax.

Alongside the above is a projection of the stock of high-quality liquid assets (HQLA) forming the liquidity buffer; allowing for any injections and for withdrawals to address the scale and timing of expected future net cash shortfalls. There is no universally agreed definition of HQLA but in CP4/19 the PRA sets out a number of criteria for asset types to be included in the liquidity buffer. We note the PRA also contemplates the division of buffer assets into those of primary liquidity—essentially cash and high-quality government bonds—versus secondary liquidity encompassing a wider range of eligible assets such as covered and corporate bonds. The broad sweep of this is similar to the regime applied in banking.

Liquidity metrics are provided with values shown for both the current position and estimates across the projection period and compared against risk limits—a simple red/amber/green (RAG) system in line with risk appetite limits might be used to highlight any metrics moving 'out of range.' A typical metric to include is the LCR already described.

As well as a base projection, results should be included for a wide range of stress scenarios covering each relevant legal entity and, if applicable, the consolidated group.

If the firm has a material exposure to cash inflows or outflows denominated in foreign currencies, then splitting the projections by currency is good practice. This allows the firm to explore the adequacy of the liquidity buffer by currency, highlighting any significant dependencies on the ability to convert currencies in possibly large volumes and at very short notice.

Any scenarios showing breaches or 'near misses' compared to risk limits should include a description of the corrective actions envisaged in accordance with the LCP, which is described in more detail later in this paper.

Information providing insight into any relevant exposure concentrations and how they compare to risk limits will also be included. Concentrations should consider the perspective of the firm's own portfolio as well as the wider market and can cover a number of different aspects:

Liability features

We illustrate this aspect by returning to the example of General American (GA). GA found itself with a very large share of the market in short-term funding agreement products. In particular, it is estimated that GA had circa 60%[7] of the market in products which contained a particularly onerous clause permitting clients to demand a return of their funds at any time with just seven days' notice. A further feature was that GA's exposure to this risk was also heavily concentrated in the hands of a very small number of institutional clients. As previously explained, this ended badly for GA but making such risk concentrations visible in the liquidity Management Information ("MI") should help insurers avoid such situations.

Assets

Concentrations of exposure are particularly relevant to the assets comprising the liquidity buffer. Concentrations of assets should be considered by type of asset, by sector, by issuer and by currency. Where assets are held via funds there should be look-throughs to the underlying holdings. We note that both the Basel Committee on Banking Supervision[8] and the PRA[9] raise a concern over exposure to so-called 'wrong-way' risk if the buffer comprises assets in financial institutions—the fear is that the assets being relied upon may be compromised in exactly the same conditions that the firm needs to draw on them.

Funding

Significant concentrations among any sources of funding upon which the firm relies or intends to rely in stress represent a potential risk to be communicated and understood. There may be interplay between this category and that of assets already described. For example, a potentially dangerous position would be for the LCP to rely on significant committed funding from a counterparty with whom a large exposure already exists within the assets comprising the liquidity buffer.

There will also be interest in data that might point to an emerging real-life stress situation—so-called early warning indicators (EWIs). Ideally, the EWIs will address both the internal environment of the firm and the external environment pertaining to the capital markets and economy. It should be noted that EWIs are what they say, 'indicators,' and they will rarely be conclusive evidence in isolation. Further investigation will often be required to establish whether a 'red flag' requires action. For example, claims backlogs might be used as an EWI. If backlogs have been increasing, it may be an indication of a liquidity strain if this is due to increasing claims volumes. However, a bout of flu in the claims department with many staff away sick might generate the same indicator result but be benign from a liquidity perspective. The timely production of EWI data allows such investigations to occur and thus avoid the escalation of false alarms.

Possible EWIs relating to the internal environment include:

- Claims processing backlogs.
- Unit-linked funds moving to a bid-pricing basis.
- Asset/liability liquidity score, which assigns a relative score to different lines of business and asset classes and monitors how it changes over time. For life insurance liabilities, this is likely to change only slowly but a persistent trend might indicate the need for adjustments to aspects of the LMF. For example, if the trend indicates that liquidity will need to be accessed more quickly in future the firm might revise the investment mandate for the liquidity buffer as well as the sources of additional liquidity support contemplated by the LCP. For assets comprising the liquidity buffer, a shift towards less liquid classes, perhaps in search of improved returns, might indicate a reduced ability to respond to very fast-moving stresses as the assets are harder to sell.
- Credit rating outlook of the firm.

Possible EWIs relating to the external environment include:

- Rise in market bid-offer spreads.
- Reduction in maximum deal sizes being quoted by market makers.
- Experience of regular asset realisation tests—e.g., an increase in the length of time and/or cost of realising a portion of the HQLA portfolio.
- Credit conditions—default rate trends on debt instruments, credit rating outlook and credit default swap (CDS) premia (if available) on key counterparties.
- Press coverage indicator—summary measure of the nature of press reporting, ranging from very positive to very negative. Clearly, the latter may be a harbinger of liquidity strain via increased claims outgo and reduced premium income.
- Broad indicators of economic conditions such as gross domestic product ("GDP") growth, wage growth, retail sales and inflation could also be considered. However, the linkage between such measures and policyholder behaviour may be quite loose. Also in this group, some of the 'Core Indicators' published by the Bank of England in its monthly Financial Stability Report may provide insight into broad market conditions and indications of the health of the banking sector in particular, which may be significant to the development of any broad-based liquidity stress.

[7] See General American: A Case Study in Liquidity Risk – Moody's Investors Service (August 1999).

[8] See Basel III: The Liquidity Coverage Ratio and liquidity risk monitoring tools .

[9] See CP4/19.

Finally, we note the following statement made by the PRA in CP4/19: '*To ensure it remains operationally robust an insurer should periodically test and update its liquidity contingency plan through simulation exercises.*' Thus, a further element of liquidity reporting might be a description of the outcome and any lessons learned from the latest dry-run exercise.[10] This could include a report from a third party acting as an independent facilitator and observer.

When

Ideally, the firm will align the frequency of reporting with the demand for information. This would reflect the nature of the firm's business and thus its liquidity exposures, in particular to rapid changes in the liquidity position. It would also reflect the current economic and market environment—circumstances likely to result in more volatile cash inflows and outflows would prompt more frequent reporting.

Nevertheless, without the widespread use of integrated and automated reporting systems, the time required to validate, process and present data will be a constraint on the frequency of reporting.

In CP4/19, the PRA notes the following: '*Risk reporting should be undertaken by an insurer with an appropriate frequency that is proportionate to the level of liquidity risk in its activities. At a minimum, however, the PRA expects risk monitoring metrics, along with stress test results and information on the insurer's liquidity buffer, to be produced for management on a monthly basis, though more frequent reporting may be appropriate when the operational environment or the nature or scale of the insurer's activities changes.*'

LIQUIDITY RISK STRATEGY: CASH REGISTER

As discussed in Section 1 above, the foundation of a liquidity risk strategy is a clear understanding of the firm's 'liquidity universe,' i.e., having a clear grasp on each of their areas of liquidity demands and of the potential sources of liquidity supply.

In order to facilitate this understanding, a 'cash register' is a key tool, sometimes referred to as a 'liquidity sources and needs' register (for example, by the IAIS (22 October 2014)). This register systematically documents each need and potential source of liquidity, but also its characteristics, as described in Section 1.

This should be a living document, maintained on a continuous basis, and be responsive to changing conditions.

Cash register for cash demands

The cash demand section of the cash register lists out all of the cash demands, both actual and potential, that the insurer faces. It then assesses key information in relation to each demand:

- Magnitude: Size of the cash flow and trend (growing/declining).
- Timeframe: Timeframe over which the flow manifests and frequency of payments.
- Predictability: Predictability of the outflow in normal circumstances, for example by standard deviation/mean and historical maximum/minimum flows, and the potential behaviour under stressed conditions.
- Flexibility: Prioritisation of the liquidity need and the ability to defer payments.
- Criticality: Adverse consequences of not making payments.

Examples of potential cash demands include:

- Claims payments for deaths, annuities and surrender
- Reinsurance premiums
- Other outflows from business operations, e.g., expenses and commission
- Off-balance sheet contingent claims and obligations, such as collateral (margin) calls on derivatives and reinsurance
- Assets purchased but not settled, including repurchase under repo facilities
- Debt servicing costs
- Dividends, both declared but not paid and also discretionary future dividends
- Tax
- Pensions liabilities
- Intragroup flows, both expected and contingent (e.g., liquidity support to other entities)

Section 1 of this paper gives more detailed examples of some of the items of cash demand, and their likely characteristics.

A simple example of a cash demand register is shown in Figure 9 to demonstrate the concept; however, it should be noted that each insurer's cash register will be specific to its own business.

[10] These will combine simulated liquidity stress events with actual execution of some elements of the LCP to verify their operational feasibility and effectiveness.

FIGURE 9: CASH REGISTER (DEMAND SIDE): SIMPLE EXAMPLE

Cash demand	Magnitude	Predictability (figures expressed as rolling 12-month, and % of mean flow)	Cash demand timeframe	Ability to defer (score 1-10)	What are the consequences? *(of deferring/not paying)*
Surrender claims	Current level: £x per calendar month ("pcm") Trend: Increasing Frequency: Daily	Low: Standard deviation (weekly): A% Minimum weekly flow = B% Maximum weekly flow = C%	Must be paid within X days as per the terms and conditions of the contract.	3	Reputational consequences—loss of current and future new business if nonpayment of claims is publicised. Legal consequences if do not fulfil contract with policyholder. Contract terms may allow deferral of certain surrenders (e.g., of unit-linked funds) in exceptional circumstances. Regulatory consequences, e.g., closure, fines.
Death benefit claims	Current level: £y pcm Trend: Reducing Frequency: Daily	Medium: Standard deviation (weekly): A% Minimum weekly flow = B% Maximum weekly flow = C%	Must be paid within X days as per the terms and conditions of the contract.	1	As per surrender claims, although less likely to have any contractual right to defer.
Salaries	Current level: £z pcm Trend: Stable Frequency: Monthly	High: Standard deviation (monthly): A% Minimum monthly flow = B% Maximum monthly flow = C%	Must be paid on X day of the month, monthly.	2	Loss of staff.

Example of 'ability to defer' score:

3: Potential ability to defer payments (e.g., liquidation of units) in exceptional circumstances for up to three months.

Another key area to document is the ownership and governance around each item on the cash register, as they are typically not in the direct control of the functions, such as the treasury, responsible for overall liquidity risk management. For example, initial decisions on whether to meet discretionary claims from customers might rest with the claims department and the customer-facing functions. The cash register should record the key stakeholders associated with each cash demand, the associated reporting, including early warning indicators, and escalation procedures where liquidity comes under stress.

Cash register for cash supply

The second section of the cash register would then consider where the insurer could source cash inflows, both on an ongoing basis as part of business as usual, and potential sources in the event of a liquidity strain.

Potential sources of liquidity might include:

- Cash and other high-quality liquid assets
- Regular inflows from assets such as dividends, coupon payments and maturity proceeds
- Inflows from regular business operations, such as premiums and reinsurance receivables
- The ability to sell other financial assets in the market
- Access to short-term credit facilities such as sale and repurchase of assets or commercial paper markets
- Collateral held and ongoing receipt of liquid assets as collateral from derivative or reinsurance transactions
- External liquidity facilities
- Intragroup sources of liquidity, such as cash injections from a parent company

For each potential supply of liquidity, the register should document:

- The predictability of expected inflows and of liquidity supply from contingent sources
- The time taken to access contingent sources of liquidity
- The potential behaviour of the liquidity source under stress
- The extent to which assets are encumbered—e.g., posted as collateral—and may therefore not be available
- The direct costs of accessing sources of liquidity, for example fees, borrowing costs or bid/offer spreads, and also how these costs might behave under stress
- Any other adverse consequences, for example capital implications if selling assets creates an ALM mismatch, intragroup contamination risks and reputational issues if raising emerging liquidity

This will enable the insurer to assess different sources and prioritise them in stress testing and contingency planning.

LIQUIDITY RISK STRATEGY: RISK REGISTER

Another key element of LMF documentation is a 'liquidity risk register.'

The PRA, in CP 4/19, refers to this as 'the identification of all material sources of liquidity risk to which the insurer is exposed.' Examples of such risks are:

Liability-side risks: For example, surrender risks or pandemics.

Operational risks: Noninsurance risks that could give rise to an unexpected cash need, e.g., litigation or fines.

Asset-side risks: Particularly where assets are assumed to be available to be sold if required to meet cash outgo.

Concentration risks: These risks can exist in assets, for example exposure to a particular sector, counterparty or asset class, as well as on the liability side, for example a high exposure to a particular product line, distributor or customer type (e.g., corporate customers).

Particular care should be taken here when considering contingency plans, e.g., access to credit lines or unsecured funding markets.

Off-balance-sheet risks: For example, risks associated with collateral on reinsurance and derivative positions, such as the need to top up collateral if risks move against the firm and/or the market value of posted assets falls, trigger clauses that might be activated by a credit downgrade and any other contingent obligations to provide funding, collateral or cash.

Funding risks: For example, the ability to roll over short-term funding or liquidity, particularly where there are maturity mismatches between cash needs and sources.

Cross-currency risks: Where cash sources and cash needs are in different currencies. They can arise both from foreign exchange ("FX") movements but also from the risk of funding markets drying up in one particular currency.

Intragroup risks: The reliance on the fungibility of intragroup liquidity, and potential exposures to contingent intragroup liquidity calls on the firm.

Franchise risk: The need to pay, rather than defer, discretionary amounts to protect the firm's reputation with customers, employees, investors and the markets generally.

Using the cash and risk register

The 'cash register' and 'risk register' will then serve as a foundation for the other liquidity risk tools:

Risk appetite: The firm should consider its appetite for each potential liquidity risk.

Reporting: The items identified in the register will form the basis of the liquidity projections and also the ongoing reporting of liquidity sources and needs.

Stress testing: This considers the potential areas of liquidity stresses and how each area of potential need and supply might behave under stress.

Contingency planning: This includes the consideration of when, how and whether potential sources of liquidity might be accessed under a liquidity strain, and, using the register, which sources may be most appropriate for different circumstances, including the risks associated with those sources.

LIQUIDITY RISK STRATEGY: SCENARIO ANALYSIS AND PROJECTIONS

To manage liquidity risk effectively, it is clearly insufficient that a firm has adequate liquidity resources only in relatively normal conditions. A robust approach requires careful thought to be applied to the creation of a range of scenarios that may imperil the firm's liquidity position—indeed, the PRA CP4/19 requires: '*Varying degrees of stressed conditions should be considered in a range of stress scenarios. Each are expected to be severe yet plausible...*'

Components

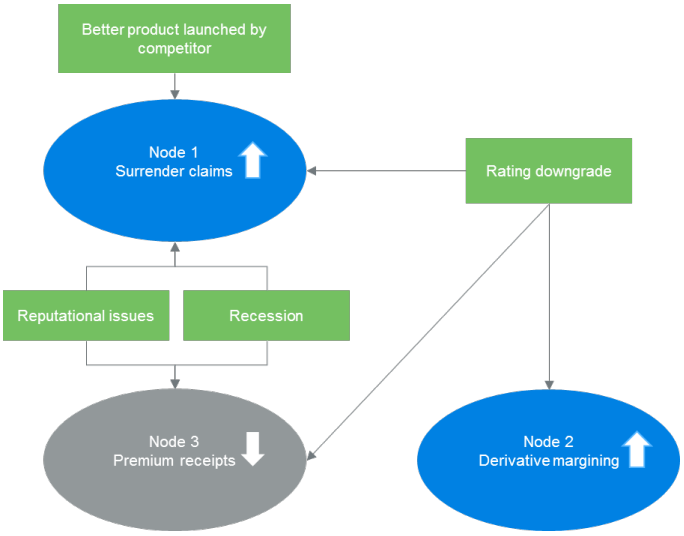
We now consider the following as components of a liquidity stress testing exercise:

1. **Objectives:** Put very simply, the aim is to determine how great a liquid asset buffer the insurer requires in order to survive a range of adverse scenarios.
2. **Scenario range:** The range of scenarios selected will contemplate:
   a. Simple (univariate) and more complex (multivariate) cases.
   b. Idiosyncratic events particular to the insurer as well as more market-wide systemic events and combinations of the two.
   c. Events of varying severity to explore the spectrum of available responses and at the extreme end of the range to test the limits of what the insurer can survive (so-called 'reverse stress tests').
   d. Where an insurer is part of a group, there may be a need to test additional scenarios at the group level, particularly those that might challenge the availability and transferability of liquidity resources within the group.
3. **Cash demands (outflows)/cash supply (inflows):** The sources and characteristics of these flows are available via the cash register described earlier. It is critical that all material (or potentially material) flows are included in the scenarios. For example, in the case of outflows, ranging from policyholder claims outgo to derivative margining requirements to debt service payments and staff salaries.

   For each flow, data is required on current exposures and also on how those exposures are expected to change over the time horizon of interest. For example, the product mix of new business volumes may be changing the liquidity characteristics of the liability portfolio over time. Alternatively, a plan to reduce or increase derivative usage or the mix of cleared versus non-cleared instruments will have an impact on the future liquidity position.
4. **Liquidity contingency plan:** Needs to be reviewed from the perspective of codifying the actions therein to enable them to be articulated within a modelling framework.
5. **Stress scenario construction:** If there are not to be fundamental gaps in the analysis, the scenarios developed must contemplate the full range of risk drivers that may

adversely impact the insurer's cash demand and cash supply balance. One approach is to take each material outflow or inflow and ask: 'What risks have the potential to drive a material change in this item?' Once the drivers of change are identified, common linkages between them can be established—a simple example is shown in Figure 10.

FIGURE 10: SIMPLIFIED EXAMPLE OF A LIQUIDITY RISK MAP



From Figure 10 we can deduce that a rating downgrade of the firm may trigger calls for additional collateral on any derivative positions that are currently liabilities, or give rise to an 'additional termination event' allowing counterparties to terminate derivatives, which will then need to be settled with cash. The downgrade may directly trigger elevated rates of surrender and of premium cessation resulting in something of a 'double-whammy,' increasing cash outflow whilst simultaneously reducing cash inflow. If the downgrade is linked to a wider reputational issue(s) then the impact is likely to be magnified, potentially causing a further wave of adverse liquidity flows. Thus, even in this very simple example we observe adverse impacts on three different inflows/outflows (represented as nodes in the model).

Taking the example further, we might explore the reasons for the rating downgrade. If this was related to investment market declines then this might imply a role for market liquidity risk. If the insurer needs to realise assets, this may take longer than usual in stressed markets and only be possible through incurring abnormally high trading costs and adverse shifts in market prices—in particular if the firm finds itself trying to deal in sizes which exceed (likely much reduced) market maxima.

In our experience, exercises such as this are greatly facilitated by the use of cognitive mapping software that allows users to visualise the drivers (nodes) within a particular system, the linkages between them and thus their relative influence on the outcomes.

The time horizon of the stress scenarios must also be considered. Unlike capital stresses under Solvency II where we are accustomed to a one-year horizon, the effective timeframe for our liquidity scenarios could be a day (or less) through to several years. The PRA makes its expectations clear in CP4/19 where stress testing is expected to include '...both fast moving scenarios as well as more sustained scenarios where the insurer's liquidity deteriorates slowly.' Insurers with significant derivative exposures and/or involvement in securities lending are most likely to consider intraday liquidity stress events through their exposure to capital market movements. However, there may be scenarios with broader applicability that might be highly disruptive on a very short-term basis, such as the failure of an automated payments system.

Once the features of the scenarios have been established, the next task is to calibrate a set of input parameters that define the scenario sufficiently precisely such that it can be modelled. Data will be available to underpin some parameters but the wide-ranging nature of some liquidity scenarios make it very likely that a significant element of expert judgement will also be needed.

1. **Modelling:** In our view, though less established, liquidity modelling is no less important than the actuarial modelling insurers already perform to evaluate their balance sheet positions and capital requirements and thus should be subject to the same rigorous standards. Ideally, we would have a single model capable of projecting all the firm's material cash inflows and outflows and their interactions in the presence of the various stress scenarios being considered. The model should also be capable of capturing the impact of invoking the firm's liquidity contingency plan. To do this, the model will need to include the metrics which will be used by management to monitor the firm's liquidity position and to instigate action. When actions are triggered their impacts to reduce cash outflows or increase inflows should be recognised, allowing for the expected time taken to execute the action and for the incremental costs of doing so. Ideally, the impact of actions will be shown separately in the results to make clear the extent to which they are being relied upon to mitigate liquidity shortfalls.

   The model should align with the timeframes of the scenarios being addressed so use of a quite granular time step, e.g., daily, might be appropriate for the initial projection period of perhaps a month. Beyond this, it may be reasonable to use a less granular approach moving into weekly or monthly time steps.

   The modelling needs to allow the required level of liquidity buffer to be readily evaluated for each scenario—that is, the level of high-quality liquid assets required to ensure the insurer is able to meet all net cash outflows over the scenario timeframe. In such analyses, there can be a danger of double-counting—an asset whose future proceeds are assumed to be available to match known cash outgo can, quite reasonably, be included in the projection of net cash flow. However, the same asset should then be excluded from forming part of the liquidity buffer even if its liquidity characteristics make it otherwise eligible. This approach avoids double-counting and a situation where a drawdown of assets in the liquidity buffer at a particular time opens up new net cash flow strains at

later times due to the elimination of future proceeds on the assets sold.

2. **Execution:** Speed of execution will be even more critical than typically seen for models concerned with capital and solvency—there is little point having a liquidity model providing daily outputs if the model itself takes longer than that to set up and run. Setting up the liquidity scenarios in the form of a model run schedule capable of automated execution would certainly help. The bulk of the run schedule will likely consist of persistent standard scenarios but there should also be slots available for more ad hoc scenarios to be added to provide a capability to react quickly to current circumstances.
3. **Reporting:** The greatest benefit will accrue if the model results can be stored and accessed centrally, with data visualisation tools used to create a range of standard reports but also providing certain users the flexibility to develop bespoke reports 'on-the-fly.'

LIQUIDITY RISK STRATEGY: LIQUIDITY CONTINGENCY PLAN

The third key component of the liquidity risk strategy is the preparation of contingency plans to meet any potential liquidity shortfalls.

The first element of any contingency plan is, of course, to maintain a suitable excess of high-quality liquid assets. These are assets which are:

- Of high credit quality
- Unencumbered by any legal or other restrictions on the ability to liquidate, sell or transfer the assets (e.g., due to ring-fencing requirements, or assets tied up in secured funding trades or posted as collateral)
- Easy to value with observable prices
- Typically exchange-listed or traded on deep, liquid and transparent markets
- Proven, from credible past experience, to be readily realisable even in stressed market conditions

Such assets can therefore provide a reliable and rapid first source of liquidity when required.

However, the insurer's stress and scenario testing may identify scenarios where the existing buffer of high-quality liquid assets is not sufficient, and firms should, in any case, prepare for scenarios other than those envisaged in stress testing as part of their risk management.

Firms should therefore develop a liquidity contingency plan to deal with potential strains that might arise. We suggest that this has five key elements:

- Identification of liquidity options
- Testing
- Interaction with stress and scenario testing
- Triggers
- Practical decision-making process

Overriding all of these considerations should be the fact that liquidity strains can develop quickly and may require urgent action to address them. Hence, it is vital that the firm's contingency plans and procedures are well documented and thoroughly tested.

The liquidity contingency plan should be a 'playbook,' designed to be actively used by management, and which sets out practical guidelines for how the firm can, and will, respond to liquidity strains, enabling efficient decision making.

Identification of options

Firms should ideally aim to identify a wide range of options, thereby maintaining a high degree of flexibility to respond to different scenarios.

Potential contingent sources of liquidity include:

- Sale or repo of assets of secondary liquidity quality, as identified in the liquidity sources in the cash and risk register
- Access to intragroup liquidity
- Collateral arrangements allowing insurers to post illiquid assets to replace more liquid assets posted previously
- Committed liquidity or funding facilities from third parties
- Uncommitted liquidity facilities

Insurers should also consider contingent plans to reduce liquidity outgo, based on the liquidity needs from the cash and risk registers, e.g., the ability to suspend dividend payments or debt redemptions, to suspend policyholder redemptions or to increase penalties on surrenders.

For each option identified, firms should document:

- The potential amount of liquidity available.
- The time taken to realise liquidity from the source.
- Applicability to different scenarios (e.g., firm-specific vs. market-wide stresses).
- The costs, both any commitment fees in advance and also costs when accessing liquidity. These costs include the fees on accessing committed facilities, the borrowing costs under repo and potential haircuts against fair market value when assets are sold in an illiquid market.
- Any adverse consequences of utilising the option (see below).

Testing

Insurers should ensure that their contingency plans are regularly tested to ensure that they work in practice, covering both the internal allocation of roles and responsibilities and also the ability to access and interact with external sources of liquidity. This may include accessing liquidity when it is not needed to ensure that the processes are robust, though recognising that execution will undoubtedly be more challenging under stress conditions.

For example, insurers who make little use of repo markets in their day-to-day business, or who manage their assets on a buy-and-hold basis, are less likely to be able to access markets in a timely fashion under stress.

Moreover, where insurers' plans rely on committed liquidity facilities, it would be prudent to test their operations on a regular basis, for example by drawing down liquidity as part of a dummy liquidity stress testing exercise. As an anecdotal example here, one firm discovered that notice to request committed liquidity could only be given by fax, not by email or phone—and the fax number given for the liquidity provider was no longer in service.

Interaction with stress and scenario testing

Testing as outlined above can typically ensure that liquidity options are operationally robust.

However, insurers should also consider how liquidity contingency plans might be impacted by the very scenarios that could give rise to a liquidity shortfall for the insurer.

For example, access to repo markets, particularly for infrequent participants, may simply not be available at the time of market-wide liquidity stresses.

Even seemingly high-quality liquid assets—e.g., money market funds (where redemptions may be suspended) or traded securities issued by financial institutions (likely to be under stress themselves in a liquidity crisis)—may prove to be illiquid during stress events.

Contingent funding facilities may prove not to be enforceable—e.g., they could have a 'material adverse change' or similar clause, enabling counterparties not to provide funding in cases of extreme market stress.

Firms would also be wise to avoid any concentrations of risk, for example overreliance on any one specific counterparty—who may themselves be suffering liquidity issues during a systemic shock—or any one particular asset class.

Insurers should also take particular care with their reliance on intragroup liquidity. Fungibility of liquidity sources may be prevented by ring-fencing requirements, or limited by the desire of regulators, particularly where different national regulators are involved, to avoid intragroup contagion.

Triggers

Here contingency planning links in closely with the liquidity risk reporting pillar in our framework.

It is key that liquidity metrics and early warning indicators operate in a timely fashion both to identify potential liquidity strains as soon as possible, and to enable the selection and operation of contingency plans in a timely fashion.

Practical decision-making process

The insurer will need a robust framework in place to:

- Activate the liquidity contingency plans once a trigger has been identified
- Confirm roles and responsibilities in light of the specifics of the scenario being faced
- Ensure that appropriate escalation is in place and that appropriate authorisations have been given to allow activation of different options
- Select between the various options available, having regard to the particular circumstances of the scenario giving rise to the stress

In making the decision as to which contingency plans to invoke, the insurer should have regard to the costs of the different options, including not just the direct financial costs but also the indirect costs, e.g., reputational.

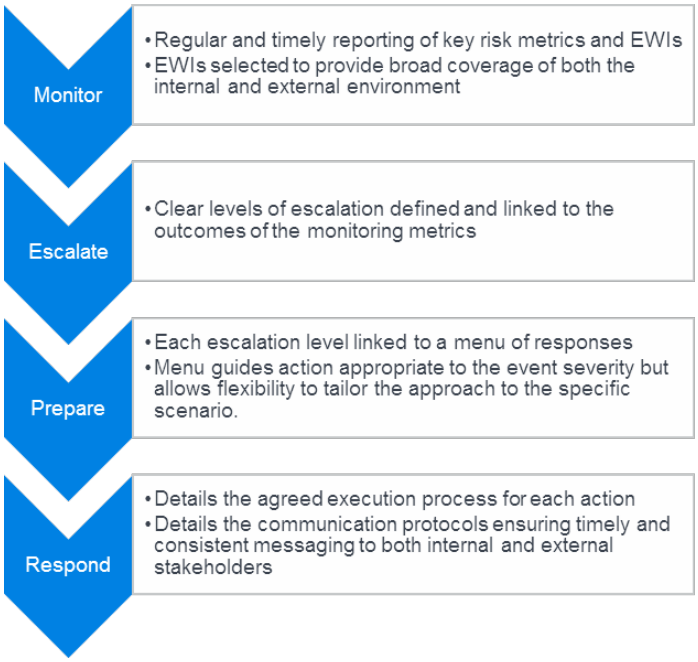
For example, it may be contractually possible to suspend policyholder redemptions, but to do so could harm the insurer's franchise.

Indeed, in certain cases, the triggering of contingency plans could itself further exacerbate an entity-specific liquidity stress by signalling financial distress to both market counterparties (who may not wish to engage in funding transactions) and customers (who may increase the rate of surrender and reduce the volume of incoming premiums).

Documentation of the features of the different options, as discussed above, is key to ensure timely and efficient decision making.

An example schematic of a framework is given in Figure 11.

FIGURE 11: PROCESS STEPS SUPPORTED BY THE LCP



LIQUIDITY RISK GOVERNANCE

Once an insurer has considered the above steps, it should have, or be able to produce, a suite of documentation and policies to define and support its ongoing liquidity risk management. We note, below, the documents and policies required within the framework for managing liquidity risk.

Liquidity documents should include:

- Risk appetite statement
- Liquidity risk policy
- Cash register to identify exposures
- Contingency plan
- Communication plan
- Review process
- Governance and responsibilities

Communication plan

A communication plan is a useful, if sometimes overlooked, component to a liquidity management framework. A key point when responding to a liquidity risk stress is how you communicate the liquidity plan in a way that implies the matter is under control. This is important externally, in terms of maintaining confidence and reputation so as to not exacerbate the liquidity issues, for example through difficulty accessing finance or through increased policyholder lapses. Communication is also important internally, so that personnel are aware of exactly what they need to communicate to who.

Governance, roles and responsibilities

Roles and responsibilities with respect to managing liquidity risk should be clearly defined within the business, whilst the board and committees are responsible for overseeing the risk management. Liquidity management should be embedded within decision making, and taken into account before additional risks are accepted.

Reporting lines should also be defined to ensure that relevant information flows throughout the relevant business lines. This includes maintaining the usual 'three lines of defence' model in which the first line refers to the treasury and investment teams, with the second line referring to the risk function and the third to internal audit.

Group: Consistency of approach

Ideally, there should be cohesion of approach across a group, with liquidity risk managed both in aggregate across the group and consistently within each individual entity. This may require consideration at group level on the approach to areas such as contingency planning, scenario analysis and asset classification, which can then be implemented throughout subsidiaries. However, the pursuit of coherence and consistency should not be allowed to detract from the recognition of the liquidity characteristics of individual entities. Thus, liquidity scenarios may need to be considered both bottom-up and top-down. The bottom-up approach allows for the specifics of each business. The top-down approach considers any specific group vulnerabilities and reveals liquidity fungibility issues. Indeed, if group resources are relied upon within stressed liquidity scenarios, this should be documented and carefully tested across the group to ensure that any intragroup liquidity support being assumed will be both available and transferrable.

Other considerations include:

- Use of consistent definitions and metrics across the group to the extent this is feasible and appropriate
- Allocation of roles at group level, and reporting lines up through the group structure
- Expansion of scenario testing to group level as well as entity level but also the potential inclusion of additional scenarios required to address any group-specific risks.

Liquidity management policy

The liquidity management policy can be seen as bringing together many of the elements discussed in this framework within one document. Typically, a liquidity risk policy will contain the following:

- An overview of liquidity risk exposures, definitions and overall strategy
- Statement of risk appetite, limits and warning indicators
- The impact of any changes in uses or sources of liquidity
- Roles and responsibilities
- Cash flow forecasts
- Stress and scenarios tests
- Reporting requirements
- Contingency and escalation plans

Review and update

Components of the LMF should be reviewed at least annually, and more frequently if there are changes to the insurer's strategic aims or external market conditions, or if there are significant business developments within the insurer, such as new product launches or changes to investment strategy.

In general, the review should involve an independent party and cover all components of the framework, including stress and scenario testing, contingency plans and appetite and limits. In particular, an insurer should reassess the limits it sets with respect to risk appetite to ensure that, as risk exposures develop or new exposures arise, limits remain in line with its preferences for risk whilst taking into account any change in circumstances. This inherently involves reassessing risk exposures in light of changes in both internal and external conditions.

Appendix 1: Real-world examples

EQUITABLE LIFE

Equitable Life found itself experiencing the insurance version of a 'run on the bank' in 2001, with a significant increase in surrenders that had been triggered by a lack of confidence in the firm following a ruling by the House of Lords on the treatment of its guaranteed annuity liabilities. Net claim outgo doubled from £3.0 billion in 2000 to £6.2 billion in 2001 and continued at elevated levels into 2002. At the same time, premium income fell very significantly by over 90% between 2000 and 2002.

Source: Liquidity Management in UK Life Insurance: A Discussion Paper - Life Research Committee of the Institute and Faculty of Actuaries

AIG

In the run-up to the global financial crisis, AIG had been an active writer of credit default swaps (CDS) and by 2008 had a very large exposure. Markets moved against AIG's positions and a downgrade of its credit rating resulted in a sudden requirement for it to meet significant collateral calls which previously had not needed to be paid. Further pain was inflicted via the termination of securities lending agreements, with AIG's counterparties seeking a return of their collateral, requiring AIG to find even more cash. These events resulted in a liquidity crisis in September 2008 with a bailout subsequently organised by the Federal Reserve.

Source: What Went Wrong at AIG? – Kellogg Insight – Northwestern University

ETHIAS

Ethias, a Belgium insurer, provides another example in the autumn of 2008 of a 'run on the bank' type of scenario, albeit on a smaller scale. The key drivers of the scenario were deteriorating financial strength and associated credit rating downgrades coupled with reputational damage arising from exposure to Lehman Brothers products.

Source: Surrenders in the Life Insurance Industry and their Impact on Liquidity – The Geneva Association

EXECUTIVE LIFE

As a final insurance example, we consider Executive Life, which ran into trouble in 1991. The company had a very large exposure to 'junk bonds' and, when their value fell significantly, policyholders sought to withdraw their funds. However, Executive Life was unable to satisfy these demands and claims payments were restricted for an extended period.

Source: What Happens When Your Insurer Goes Under? – The New York Times (14 Nov 2008)

WOODFORD EQUITY INCOME FUND

Following a period of high redemptions, investors (including retail investors) in this fund have now been blocked from withdrawing further funds for a period of at least 28 days.

Source: Neil Woodford blocks investors from pulling cash from flagship fund - The Guardian (4 June 2019)

This is not an insurance example directly, of course, but many insurers will hold investments in mutual funds such as this, with assumptions being made about their liquidity—this final example may prompt some reflection on those assumptions.

Appendix 2: Glossary of acronyms

ALM	Asset-Liability Matching
BEL	Best Estimate Liability
CDS	Credit Default Swap
CP	Consultation Paper
EMIR	European Markets and Infrastructure Regulations
EWI	Early Warning Indicators
FPC	Financial Policy Committee
G-SIIs	Global Systemically Important Insurers
HQLA	High-Quality Liquid Assets
IAIS	International Association of Insurance Supervisors
LCP	Liquidity Contingency Plan
LCR	Liquidity Coverage Ratio
LMF	Liquidity Management Framework
PHI	Permanent Health Insurance
PPFM	Principles and Practices of Financial Management
PRA	Prudential Regulation Authority
SCR	Solvency Capital Requirement

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Milliman is among the world's largest providers of actuarial and related products and services. The firm has consulting practices in life insurance and financial services, property & casualty insurance, healthcare, and employee benefits. Founded in 1947, Milliman is an independent firm with offices in major cities around the globe.

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