

# Buy-side liquidity risk management best practices

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**Abstract** Asset management activities and liquidity risk management practices have captured the attention of regulators and investors, who have focused on the potential mismatch between the promised liquidity terms in daily dealing open-end funds and the liquidity of the underlying assets in these funds. This paper describes what State Street Global Advisors has learned over the past five years while building out a liquidity risk management framework, including best practices developed to meet fiduciary and regulatory responsibilities. A comprehensive and robust buy-side liquidity risk management framework should incorporate strong governance, real-time measurement and monitoring processes, contingency planning and product suitability reviews, supported by best-in-class liquidity risk monitoring tools and systems.

**Keywords:** *asset management, liquidity risk management, stress testing, contingency planning, product suitability and disclosures*

## INTRODUCTION

Asset management activities and liquidity risk management practices have captured the attention of regulators and investors, who have focused on the potential mismatch between the promised liquidity terms in daily dealing open-end funds (funds) and the liquidity of the underlying assets in these funds. For regulators, the concern is that market stress and

significant redemptions from funds with similar investment strategies might cause these funds to sell assets into a falling market. This would lead to a price and illiquidity spiral, and the potential contagion could cause not only liquidity issues for individual funds, but also broader systemic issues across the financial markets. For investors, along with the risk of not getting their cash back when

redeeming fund units during such a contagion, those remaining in a fund may bear costs related to redemptions by other investors.

Liquidity concerns in corporate bonds, bank loans and emerging markets are not new. Since 2010, when first such phenomenon was observed, market participants and policymakers alike have observed the rise of ‘flash events’ without clear fundamental drivers — even in what have historically been some of the world’s most liquid markets. Meanwhile, bond trading turnover has declined over the period from 2008 till present, with the crowding out of active managers, among other secular trends, lowering the ratio of trading activity per unit of bonds outstanding. Accompanying these trends has been the reduction in market liquidity and depth, as measured by average trade size and price impact, further discouraging active managers from trading. What is more, asset management companies have assumed more responsibilities for managing liquidity as their assets under management have grown significantly, while banks and other market participants have limited their market-making activities after the 2008 global financial crisis.

Though there may be pockets of illiquidity in certain less liquid parts of the market, it is especially important during times of market stress to understand the wide range of established liquidity risk management processes and tools that fund managers have at their disposal to manage and mitigate liquidity risk for their funds and products.

This paper describes what State Street Global Advisors has learned over the past five years while building out a liquidity risk management framework, including best practices developed to meet fiduciary and regulatory responsibilities. State Street also aims to contribute to the current debates around the liquidity risk management of open-end funds and the role of the asset management companies. The following topics will be covered:

- Buy-side liquidity risk management framework, covering governance, measurement and monitoring, contingency planning, product suitability and disclosures.

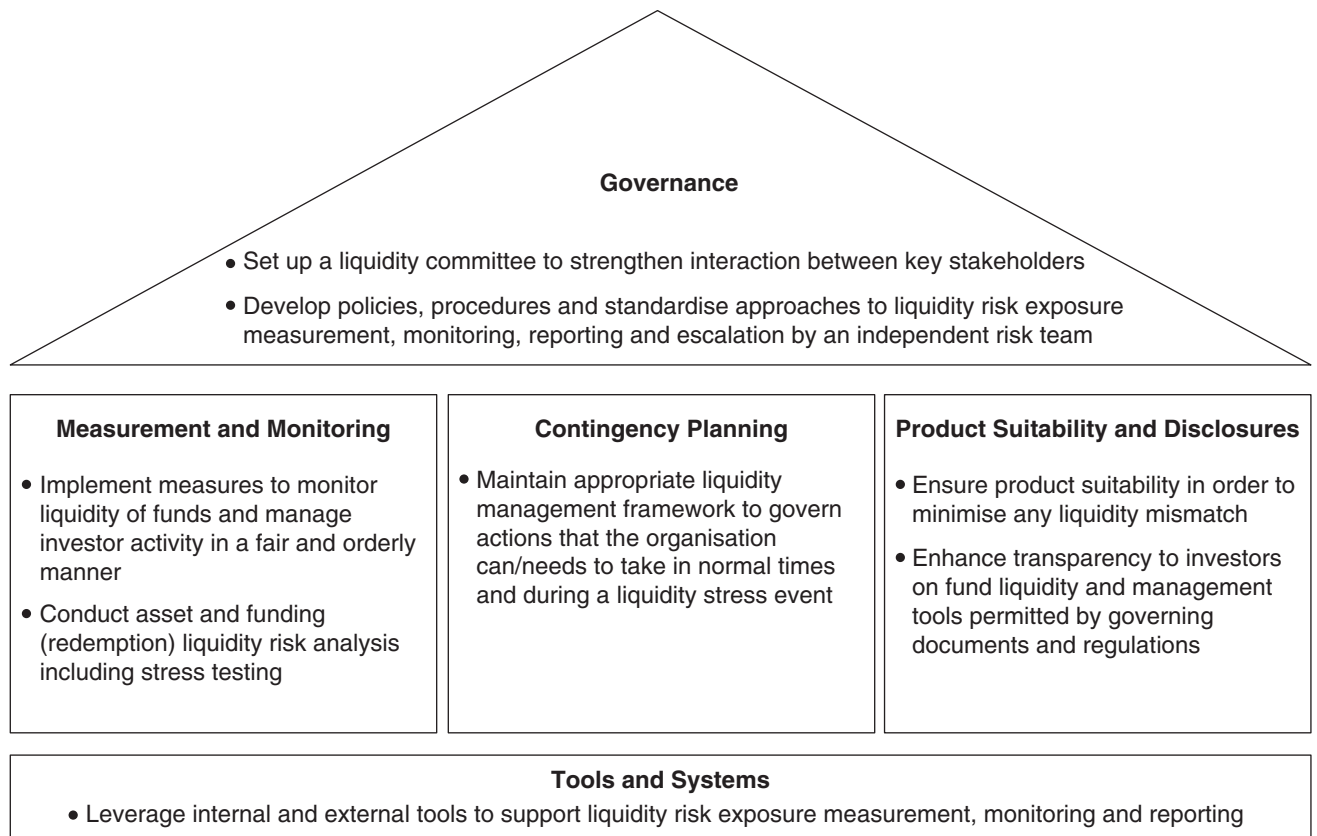
- Liquidity risk measurement and monitoring, including asset and funding liquidity risk measurement techniques, as well as stress testing.
- Contingency planning used to govern an organisation’s actions to protect investors in normal market conditions and during times of market stress.
- Product suitability and disclosures, covering key liquidity considerations throughout the product lifecycle.

## **BUY-SIDE LIQUIDITY RISK MANAGEMENT FRAMEWORK**

Effective liquidity risk management helps to safeguard the interests of investors, maintain the orderliness and robustness of collective investment schemes (CIS) and markets, and reduce systemic risk, all in the support of financial stability.<sup>1</sup>

For this reason, and in response to changes in financial markets, the regulatory landscape and clients’ expectations around liquidity, asset management companies should consider strengthening their liquidity risk management frameworks. A strong liquidity risk management framework pays attention to governance, measurement and monitoring, contingency planning and product suitability, supported by best-in-class liquidity risk monitoring tools and systems. Figure 1 presents a stylised overview of this framework.

Governance is of paramount importance for an effective liquidity risk management process, as even the most sophisticated liquidity modelling and perfectly predicted cash flows require effective oversight and controls to deal with the information produced.<sup>2</sup> Such governance should include a liquidity committee or similar senior governance forum with the purpose of assessing, monitoring, reviewing and challenging the liquidity profile and liquidity management process across all funds in normal and stressed liquidity conditions. This committee should have cross-functional representation from investment management, trading, risk, compliance and other relevant teams, combined with sufficient



**Figure 1:** Liquidity risk management framework overview  
Source: State Street Global Advisors.

independence from the day-to-day investment decision-making process.

Liquidity risk policy should guide liquidity management activities and risk monitoring processes, and procedures should detail key risk metrics and thresholds, combined with a process for monitoring and escalation.

Independent risk functions should regularly monitor and stress test the liquidity risk of funds and highlight excess exposures to help ensure that client activity is managed in a fair and orderly manner.

Liquidity risk contingency plans should be recorded in playbooks or similar documents to support portfolio managers and protect investors in open-end funds during stressed liquidity conditions.

Liquidity risk management is a cross-functional responsibility across the first and second lines of defense, and a robust liquidity risk management

framework should reflect that shared responsibility through governance representation and input regarding contingency plans.

## LIQUIDITY RISK MEASUREMENT AND MONITORING

Liquidity generally refers to the ability to execute large transactions with limited price impact, and tends to be associated with low transaction costs and immediacy in execution.<sup>3</sup>

Liquidity is a multidimensional concept, depending on a variety of factors including market structure and the nature of the asset being traded. Both the level and resilience of liquidity are important for market participants. Changes in market structures appear to have increased the fragility of liquidity. Larger holdings of corporate bonds by mutual funds and the higher concentration of holdings among mutual

funds, pension funds and insurance companies are associated with less resilient liquidity.<sup>4</sup>

Unfortunately, no single metric fully captures all relevant aspects of liquidity, making it difficult to assess liquidity conditions across markets or within a fund. Liquidity in an investment management context usually refers to the ability to convert an asset into cash in a defined time period and with limited discount to fair value. An asset is considered liquid when investors are able to buy or sell it with little delay, at low cost and at a price close to the current market price or fair value. Many factors may impact the liquidity of an asset, which can be measured by different modeling approaches.

Because of the multifaceted nature of liquidity, a three-dimensional approach should be used to estimate asset liquidity risk, based on:

- Quantity: How much are we trying to sell?
- Time: How long do we have to sell an asset?
- Cost: How much liquidation cost or discount to fair value are we willing to accept?

Liquidity is typically better at lower quantities, with more time to sell and with lower costs. That said, expressing liquidity in a uniform way can be challenging, as any asset liquidity metric needs to take all three dimensions into account. Data challenges create further complications, such as the lack of security-level market activity data needed to model the liquidity of over the counter (OTC) instruments. To overcome this, State Street relies on several complementary measures of liquidity in the liquidity risk monitoring process, and uses security-level liquidity metrics based on dynamic, real-time market data — with comprehensive coverage across all key asset classes, including derivatives — to ensure that investment liquidity is properly measured and monitored.

### Key liquidity risk measures

To fully capture the multifaceted nature of liquidity risk, as outlined above, key risk measures should incorporate both time and cost dimension of liquidity risk by using dynamic, market data-based inputs when analysing sources of liquidity in portfolios. In addition, the analysis should focus on

estimating funding liquidity needs coming from client-driven redemptions. The availability and quality of the data required should be taken into consideration when selecting key measures to be used in the framework and reporting.

Available industry best practices, regulatory requirements, guidelines and several research papers on buy-side liquidity risk management point to the following key liquidity risk measures.

#### *Asset liquidity risk*

- Estimated percentage of a fund's net asset value (NAV) that can be liquidated and made available to investors as cash over a specified time period, at an acceptable discount to fair value, or liquidation cost.
- Estimated liquidation cost when liquidating a predetermined percentage of a fund's assets in a defined time period.

In open-end funds, it is crucial to monitor whether the fund can meet estimated redemption requests without significantly impacting — or diluting — the remaining investors. Funding liquidity risk therefore needs to be monitored to establish whether the fund has sufficient sources of liquidity to meet estimated liquidity needs under normal or stressed market conditions.

#### *Funding or redemption liquidity risk*

- Estimated percentage of a fund that could be redeemed in a defined time period.
- Historical redemption rate patterns.
- Funding profile, including investor concentration and other investor characteristics.

Additionally, the liquidity coverage ratio (LCR) is a central measure bringing together asset and funding liquidity risk to estimate whether an open-end fund has adequate sources of liquidity — that is, liquid assets that can be converted into cash — to cover liquidity needs, such as investor redemptions, in normal or stressed market environments. It is worth noting that the LCR metric in a buy-side context is somewhat similar, but not the same, as the LCR maintained by banks by holding a sufficient amount of liquid asset on their balance sheet to meet maturing

liabilities. Because of that, some authors prefer to use the investor redemption coverage ratio or similar term in a buy-side context to differentiate it from banking LCR; we will stick to LCR in this paper.

### Liquidity coverage ratio (LCR)

$$LCR = \frac{\% \text{ of fund's NAV that could be turned into cash (including via asset liquidation) over a specified time period}}{\% \text{ of fund's NAV that could be redeemed over a specified time period}} \geq 1 \text{ or other specified limit}$$

These measures should be monitored daily to track deteriorating trends for every fund, including drilling down to the security level to explain changes.

### Liquidity risk stress testing

The aim of stress tests is to improve risk analysis by dedicated teams or senior managers, and to highlight the limits of risk measurement and management strategies. In particular, they flag up the consequences of, or conditions that might lead to, extreme scenarios, highlighting risks that have not been taken into account by the investment team.<sup>5</sup> Liquidity stress testing and scenario analysis covering both asset and funding liquidity risk is an important part of an effective liquidity risk management framework and should focus on historical and hypothetical scenarios.

A *historical scenario* stress test is designed to estimate how the liquidity of the current fund could deteriorate if the fund were subjected to market and liquidity dislocation like that which occurred during a selected historical period. These scenarios should as a minimum cover periods such as the Global Financial Crisis (October 2008), the European Debt Crisis (August 2011) and the Flash Crash (May 2010), as each of these scenarios brings something unique to the full picture. Additional scenarios might be needed when monitoring liquidity risk exposures that stem from emerging markets (EM).

A *hypothetical scenario* stress test measures the potential impact of market shifts, correlation changes

and stress redemptions that may be relevant currently but that did not necessarily occur historically. Such scenarios can involve shocking liquidity of certain fund holdings to assess the impact on overall fund liquidity. For example, one such stress test might assess how a worsening of Brazil's political crisis and illiquidity of related investments could affect the liquidity of EM funds as a whole.

Performing historical scenario stress testing at the security level is not as straightforward for non-exchange OTC-traded instruments, because the liquidity risk characteristics of current OTC instruments, especially bonds, cannot be compared directly with instruments that existed in previous periods of market stress. Most instruments held in portfolios today were not yet issued in those periods, and even when they were, they had different liquidity risk characteristics then. With that in mind, State Street has designed hypothetical stress tests with the objective of reflecting the liquidity deterioration experienced during the 2008 global financial crisis.

Hypothetical scenario stress testing can be performed by, for example, stressing the liquidity costs or trading volumes. For example, a hypothetical stress scenario used for high yield (HY) bonds assumes that current trading volumes would fall by 75 per cent and that liquidity costs would rise by 200 per cent to approximate the magnitude of liquidity shock HY bonds experienced in October 2008, on average.

For certain strategies, coordinated selling scenarios also should also be taken into account — if there were a run on EM small cap equities, for example, how much would it cost and how long would it take to liquidate? In such a case, State Street would monitor the liquidity metrics for the EM small cap composite, which combines the holdings from all EM small cap funds. These stress tests can assume pro rata liquidation, liquidation from the most to least liquid security or a combination of both.

In terms of funding liquidity risk, historical fund flow distributions can be analysed and compared with industry-wide fund flow distributions by similar strategy and size to generate a conservative estimate of the fund percentage that could be redeemed. To address tail events, metrics similar to value at risk (VaR) and conditional VaR can be used, with net redemption rate estimates at a certain confidence level — for example, 99 per cent — and



expected net redemption rates for the corresponding tail event range — for instance, a 1 per cent tail. The most conservative estimate from both internal and industry-wide distributions can be used as a final input for stress testing.

Investor concentration data can be used in parallel with fund redemption analysis to simulate hypothetical scenarios in which several of the largest investors redeem their holdings in a short period of time.

## **Liquidity risk management across open-end funds**

This section focuses on key liquidity risk management considerations and best practices used in liquidity risk management for open-end funds.

Liquidity should be one of the key risks covered when developing new investment strategies offered in open-end funds. For more guidance, refer to the section on product suitability and disclosures.

Frequent monitoring of liquidity risk exposures should be performed across open-end funds, covering estimated asset and funding or redemption liquidity risk, as well as historical fund flow patterns.

Measurement and monitoring processes should rely on market data-based security-level liquidity measures, with comprehensive coverage across relevant instruments. For securities without available market data, proprietary algorithms may need to be developed and applied to project relevant stressed volumes traded and liquidation costs. Also, when needed, models should be built (generally using many years of external and internal fund flow and investor concentration data) to project potential redemptions under normal and stressed market conditions.

Along with monitoring fund liquidity risk exposures, the risk management process for exchange traded funds (ETFs) — a somewhat more sophisticated type of open-end fund with additional liquidity features<sup>6</sup> — should cover: (1) primary market activity with focus on authorised participant (AP) concentration caused by a small number of APs engaging in fund's primary market activity and cash versus in-kind redemptions,<sup>7</sup> as well as (2) secondary market activity and liquidity indicators, such as secondary market trading volumes, bid-ask spreads, net asset value (NAV) premiums or discounts.<sup>8</sup> Regular reporting and interaction with investment

teams through formal risk reviews, combined with strong governance and timely escalation of excess risk exposures, can help ensure that liquidity risk exposures are well understood and that unintended exposures are promptly managed and mitigated by the investment teams.

A prime benefit of effective fund liquidity risk management is that it can help to ensure that in case of redemptions exiting investors are treated fairly and that remaining investors are not materially diluted in case of redemptions. A starting point is ensuring that portfolio structure remains largely stable throughout the portfolio liquidation process. If that is not possible, portfolio managers should balance pro rata and most-to-least liquid liquidation so that investment objectives and constraints can be met. They should also use liquidity management and mitigation tools, such as anti-dilution levies, which are designed to support portfolio managers and protect investors in open-end funds during stressed liquidity conditions. These tools will be discussed further in the next section.

## **CONTINGENCY PLANNING**

Liquidity management contingency planning should be used to guide the asset management organisation's actions in normal times and during potential market liquidity stress events. When managing liquidity, portfolio managers have a variety of liquidity management and mitigation tools available, including the following:

- *Anti-dilution measures*

Investor purchases or redemptions of units or shares of an open-end fund may cause the fund to incur charges relating to such transactions, including, among others, brokerage commissions, taxes, custody ticket charges and other fees.

Fund management company may require each participant who is contributing to a fund (where the fund experiences net contributions for the day) or withdrawing from a fund (where the fund experiences net redemptions for the day) to bear that participant's proportionate share of the actual transaction-related costs so that such costs are not borne by the fund's non-transacting participants.

Market effect, sometimes also referred to as anti-dilution levy, is a percentage fee representing the dealing costs associated with subscriptions/redemptions that are allocated to those investors whose transactions give rise to those costs as the fund manager considers appropriate.

Swing pricing is an anti-dilution mechanism which protects fund shareholders by countering the dilution effect of subscription and redemption activity. With swing pricing, a single price is issued for the fund and all clients buy and sell shares at this price. This single price incorporates a swing in the NAV of the fund in consideration of subscription and redemption activity on a dealing day. The direction and extent of the swing is dependent on the magnitude and direction of the dealing activity.

Redemption fees are collected by a fund from traders practicing mutual fund timing. This penalty is used to discourage short-term, in-and-out trading of mutual fund shares. Generally, the fee is in effect for a holding period from 30 days to one year, but it can be in place for longer periods.

Variable fees are a percentage fee charged to an ETF AP upon creation or redemption of share in the fund.

- *Redemption credit facility*  
Redemption credit facility is an arrangement between a financial institution, usually a bank, and a fund that establishes a maximum loan balance that the bank will permit the borrowing fund to access and by that add liquidity to the fund over a period usually limited up to one month. The borrower can draw down on the line of credit at any time, as long as he or she does not exceed the maximum set in the agreement in order to manage any cash flow mismatch in a fund arising from investor redemptions combined with asset sale settlement delays or illiquidity related issues.
- *In-kind redemption*  
Such redemption involves the transferring of shares in-kind and there is no cash movement associated with the transaction.
- *Redemption limits*  
A limit on daily redemption activity usually imposed by the directors of a fund to either: (1) X per cent or more of the total number of shares outstanding of a fund on that day; or (2) X per cent or more of the net asset value of the fund.

The redemption limit is applied pro rata across all investors requesting redemption on that day and any excess redemption activity is treated as having been requested on each subsequent dealing day until all redemptions requested have been fulfilled.

- *Settlement delay*  
Delay in fund unit settlements due to liquidity constraints, usually limited to only a few days.
- *Gating*  
A restriction placed on a fund limiting the amount of withdrawals from the fund during a redemption period. The purpose of the provision is to prevent a run on the fund, which could cripple its operations, as a large number of withdrawals from the fund would force the manager to sell off a large number of positions.
- *NAV suspension*  
Suspension of the valuation of the securities or other assets held by a fund and/or the units of a fund.

Only a subset of the possible tools may be available based on several fund factors, including region and legal structure. Contingency planning policies and procedures — for instance, playbooks — should provide guidelines for decision-making, including describing available liquidity management tools and identifying responsible parties and their roles. Playbooks are meant to describe, structure and, to some extent, simplify a complex decision-making process. During a market stress event, these contingency plans serve as key reference materials for portfolio managers and senior management.

Significant development work is required to ensure that different pieces of the puzzle — tools, roles, decision rights, procedures, timing and escalation protocols — are well defined, understood and socialised across the organisation. At a minimum, the following components are needed when building out contingency plans:

- *Real-time liquidity measurement and monitoring process*
  - To identify and confirm a deterioration in liquidity potentially leading to a liquidity event, and to provide real-time inputs to decision-making.
  - To ensure that liquidity costs are measured correctly, and any associated costs are distributed appropriately to clients benefiting from such liquidity.

- *Decision-making guidelines or playbooks*
  - For use in periods of market stress or crisis, on an ultra-short-term basis or during a more chronic liquidity stress period.

## **Real-time liquidity measurement and monitoring process**

Market liquidity is a function of investor confidence and therefore highly correlated with market conditions that can change abruptly. Financial market liquidity conditions and fund-level liquidity risk should thus be monitored frequently to identify and confirm any deterioration in liquidity conditions that could potentially lead to a liquidity event. This monitoring and notification process is a crucial input to the contingency planning process.

Such a process can be set up by connecting investment, trading and risk teams in real time to ensure insight into liquidity conditions across different asset classes, regions and parts of the investment process globally. These teams should then be responsible for continuously monitoring liquidity conditions and notifying relevant stakeholders when liquidity conditions deteriorate. The designated team identifies and confirms a change in liquidity conditions, gathering supporting evidence before communicating the change through the central notification system.

The liquidity condition is, to some extent, a subjective view of the world, and therefore needs to be supported by objective evidence and expertise in the group responsible for investment management and trading. Supporting evidence includes, but is not limited to, ex post and ex ante measures of liquidity, such as various liquidity indicators — for example, bid-ask spreads, trading volumes and turnover — volatility measures, fund flows and so on.

## **Decision-making playbooks**

Decision-making guidelines or playbooks are meant to describe, structure and, to some extent, simplify a complex decision-making process. Once these decision-making mechanisms have been built, the investment and operations teams can use specified liquidity management tools according to the decision

rights, timing and other identified factors. Figure 2 shows a simplified example of a mutual fund liquidity risk playbook.

The availability of particular liquidity management tools based on legality, feasibility and other factors will determine, to a great extent, how effective the liquidity decision-making guidelines are in practice, especially as liquidity challenges increase.

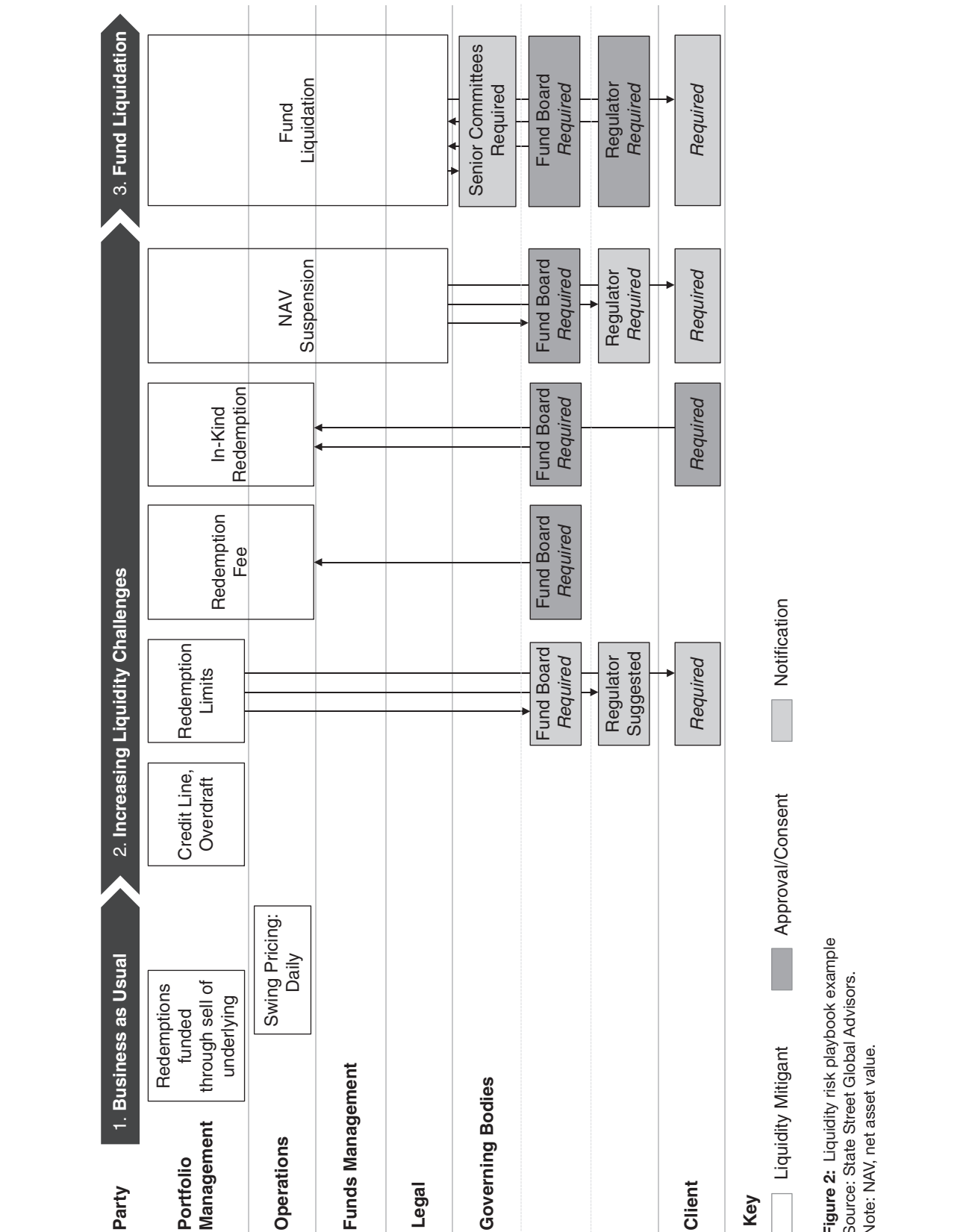
Contingency plans should cover all permissible liquidity management and mitigation tools, and ensure that decision rights, roles and responsibilities, and communication protocols are well defined for all phases of a liquidity event. While some parties own and use the liquidity mitigation tool, other parties need to preapprove or only need to be notified of its use.

Additionally, all parties identified in contingency plans should be aware of their roles, whether through participation in plan development, regular testing or legal provisions and disclosures in fund documents. Periodic operational tests of readiness to use liquidity management tools should be performed to ensure that tools can be used in an orderly and prompt manner.

## **PRODUCT SUITABILITY AND DISCLOSURES**

A new open-end fund may be set up under various regulatory regimes — typically, Undertakings for Collective Investment in Transferable Securities (UCITS) and Alternative Investment Fund Managers Directive (AIFMD) fund structures in Europe and the 40-Act registered fund structure in the USA. From a regulatory philosophy perspective, UCITS and 40-Act regimes were designed for retail clients, while the AIFMD regime was drafted for institutional clients. In practice, however, the distinction is less clear. In certain European markets, it is common to see retail clients buying alternative investment funds (AIFs) and institutional clients buying UCITS funds. When looking at the liquidity of the underlying investments, UCITS and registered 40-Act US funds are expected to invest in liquid assets, mostly with a daily NAV. By contrast, AIFs may invest in less liquid assets, and a non-daily NAV is widely accepted for this kind of product.





Therefore, properly assessing the liquidity of the investments and choosing the frequency of fund dealing accordingly is the first step to mitigating liquidity risk. Careful product design can help to avoid unexpected liquidity problems during the lifecycle of the product by managing client expectations properly. This assessment is also critical to ensuring that the fund is suitable for clients going forward.

Launching a new product also means drafting the prospectus and supplemental documentation. One requirement of this legal documentation is providing the client with a fair assessment of the potential risks of the fund, including liquidity risk. Liquidity risk should be assessed through the long run, and the high dispersion of potential liquidity risk levels should be considered. That includes, for example, making clear that some asset classes are liquid most of the time but can become illiquid during rare stress periods. This is also true for individual securities that might become illiquid because of idiosyncratic events, such as bankruptcy.

The prospectus also defines the inflow and outflow process. Liquid funds usually offer daily inflows and outflows to their clients. For less liquid funds, a number of liquidity risk mitigation tools — for instance, less frequent NAVs and inflow/outflow windows, pre-advice periods to post redemption requests, and redemption fees — can be incorporated into the product guidelines. The fund's board of directors can also be given the opportunity to suspend inflows/outflows or NAV calculations in the event of liquidity problems, when in the best interest of all shareholders.

An important evolution in asset management is the application of anti-dilution measures, with swing pricing leading the pack. Swing pricing is basically the application of a spread at the top of the NAV, which can be applied at a certain level of inflow or outflow. This process ensures a better balance between the interests of clients joining or leaving the fund and the clients staying in the fund. The spread is a function of the fund's asset class and can be reviewed depending on market conditions.

## Product design

The initial design of a product presents an opportunity to establish arrangements to underpin

effective liquidity risk management. Open-end funds should be designed to meet their redemption obligations. If those obligations cannot be met in a particular situation, then redemptions must be managed in a prudent and orderly fashion that is in the best interest of investors.<sup>9</sup>

As a fundamental part of the product design of a new fund at State Street, product, investment and risk teams examine the liquidity of the underlying securities in different market environments to understand how their liquidity profiles change over time and what impact that may have on the liquidity of the fund itself. State Street performs additional stress testing and analysis on the less liquid parts of the equity and fixed income universes, such as EM and credit securities. This ensures that both the index and the investment processes used for a fund are robust enough in all market cycles. State Street also works with index providers to ensure that the benchmarks being tracked are investable and, where necessary, uses screens within the index methodology to help remove the least liquid constituents from the investable universe.

All existing specific liquidity management tools and mechanisms — for example, gating and payment in kind — should be documented, and procedures for their activation should be transparent to investors.

The product design phase is also the opportunity to assess, based on portfolio and strategy characteristics, the need for specific liquidity and capacity limits.

Determining the capacity limit of a strategy involves a multi-pronged approach, which may include the following analyses:

- Performance decay (alpha decay or ability to track) as the asset size grows and/or market conditions change.
- Liquidity profile and how the strategy would evolve in the event of a stressed market environment.
- Competitive landscape and reasons for capacity limits versus other similar strategies.
- Product structure.

All such limits should be validated by senior management and governance committees, whose

oversight authority covers investments, liquidity, new products and other relevant areas.

## Product life

After a liquidity risk-management process is established before a product launch, this process must be effectively performed and maintained during the life of the fund, with the monitoring of liquidity risk and capacity controls implemented on a regular basis.

As part of this process, an independent risk team should analyse and regularly monitor key liquidity risk metrics (eg, estimated time to liquidate, estimated liquidation costs, illiquid tail outliers analysis) and concentration characteristics, including considering anticipated client flows, under both normal and stressed market conditions. In addition to that, it should assess product liquidity and capacity recommendations, operate a capacity early warning monitoring system and escalate any concerns. All alerts and limit breaches should be managed according to control standards, with alerts analysed, acted upon or escalated as needed, and breaches remediated in a timely manner.

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- ETFs combine features of open and closed-end funds. Like open-end funds, the quantity of shares outstanding can increase or decrease in response to investor demand through primary market creation and redemption process. Like closed-end funds, ETF shares trade intraday on a secondary market.
- Funds that must satisfy redemption requests in cash must find a willing cash buyer for portfolio holdings. The concept of liquidity is an entirely different consideration for funds which transact in-kind, such as majority of ETFs. There is no need for such funds to be able to convert their holdings to cash, and every holding such fund holds is liquid in the sense that it can be distributed in exchange for a redemption to the parties eligible to transact in-kind with the funds (the authorised participants in case of ETFs), who agree, and in most instances prefer, to receive such proceeds in-kind.
- Specifically, when an ETF's shares trade at a discount to the value of the assets held by the ETF (NAV), authorised participants (APs) can buy the ETF's shares and redeem them with the ETF sponsor for the underlying assets. These underlying securities can then be sold, potentially resulting in a net profit for the AP. The process works in reverse when ETF shares are trading at a premium. As a result of this creation and redemption arbitrage mechanism, the market price of an ETF's shares and the value of its underlying assets tend to generally stay closely aligned.
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## Glossary:

1. Market and liquidity dislocation – when equity and fixed income markets behave in ways one wouldn't normally expect in a given set of financial conditions.
2. Value at risk (VaR) – a measure of the risk of investment loss. It estimates how much a set of investments might lose (with a given probability) in a set time period such as a day.
3. Conditional VaR – a risk assessment measure that quantifies the amount of tail risk within an investment portfolio.  
Market price – the current price at which an asset or service can be bought or sold.
4. Fair value – where a price is believed to represent the correct market value of an asset, i.e. is not under or overvalued.
5. Daily dealing – typically used to describe a mutual fund that prices its units daily, allowing investors to buy and sell units daily.
6. Swing pricing – a pricing mechanism which protects fund shareholders by countering the dilution effect of subscription and redemption activity.
7. Authorized participant – a party at the center of the creation and redemption process in the ETF market playing the critical role in ETF liquidity; responsible for acquiring the securities in exchange for ETF shares from the issuer during the creation process and acquiring the ETF shares in exchange for the securities from the issuer in the redemption process.
8. Ex post and ex ante measures of liquidity – ways of measuring actual and anticipated liquidity (liquidity is the degree to which a security can be bought or sold without materially affecting the market price).
9. Bid-ask spread – the difference between the bid price on a security (the buyer's price) and the offer price (the seller's price).