

Liquidity Shock: The Hidden Risk in Modern Markets

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Introduction

Post-crisis changes to regulations and market structure have combined with innovations in technology and financial products to make global markets more robust and efficient. Despite this progress, today's markets still contain risks that increase vulnerability to volatility spikes, episodic disappearances of liquidity and, potentially, another liquidity crisis. The main sources of these risks are the ongoing stream of financial product innovations, automated and algorithmic trading practices and, ironically, some of the very regulatory adjustments put in place to strengthen markets after the 2008 crisis.

Together, these factors have the potential to turn a small market disruption into a rapid collapse of asset prices—a danger that became all too real to investors during the sudden and dramatic reappearance of market volatility in February 2018. Over the coming decade, these risks could be exacerbated by unprecedented “quantitative tightening” by central banks that could cause funding liquidity and, ultimately, market liquidity to shrink.

Exhibit 1 (*next page*) illustrates how complex interactions among this web of factors could be making markets more “accident prone.”

Institutional investors who fail to account for resulting potential liquidity shortages in their risk management practices are likely to find themselves in the dangerous position of having to scramble for liquidity in disorderly markets to protect against losses or meet regulatory requirements.

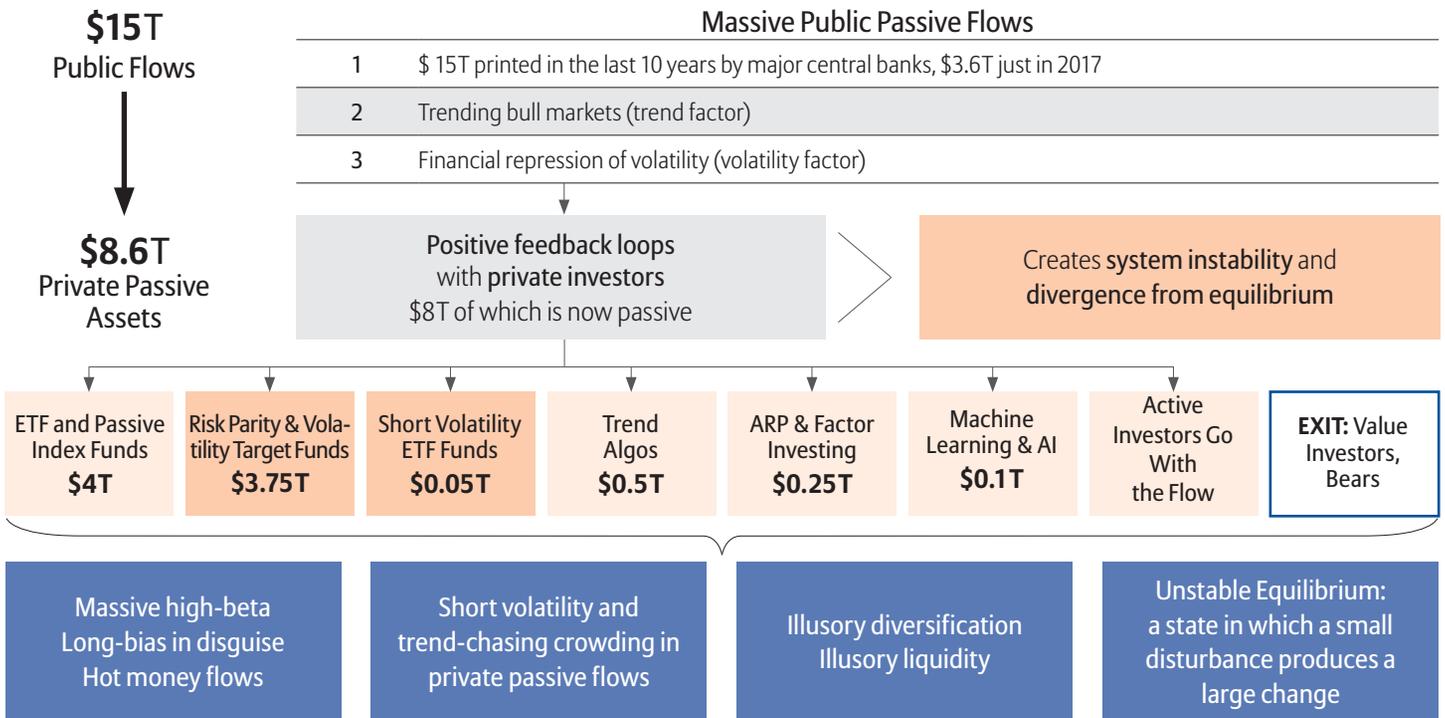
In this paper, we identify and assess the factors contributing to liquidity risk and provide recommendations on how institutional investors can protect their portfolios from future liquidity shocks.

Key Takeaways

- Today's markets contain hidden risks that increase vulnerability to volatility spikes and liquidity shortages.
- The main sources of these risks are financial product innovations, automated and algorithmic trading practices and regulatory adjustments put in place to strengthen markets after the 2008 crisis.
- Also contributing to more “accident prone” markets are diminished bank bond inventories, the growth of high-frequency trading, and the proliferation of ETFs and rules-based trading strategies.
- These risks could be exacerbated in coming years by unprecedented “quantitative tightening” by central banks.
- Institutional investors should act now to account for potential liquidity shortages in their risk management practices.
- Protecting a portfolio against liquidity shocks requires a system to identify early or predictive signs of a shock and palliative actions in case a liquidity shock occurs.
- Congress and regulators should work together to put in place micro- and macro-prudential measures that can minimize risks to liquidity availability, help build investor confidence and, potentially, soften liquidity shocks.

Exhibit 1: The financial infrastructure is more fragile than it seems

Feedback loops create hidden instabilities



Source: Fasanara Presentations “Market Fragility: How to Position for Twin Bubble Bust,” October 16, 2017, Allianz Global Investors

As the financial system strengthened, markets became more liquid

During the Great Financial Crisis of 2008, liquidity shrank dramatically or dried up entirely in the LIBOR, repurchase agreement, short-term commercial paper and other large-volume money markets. The cost of short-term money soared as perceptions of counterparty risk became more acute. Illiquidity in the funding markets spread to the capital markets, which became unstable. Price discovery became difficult, if not impossible, as counterparties sought safety in cash.

In response, financial market participants, regulators and central banks, especially, took powerful steps to make the banking and financial systems more resilient and assuage fears that funding liquidity would become unavailable or unaffordable. These steps changed the financial landscape permanently.

In the midst of the crisis, monetary authorities were forced to step in to assure that illiquidity in specific funding markets did not lead to sequential disruptions that would make the entire financial system inoperable. These actions proved highly effective. Unconventional monetary policies drove interest rates to unprecedented low levels that sustained a recovery in real economic growth and accommodated lengthy bull markets in both stocks and bonds. As Randal Quarles, the US Federal Reserve’s Vice Chairman for Supervision, put it in a January 2018 address to the American Bar Association Banking Law Committee, new regulations and their enforcement “resulted in critical gains to our financial system: Higher

and better quality capital, an innovative stress testing regime, new liquidity regulation, and improvements in the resolvability of large firms.” Stress tests—as well as multilateral accords that increased banks’ risk-based capital requirements and limited the amount of leverage banks can take on—provided a buffer against credit-related losses, while new laws like Dodd-Frank created a new, deeper source of liquidity in the form of a modernized swaps market.

Since the crisis, markets have also been made more efficient mechanically by technological advances and product innovations. Trades are executed nearly instantaneously worldwide at transaction costs that are a small fraction of what they were a few decades ago. Fixed-income markets, especially, have been transformed as barriers to entry have fallen and new liquidity providers have stepped forward. Electronic trading platforms, post-trade infrastructures and steps to enhance transparency have led to more open markets and away from bilateral and over-the-counter structures.

The new electronic infrastructure allows for a more diverse set of investors to participate, increasing competition and improving market liquidity. On many of the most volatile trading days, a new nonbank market entrant now consistently ranks as one of the top three liquidity providers on the main electronic trading venue. During these volatile periods, nonbank participants have maintained tight bid-ask spreads while banks widened bid-ask spreads and, at times, withdrew completely from the markets. Overall, due to nonbank participants, bid-ask spreads are now meaningfully tighter, complex documentation has been eliminated, and risk has been reduced.

Meanwhile, funds tracking bond indices now hold more cash and invest increasingly in standardized derivatives that are more liquid than individual bonds and can be sold without much loss if funds face a rash of redemptions. Information flows more freely and is distributed more widely, and prices are readily available to virtually all participants to discover.

In sum, these changes have addressed many of the systemic risks seen as causes of the Great Recession and made markets more robust, resilient and efficient.

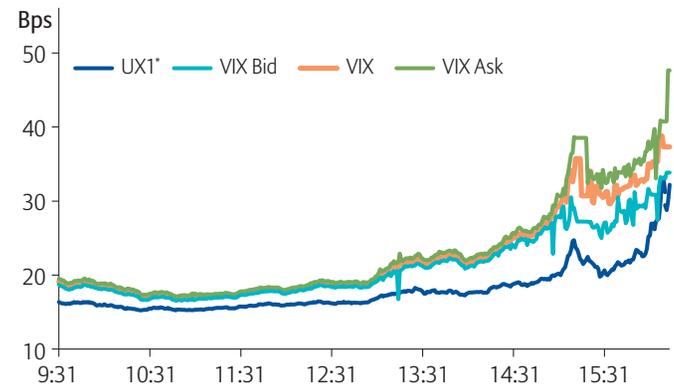
Redesign of the financial landscape may have elevated liquidity risk, too

Despite these significant improvements and the availability of ample liquidity in most asset markets through January 2018, the banking and financial systems remain vulnerable to many of the same liquidity-zapping risks that created distress during the Great Financial Crisis. In fact, some of the steps taken in the wake of that crisis have actually contributed to higher levels of liquidity risk.

Systemic liquidity has two components: market liquidity and funding liquidity. Although the two types of liquidity are distinct, they are closely related and, often, mutually reinforcing. When funding liquidity is not abundant, traders do not have the resources with which to finance the trading positions that smooth out price shocks and sustain orderly markets. Next, volatility worsens and trade financing becomes stifled. As margins increase, borrowing costs in the short-term funding markets elevate and the flow of credit becomes disrupted. Once liquidity becomes scarcer, the actions of individual players have a bigger impact on markets. Thus, the market machinery takes a small event, distorts it, and creates a major breakdown.

Exhibit 2: Liquidity shortages exacerbated February's spike in the VIX index

Feb 5, 2018 bid-ask spreads on VIX



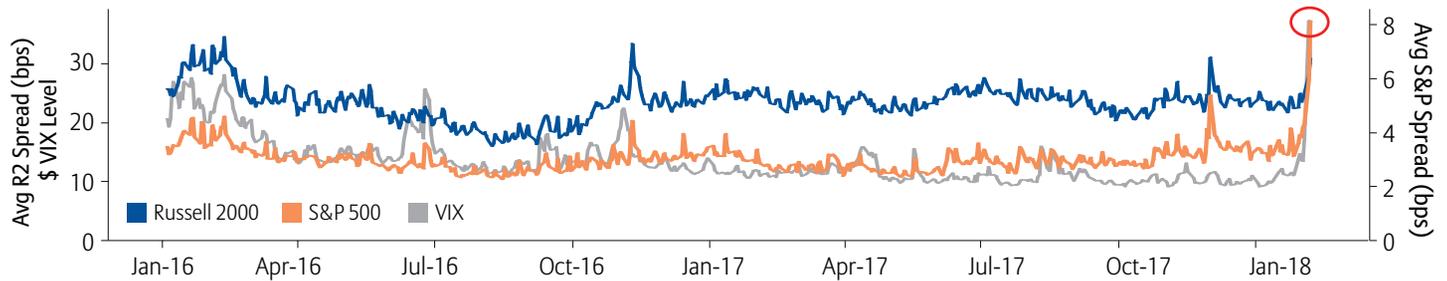
* The front month VIX future index
Source: Barclays Research, Bloomberg

The market provided an unnerving example of this cascade effect in February 2018. On Feb. 5, the Dow plunged 1,175 points, or 4.6%. **Exhibit 2** illustrates the corresponding spike in the VIX index—a sudden move that was triggered initially by the equity market sell-off but was fueled largely by a decrease in liquidity, as depicted by the newly expansive gap between VIX bid and ask spreads.

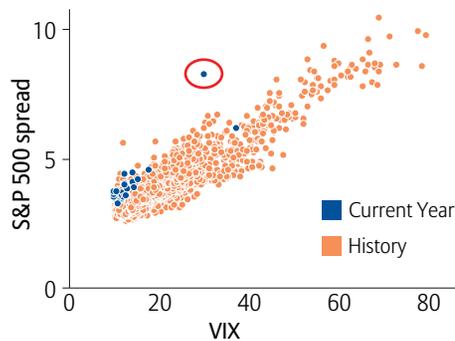
The sudden disappearance of liquidity was not limited to the VIX. **Exhibit 3** illustrates the equally impressive spike in equity bid-ask spreads during the market sell-off—even in the large cap equities that make up the S&P 500. Although spreads recovered quickly, this event represents a clear warning to investors that significant liquidity risks are embedded in today's complex financial market infrastructure.

Exhibit 3: Liquidity evaporated broadly during the February 2018 market sell-off

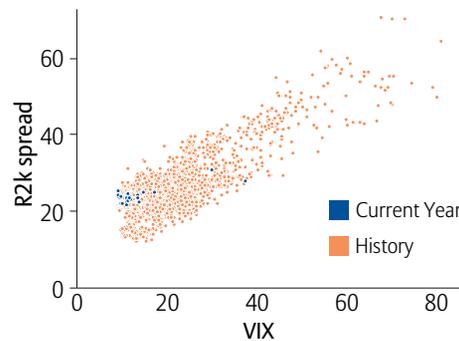
Average bid-ask spread vs VIX



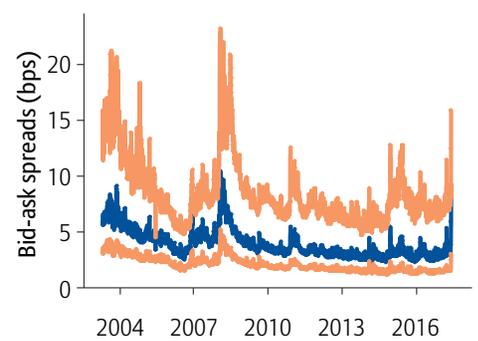
Bid-ask spread vs VIX (S&P 500)



Bid-ask spread vs VIX (Russell 2000 stocks)



Bid-ask spread for S&P 500 stocks (High-Median-Low)



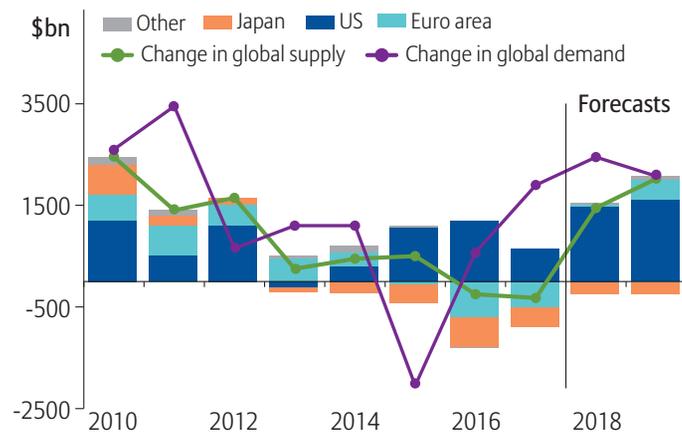
Source: Credit Suisse, TAQ

Is funding liquidity at risk?

The biggest determinant of funding liquidity over the next decade will be actions of central banks and governments, starting with the US Federal Reserve and the Treasury Department. The Fed is on a predetermined course to raise its policy interest rate targets, shrink its balance sheet, withdraw reserves from the banking system, and maintain the inflation rate at, or near, 2 percent a year. While other major central banks have not yet begun to remove monetary accommodation in earnest, such a process likely will advance in 2018 and 2019. Accordingly, central banks globally will be buying fewer and fewer securities, shrinking demand for bonds. **Exhibit 4** illustrates the projected impact of these policies on the supply and demand of public safe assets around the world. This unprecedented “quantitative tightening” will entail many unknowns that could cause funding liquidity and, ultimately, market liquidity to shrink.

Exhibit 4: “Quantitative Tightening” will have consequences, known and unknown

Net supply and change in notional demand of public safe assets



Source: Citi Global Economics, Allianz Global Investors

As tighter monetary policy causes interest rates to increase, public- and private-sector debt servicing costs will climb and some marginal borrowers likely will be crowded out. Money supply growth, already in a multi-year deceleration in the US, will slow even more, making the US dollar scarcer in global markets. Liquidity risk premiums can then be expected to rise. **Exhibit 5** illustrates how progressive tightening of US monetary policy will coincide with soaring issuance of Treasury securities as the federal budget deficit widens over the years ahead. Meanwhile, the Treasury can be expected to boost its cash holdings on deposit at the Fed whenever Congress becomes deadlocked over provisions of the federal budget or the federal debt limit. Such occurrences tend to drain bank reserves and funding liquidity while dampening the growth rate of the money supply.

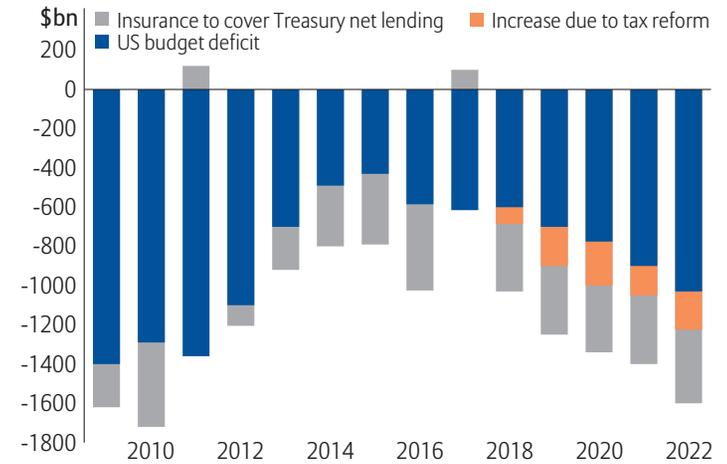
Is market liquidity at risk?

The safeguards put into place by regulators to make the banking and financial systems more resilient also could put market liquidity at risk, especially during a period of financial market distress.

During a crisis, banks operating under the Basel Capital Accords and Supplementary Leverage Requirements (SLR) will be unlikely to

Exhibit 5: Interest rates projected to rise with Treasury borrowing needs

Issuance of US Treasury securities; US budget deficit plus Treasury net lending



As of January 30, 2018

Source: MacroStrategy, Allianz Global Investors

accept new non-operating, short-term deposits that would require setting aside increased capital. Similarly, banks likely will be reluctant to underwrite stock issuance through rights offerings, because doing so absorbs capital and requires additional liquidity.

The regulatory structure also diminishes the willingness and capacity of banks to buy bonds if a financial shock arises or the trend in bond yields turns upward. **Exhibit 6** illustrates the shrinking footprint of market-makers in corporate bond markets since 2006-07. Banks kept much smaller inventories of securities, even relatively low-risk Treasury securities, than before the financial crisis, dampening repo financing activity and making markets more susceptible to liquidity

Exhibit 6: Market-makers have retreated from the corporate bond market

US holdings of US and non-US corporate bonds, year-end 2002-2014 (in trillions of US dollars)

	Investment Funds	Securities Brokers and Dealers
2002	0.76	0.18
2003	0.78	0.23
2004	0.83	0.25
2005	0.97	0.33
2006	1.22	0.38
2007	1.3	0.37
2008	1.25	0.14
2009	1.48	0.18
2010	1.5	0.21
2011	1.69	0.12
2012	2.07	0.17
2013	2.3	0.17
2014	2.62	0.16

As of December 31, 2014

Source: US Federal Reserve, Bank for International Settlements, Allianz Global Investors

droughts. In this environment, small interest-rate movements can generate big changes in fixed-income securities prices.

In principle, asset managers could help absorb some of the bonds left behind by banks. However, unlike banks that can fail due to trading losses, asset managers, as custodians of money, pass losses in their funds directly on to investors. In times of turmoil, asset managers could be forced to offload securities, and even derivatives, at fire-sale prices. What's more, some asset managers now bypass banks by cross-trading or by breaking up trades into smaller orders to prevent them from moving prices in an adverse direction. This lopsidedness puts at risk the availability of liquidity and increases susceptibility to flash crashes.

Although hedge funds can pick up some of the slack from banks, they do not have the capacity to match the influence banks had in the fixed-income marketplace. They're simply too small. Also, due to hedge funds' concerns about rising risk, they have a tendency to sell securities ahead of near-term increases in volatility, which increases reliance on price momentum. Acting on these trends actually reinforces feedback loops that amplify stock-price volatility and correlation, and raise overall market risk of price declines and liquidity disappearance.

Meanwhile, other types of investment firms have become more discriminating about the markets they make and clients they serve. Market-makers in equities, bonds, currencies and commodities have a tougher time buying and selling assets cheaply and quickly without moving the prices. Trading desks that still match buyers and sellers are now reluctant to purchase securities before lining up a client.

Several additional factors could be contributing to elevated levels of market liquidity risk:

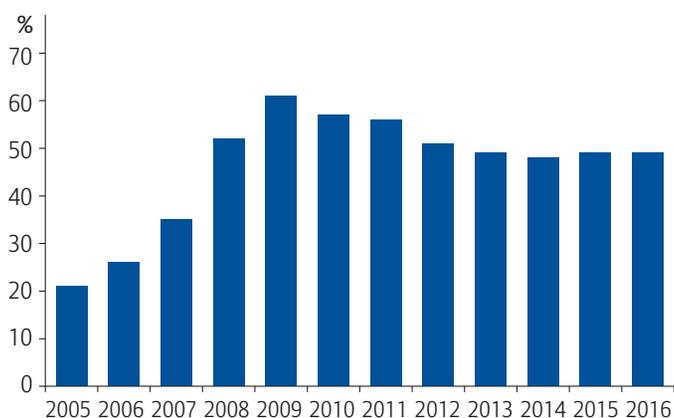
Algorithms and the acceleration of trading

Ironically, the same automated and algorithmic trading platforms that help to bolster funding liquidity might present challenges to market liquidity. Critically interdependent components of the financial system have become tightly coupled across markets and geographies, elevating the risk that a market disruption anywhere in the banking or financial system could spread to somewhere else. Given the hyper-speed of automated transactions, apparently simple and innocent actions can quickly initiate—without human intervention—a chain of compounding problems:

- Automated and algorithmic trading systems accommodate unprecedented trading volumes in fractions of seconds. These systems enable traders to adjust their holdings and risk exposure almost instantaneously in response to evolving order book and market price dynamics. For that reason, quantitative-based electronic platforms that are effective in pooling liquidity in “normal” times contribute to discontinuous pricing when circuit breakers shut down trading platforms during periods of stress.
- As shown in **Exhibit 7**, high-frequency traders generate nearly half of US equity trading volume. However, these automated trading firms, which provide very short-term intra-day liquidity, typically do not end their trading days with significant long or short net exposures. During periods of unsettled market conditions, these

Exhibit 7: Liquidity from high-frequency traders could prove ephemeral in crisis

High-frequency trading as a percent of overall US equity trading



As of December 31, 2016

Source: TABB Group, Allianz Global Investors

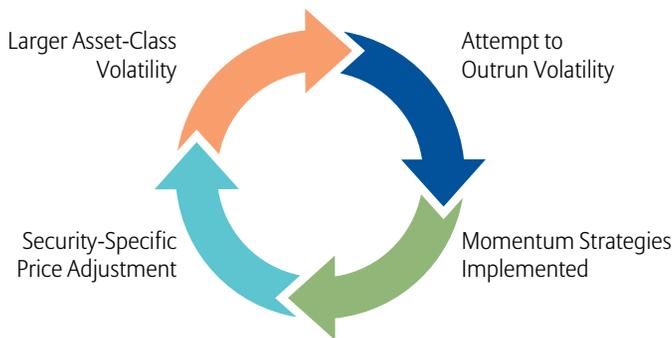
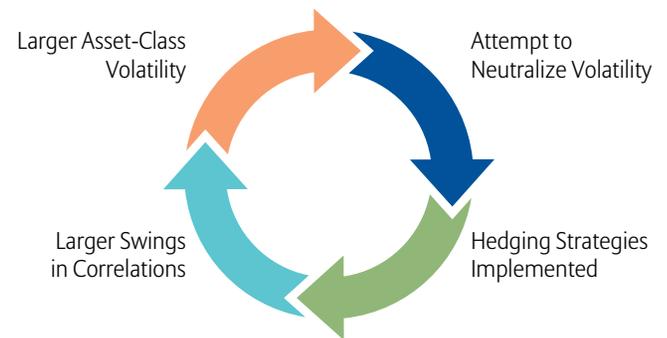
firms are not likely to buy securities dumped into the market at distressed prices. Thus, they will not provide the shock absorption provided by more conventional market-making.

- Leveraged investors can be forced to put up more cash than they have on hand—and can be put into a position of selling liquid assets—if caught on the wrong side of sinking markets. Margin calls can set off waves of selling, price declines, marking to market, further margin calls and further price declines. Given the speed of trading, investors do not have time to adjust positions in response to price changes in an orderly way.

Proliferation of rule-based strategies

The increased popularity of rule-based strategies tied to low volatility, momentum, and dynamic-hedging strategies could set the stage for increased volatility when investor confidence and market performance turn negative. Hedging or momentum strategies may not always neutralize unwanted risks in a systemic way. In the process, these strategies, at times, aggravate the macro-prudential risks they were meant to eliminate. Thus, the mass desire to manage volatility without sacrificing returns may become self-defeating as increases in the volatility of individual securities typically raise the volatility of an asset class as a whole, reducing the benefits of diversification. **Exhibit 8** (next page) illustrates how these feedback loops can play out with regard to momentum and hedging strategies.

If volatility begins to rise, low-volatility fund managers may be forced to liquidate positions in order to meet redemptions demanded by investors. Similarly, if interest rates rise in a disorderly way, investors in risk-parity strategies will have to come up with more cash. Once bonds, equities and credit sell off simultaneously, risk-parity funds will be forced to gamma hedge, selling against their own positions. They will sell whatever they can sell, creating a cascading effect that will only bolster volatility. This, in turn, will put downward pressure on prices, and increase volatility further. A scramble for liquidity will intensify. The leverage that was taken on due to the availability of abundant liquidity potentially becomes harmful when liquidity disappears.

Exhibit 8: Feedback loops amplify volatility, strengthen correlations and increase market risk**Momentum Strategies****Hedging Strategies**

Source: AllianceBernstein, Allianz Global Investors

ETFs: Only as liquid as their least liquid holding

Most investors trade ETFs on a stock exchange, so it's only natural to think that bid and ask sizes viewable on trading systems are a good representation of an ETFs' liquidity. Shares of ETFs can be added into circulation constantly or taken out of circulation. This attribute helps ETFs significantly with their liquidity and pricing.

An ETF's liquidity, though, is not determined primarily by its trading volume, but rather, by its underlying holdings. Consequently, an ETF is only as liquid as the least liquid security in its portfolio. ETFs in, say, bank loans and high-yield bonds are relatively less liquid than ETFs in stocks because their holdings trade over-the-counter rather than on exchanges. As a bid-ask spread widens, fewer traders typically enter the market for these ETFs, leading to decreased liquidity and wider price swings. Redemption of fund units then leads to across-the-board selling of the underlying securities, regardless of the strength of the buying interest in them. Contagion across asset classes becomes more likely, transmitting waves of distress to other markets.

Left unabated, the result could be more widespread insolvencies, as well as damage to the financial system and, ultimately, to the economy as a whole—transforming what started as credit risk into liquidity risk. Intricate risk-management structures might actually make the situation worse, leading to greater complexity, rather than a robust market response. Meanwhile, increasingly sophisticated models employed by index funds will become more effective at pushing trades toward specific, often fleeting, moments at the end of sessions, when the mispricing of securities can be identified and exploited. As this practice expands and trading volume shifts closer to end-of-day, liquidity will drain away during mid-day hours, elevating the cost of early- and mid-session trading.

Create a framework for coping with a liquidity shock

Due to the many factors discussed so far in this paper, markets still possess hidden risks that could trigger a crisis in funding and ultimately market liquidity. It is incumbent upon institutional investors to incorporate the possibility of future liquidity shortages

into their risk-management strategies. A thoughtful framework for positioning against a liquidity shock would have two key objectives:

1. Identify early or predictive signs of a potential liquidity shock and portfolio risk, and
2. Initiate palliative actions in case a liquidity shock occurs.

Predictive signs of a potential liquidity shock

In the event that a financial correction becomes intense, institutional investors must be on watch for signs of market illiquidity. Rapidly falling securities prices could force banks to reduce assets and hoard liquidity in order to satisfy intertwined capital, leverage and solvency tests.

An array of at least 10 real-time, quantitative measures can help identify signs of potential liquidity shocks. These include:

1. Bid-ask spreads (the difference between the highest bid price and the lowest ask price for a security)
2. Order-book depth (the average quantity of securities available for sale or purchase at the best bid and ask price)
3. Trade size
4. Volatility over volume price impact (effect on market prices of a \$1 million trade)
5. Market volatility
6. Correlations
7. Momentum (rate of change of valuations)
8. Immediacy (time needed to execute trades fully)
9. Resilience (how quickly prices recover after shocks)
10. Bond duration

A look at a few of these measures in the current market shows that, although institutional investors should remain vigilant, liquidity risk at the moment is limited:

- One of the most direct liquidity measures is the bid-ask spread. Bid-ask spreads widened markedly during the 2008 crisis, but have been narrow and stable ever since. Effective bid-ask spreads have

been trending down since the early 2000s to below pre-crisis levels, suggesting that liquidity is available and trading costs are relatively low. Even during the sudden widening that occurred during the February 2018 sell-off, spreads remained tight by historical standards and recovered quickly as markets settled down the following week.

- Order-book depth declined markedly during the 2013 taper tantrum and the other short, but sharp, episodes of illiquidity over the last four years. However, order-book depth is much greater now than during the financial crisis and does not appear to be unusually low by historical standards (though it is lower than in 2012 and 2013).
- The average trade size for investment-grade corporate bonds decreased from \$700,000 to \$800,000 in the early 2000s to around \$500,000 in recent years, a cautionary sign for liquidity. However, price measures of corporate bond liquidity do not substantiate any negative trend implied by this quantity measure. Declining trade size may merely reflect the prevalence of high-frequency trading in the interdealer market, making trade size a less reliable indicator of reduced liquidity than bid-ask spreads and order-book depth.
- Credit markets in recent years have shown a tendency to bid down spreads rather sharply in the optimistic phase of the credit cycle, often to the point where returns no longer seem commensurate with risk. Investors will need to be vigilant in observing whether lenders in the credit markets pull back and cause spreads to widen rapidly when interest rates move to sustainably higher levels.

Initiate palliative actions in case a liquidity shock occurs

Fortunately, there are steps institutional investors can take to manage liquidity risk without addressing the broader, underlying market-structure issues causing the problem:

- Maintain a broadly diversified portfolio across geographies, asset classes, styles and other factors. In that way, illiquidity in

an individual market will not necessarily make the investor's entire portfolio illiquid.

- Use more derivatives in portfolio construction, as derivatives tend to be more liquid than definitive securities and investment funds.
- Lengthen investment horizons in order to build in sufficient time to recover from losses and take advantage of buying opportunities presented by disrupted markets.
- Avoid crowded trades to minimize the risk of getting trapped in deteriorating markets just as a horde of other market participants attempt to get out simultaneously. In that way, investors stand a better chance of liquidating positions relatively quickly at an acceptable price.
- Consider strategic allocations to private credit during periods of market illiquidity in order to generate reasonably assured cash flows.

Conclusion

Many of the factors that contributed to the liquidity breakdown in the 2008 crisis not only still exist, they have become even more powerful. Since the consequences of a liquidity shock can be severe for the banking and financial systems and, by extension, the economy, it is incumbent upon institutional investors to develop a framework for coping with these issues.

Meanwhile, Congress and US regulators in both the banking and financial systems need to reassess the impact of post-financial regulations and supervisory practices on investors, institutions and markets. These players should work together to put in place micro- and macro-prudential measures that can foretell dangers to liquidity availability. They should also consider revising policies to encourage banks to once again absorb relatively large shares of securities placed onto the market at distressed prices, thereby supporting market liquidity. These steps would help to build investor confidence and, potentially, soften liquidity shocks.

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