THE EVOLUTION OF MARKET STRUCTURE

Managing illiquidity risk across public and private markets

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IN BRIEF

- The structure and role of the capital markets have evolved steadily but profoundly over the last 50 years. Public equity markets, which traditionally funded corporate expansion and investment, are increasingly becoming a mechanism for cash distribution and balance sheet management.
- At the same time, private markets, which traditionally provided vital funding for new ventures, have significantly expanded in their scale and scope; they now offer capital for many areas that had historically been financed by public equity markets.
- Investors in private assets take on illiquidity risk and tacitly assume it is compensated through superior returns. This is in essence correct, although full compensation is only captured by above-median managers. Some public assets may also have embedded illiquidity risk, but it is more cyclical and not always compensated. Identifying compensated and uncompensated illiquidity risk across public and private markets is critical in portfolio construction.
- Optimizing returns from the private part of the portfolio means staying the course and harvesting the illiquidity premium over the cycle. This suggests that any cash calls or redemptions may be disproportionately financed by the sale of public assets. While larger and more sophisticated investors have a greater propensity to take on private market illiquidity risk, there is no economy of scale in dealing with public market illiquidity.
- We introduce a framework to demonstrate how actively planning for illiquidity in public asset markets can help with portfolio construction decisions over the cycle.

THE EVOLVING ROLE OF PUBLIC AND PRIVATE MARKETS

Over the last half century, we have witnessed a gradual but profound shift in the role and structure of the capital markets. Public equity markets were traditionally where firms sought financing for expansion and investors sought to share in the fruits of that growth, including a dividend when operating cash flows allowed. Today, public equity markets are increasingly a vehicle for cash redistribution where greater regulatory scrutiny, plus regular reporting requirements, can incentivize firms to focus on current operations – possibly to the detriment of investing in future growth (**Exhibit 1**). More and more, public equity markets are playing the role in firms' financial calculus that corporate credit markets typically fulfilled, and in turn are giving investors an ever more bond-like return stream.

As public equity markets morphed from providing growth capital to providing operational capital, private asset markets grew to fill the void. Private markets were once a financial backwater where a small number of investors with deep pockets and even deeper risk tolerance offered capital for innovators and entrepreneurs. Today, the market value of private assets has grown to around one-fifth of the market capitalization of U.S. public equity markets (**Exhibit 2**). Increasingly, private asset markets attract investors of all types and offer the exposure to corporate growth, emerging technology, restructuring, and operational transformation that public equity markets may not – and with that, the prospect of superior returns. The trade-off is assumed to be illiquidity, but this may be a naive conclusion; private assets are indeed illiquid, but generally investors are compensated for it, subject to appropriate manager due diligence (see page 37 for a more detailed discussion). Public market assets can also be illiquid, but investors may not, at times, be fully compensated for it. Identifying compensated and uncompensated illiquidity across different markets is critical in optimally designing a portfolio with both public and private assets.

In this paper, we explore the shifting structure of the private and public markets, and consider how this may affect portfolio construction. Specifically, we look at the nature of illiquidity[1] in both private and public assets to understand how best to harvest illiquidity premia across the cycle, and how to avoid being trapped with uncompensated illiquidity in public asset markets.

Looking back to the early phase of the modern financial era,[2] between the late 1960s and early 1980s, public equity markets functioned largely in the way described by the classic financial textbooks. Firms raised funds via the stock market, with returns generated from reinvestment of investors' capital (retained earnings) and any excess paid out as dividends. The permanent nature of public equity capital meant that it was traditionally viewed as the main source of funding for the expansion and development of businesses.

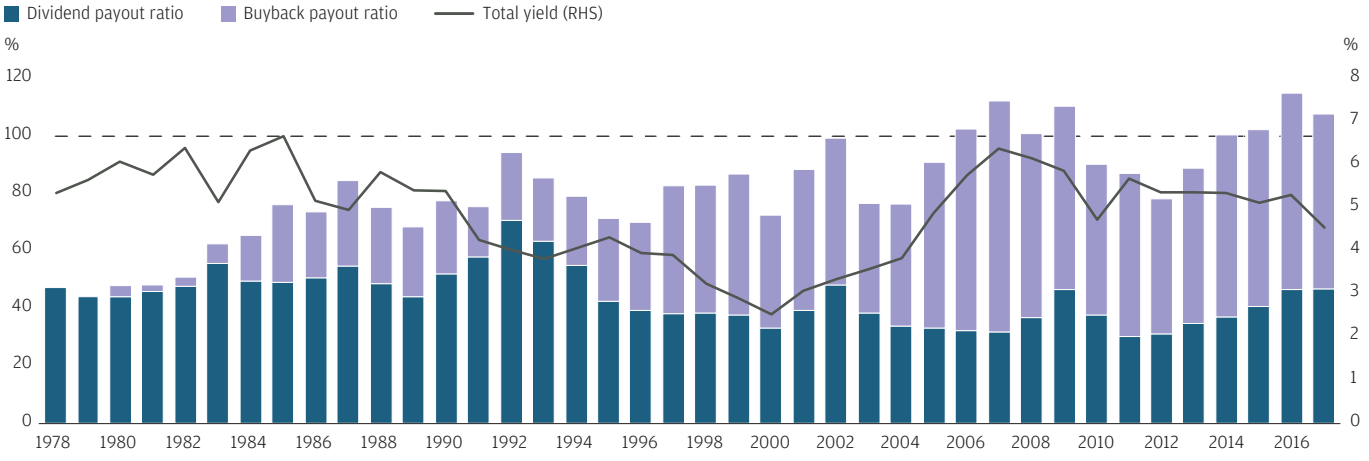
Over the subsequent decades, the role of equity markets changed. The secular decline in interest rates led investors to rely more heavily on equity income and to reward firms with

[1] Illiquidity premium is the additional return demanded by investors for assuming the risk of illiquidity, which typically arises due to the delay in conversion of an asset to cash at prevailing market prices. Illiquidity risk can arise from the size of the position, the nature of the underlying asset, friction in the capital market or a combination of all three. Literature has supported the existence of this phenomenon across asset classes for instance, Keynes (1936), Townsend (1937), Amihud and Mendelson (1986), Constantinides (1986), Luttmer (1996), Liu and Loewenstein (2002), among others.

[2] We assume the modern financial era to run from the late 1960s to the present day, the starting point being loosely defined as around the time when modern portfolio construction techniques (CAPM, efficient frontiers, etc.) gained prominence.

The U.S. equity payout ratio has been rising and has frequently been above 100% of earnings in recent years

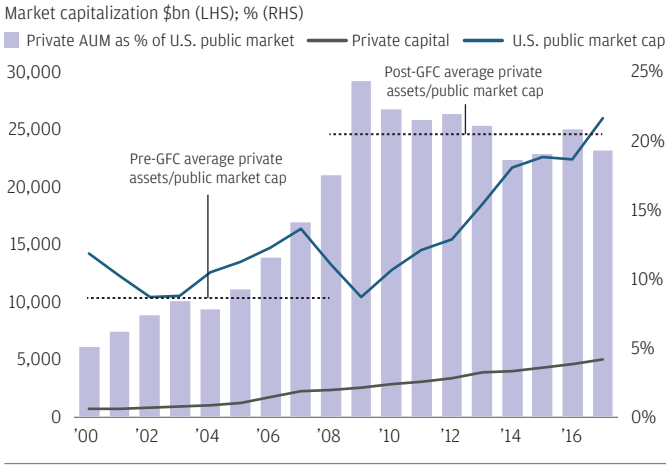
EXHIBIT 1: U.S. PAYOUT RATIO, BROKEN DOWN INTO BUYBACKS AND DIVIDENDS



Source: Thomson Reuters Datastream, J.P. Morgan Asset Management; data as of July 31, 2018.

Expanding private asset markets offer the exposure to corporate growth, emerging technology and operational transformation that public equity markets may not

EXHIBIT 2: PRIVATE EQUITY ASSETS AS A PERCENTAGE OF THE MSCI U.S. MARKET CAPITALIZATION



Source: Thomson Reuters Datastream, Preqin; data as of December 31, 2017.

more stable dividend streams. The global financial crisis (GFC) only reinforced this trend, as interest rates fell to near zero. The growing dual burden of regular reporting and regulation – notably Sarbanes-Oxley in the U.S. – further favored maximization of returns from current operations rather than investing in expansion (**Exhibit 3A**). Today, the combination of deeper and more liquid public markets, lower interest rates and diminished shareholder willingness to forgo dividend growth means that it often makes more sense to buy growth than to build it organically. Public equity has been transformed from being primarily a source of growth financing to being an income-bearing asset for investors and an acquisition currency for corporations.

This was not a transformation that could happen in isolation, of course. The expansion of private asset markets, as well as the scale and sophistication of M&A and primary markets, accompanied the gradual structural shifts in the role of public equity markets. From vehicles for financing the rebuilding of the industrial base, private asset markets gradually shifted toward the financing of innovation and new ventures. Venture capital and smaller cap private equity (PE) still focus on this today, while larger cap private equity is dedicated mainly to financing operating efficiency and building scale. The preference for private over public markets as financing venues for new enterprises is reflected in the long-term decline in IPOs (**Exhibit 3B**).

The evolution of market structure across public and private asset markets is symbiotic: Public markets have shifted to optimize the distribution of cash to shareholders that in turn provide the equity base to allow firms to raise other forms of capital. At the same time, private markets have expanded to provide funding for growth and operational effectiveness at an industrial scale, bringing to bear not only capital but professional and managerial resources.

The modern structure has developed as a compromise to address the sometimes competing requirements and incentives from the regulatory environment, cost of capital and investor demands. Public markets allow firms to concentrate on existing operations, and make it cheaper and less risky to simply "buy in" growth when needed. Private markets can effectively "hothouse" and optimize growth and expansion more effectively than might be possible within public enterprises and provide the bolt-on opportunities to public firms when they decide it's time to "buy in" growth.[3]

[3] M&A volumes and values tend to be cyclical and have grown in line with underlying market values over the long run. The nature of deals, though, appears to be shifting somewhat from large-scale consolidation to more targeted deals to acquire new capabilities, technology or access to new markets and to integrate these into the acquirers' existing business. See, for example, PitchBook 2Q18 M&A report and BCG 2017 M&A report.

As regulatory burdens increased, companies found public listings less compelling

EXHIBIT 3A: NUMBER OF PAGES OF THE CODE OF FEDERAL REGULATIONS, 1970-2017

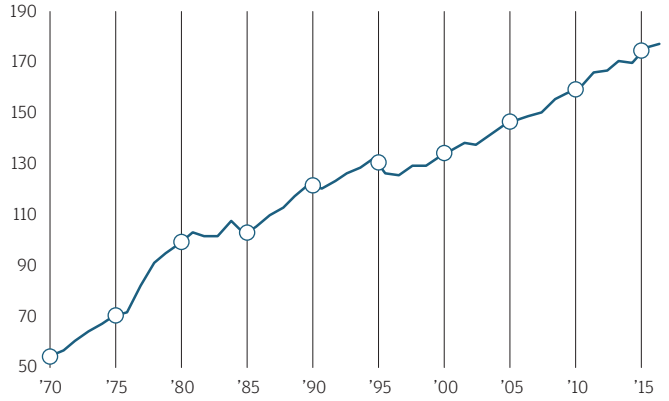
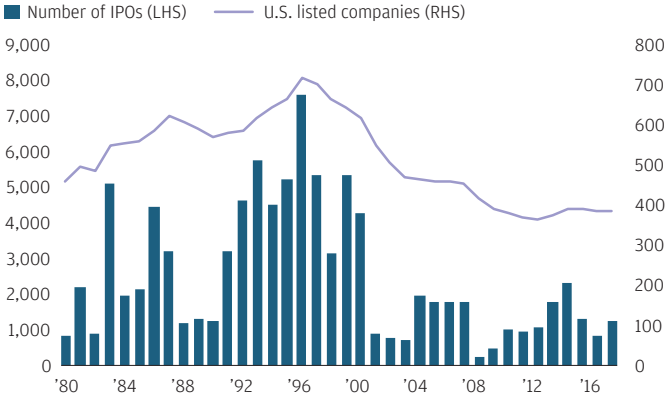


EXHIBIT 3B: NUMBER OF IPOS AND U.S. LISTED COMPANIES



Source: Jay R. Ritter, University of Florida, Warrington College of Business, "Initial Public Offerings: Updated Statistics," May 14, 2018; World Bank, data from 1980 - 2017; Federal Register, data as of December 31, 2017.

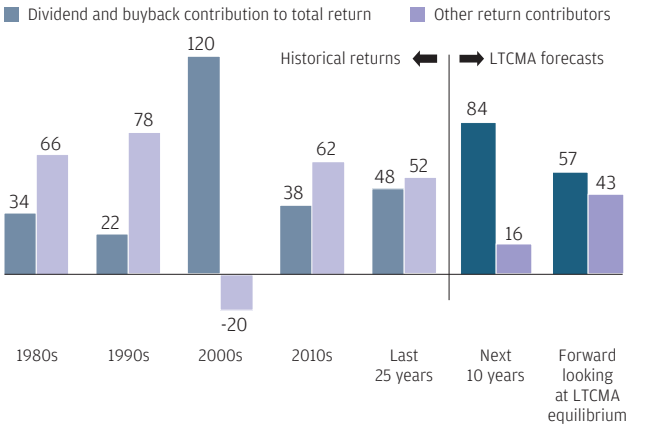
Portfolio construction: The role of private assets and the impact of illiquidity

At this juncture, we shift our perspective to the investor and consider how the evolution of public and private asset markets is affecting portfolio design and strategic allocation decisions across the cycle. We note the increasingly income-dominated return stream in public equity markets and the growth in access to private markets, and begin to consider how investors should factor in the illiquidity risks inherent in private assets.

Looking ahead, we expect over 80% of returns in developed public equity markets over the next 10 years to come from dividends and buybacks, compared with less than half over the last 25 years (**Exhibit 4**). The current return profile reflects the growing importance of income to investors but also implies that public equity markets have a reduced exposure to growth and new ventures. To capture those exposures, investors must increasingly turn to private asset markets, where they can expect a higher return but must also accept the illiquidity risk that comes with it.

Over 80% of the returns in developed public equity markets over the next 10 years could come from dividends and buybacks, vs. less than half over the last 25 years

EXHIBIT 4: PAST AND FUTURE PROPORTION OF EQUITY TOTAL RETURNS FROM CASH FLOWS (DIVIDENDS + BUYBACKS) VS. CAPITAL GROWTH (%)



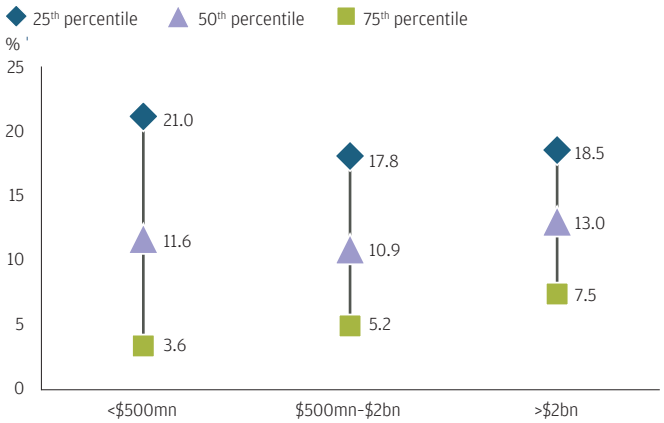
Source: Bloomberg, Citigroup, FactSet; data as of December 31, 2017. LTCMA equilibrium assumes returns at equilibrium margin buyback and valuation levels, as opposed to starting point values.

The benefits of the illiquidity risk premium in private assets are broadly accepted by sophisticated institutional investors. Indeed, illiquidity risk in private asset markets can be thought of as a function of the business model for which investors will be compensated over the cycle. Lack of a daily mark-to-market in private equity certainly helps to dampen traditional measures of market risk and can make private equity an optically outstanding portfolio contributor. But simply taking on illiquidity risk does not guarantee that private equity will deliver superior returns; these have to be generated by skilled managers, which need to be carefully identified and accessed. In an important sense, illiquidity is what enables skilled private equity managers to generate excess returns, through tools such as reorganization, leverage, product repositioning or strategic acquisition. In contrast, public market illiquidity risk is simply a frictional cost that is cyclical and for which investors are not always fully compensated.

In recent years, however, the average private equity manager has not delivered a meaningful premium over the public markets. A very wide dispersion of returns (**Exhibit 5**) suggests it's not illiquidity alone that is compensated but, rather, the strategy and skill of the operator employed. For investors with a sub-optimal selection of available managers and/or an uncertain commitment to the unique long-term aspects of private equity investing, the illiquidity risk they are taking on in private markets may be underestimated.

Wide dispersion of PE returns reflects relative manager skill more than illiquidity compensation

EXHIBIT 5: HISTORICAL PRIVATE EQUITY DISPERSION BY SIZE OF FUND, * IRR OF VINTAGE YEARS 2002-16 (%)



Source: Burgiss, J.P. Morgan Asset Management; data as of March 31, 2018.
*Includes buyout and expansion capital funds.

The optimal level of illiquidity risk needed to at least match required returns varies greatly across institutions. For those with ample access to top-tier managers and proven manager selection skills, illiquidity risk becomes a lower-order consideration. In such cases, liquidity is required only to meet planned distributions, to address dislocations in the normal cash flow modeling of illiquid exposures or to set aside a small contingency allocation. For investors with very long investment horizons, good access to top-tier managers and well-formulated contingency plans for any liquidity event, it is the value of liquidity that can be overestimated.

In the majority of institutional portfolios, a sustainable balance can be found between liquidity requirements and illiquidity risk, and between the potential for excess return

and the certainty of lower but more liquid/tactical and low cost returns. Nevertheless, this balance will vary cyclically with market and economic conditions.

There is also a connection between institutional asset size and the balance between liquid and illiquid allocations, with larger institutions generally more willing to take on illiquidity risk (**Exhibit 6**). However, as we will discuss at greater length, when we account for additional illiquidity risks in public asset markets and factor in the economic cycle, we find that larger institutions will need to be more proactive in managing public market illiquidity risks. Indeed, a higher propensity to hold illiquid private assets in a diversified portfolio only serves to exacerbate that need. An institution's size, though, is just one factor in determining an appropriate balance between liquidity and illiquidity. Other considerations include an institution's access to private investment, tolerance for illiquidity risk and J-curves,[4] and ability to accept 10- to 12-year lockups and identify high performing managers.

Assessing the costs and benefits of illiquidity under different market scenarios

We have thus far explored the evolution of public and private asset markets, and the opportunities and considerations they present to investors over a cycle in stable, equilibrium conditions. We now focus more on cyclicality – in particular for illiquidity risk – and propose a framework for evaluating allocations to both public and private assets in a multi-asset portfolio. The process is critical to successful portfolio construction and hinges on the idea that the illiquidity risk premium is a natural and even desirable feature of private assets, for which investors are generally compensated over the cycle. Meanwhile, in public asset markets illiquidity risk is a manifestation of friction in the secondary market, for which investors may not always be compensated. Thus, an investor with allocations to both public and private assets should look to capture compensated illiquidity risk in private assets but seek to avoid being forced to crystallize losses in less liquid public assets at times when illiquidity risk may be uncompensated.

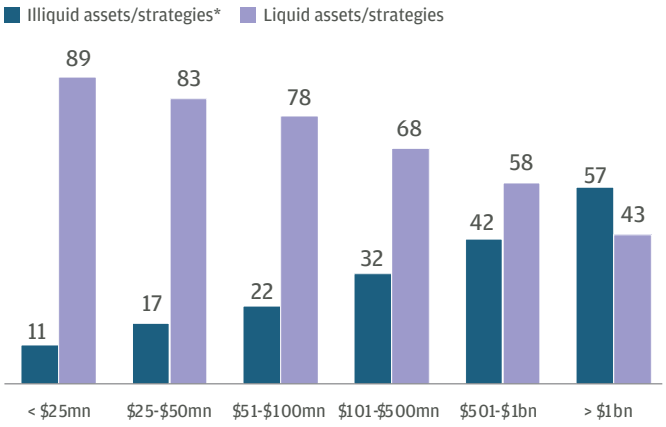
To help understand the interplay between illiquidity risk and market risk through the cycle, we refer to two concepts. The first is based on the way cash flows evolve over the life cycle of a private investment, and the second is based on the probability of experiencing an adverse liquidity event in public markets over a defined time horizon.

Private investments follow a life cycle with three defined phases: an investment phase in which capital is committed up front from investors, further cash calls are possible and cash flow to investors is negative; a breakeven point when cash flow to investors begins to turn positive; and a harvesting phase in which cash is returned to investors (**Exhibit 7**). Should economic conditions deteriorate during the investment phase, it may be that cash calls are brought forward and/or that planned future positive payouts to investors are delayed.

[4] The J-curve represents the pattern of returns an investor can expect to realize from a private equity fund over time, from inception to termination. The J-curve effect refers to the fact that a private equity fund will often show a negative return in its early years, when fees and start-up costs are incurred; investment gains will usually come in the later years as portfolio companies mature, increase in value and are ultimately exited with returns realized.

Larger institutions are generally more willing to take on illiquidity risk

EXHIBIT 6: ASSET ALLOCATION OF ENDOWMENTS BY SIZE FOR FISCAL YEAR 2017, %

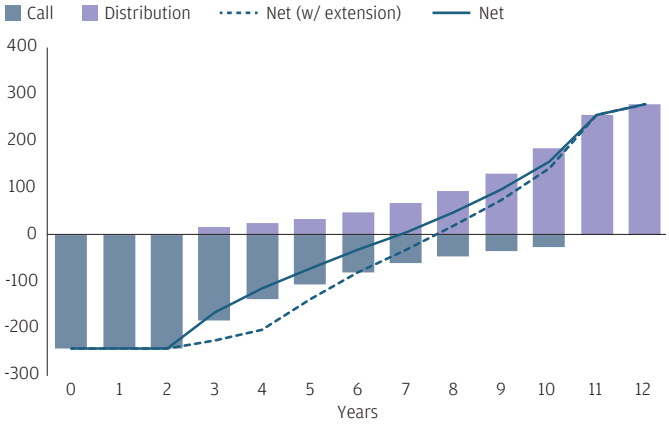


Source: 2017 NACUBO-Commonfund Study of Endowments.

* Includes private equity, hedge funds, venture capital, private real estate, energy, natural resources, commodities, managed futures, distressed debt and others.

To earn the illiquidity risk premium in private markets, investors need to be able to weather any variation in the cash flow profile over the full investment life cycle

EXHIBIT 7: AGGREGATE PRIVATE EQUITY INVESTMENT CASH FLOWS OVER LIFE CYCLE



Source: J.P. Morgan Asset Management. The chart shows a hypothetical stream of capital calls and distributions, and assumes an additional capital call in year three due to an unexpected period of financial market stress. The chart is based on average capital call and distribution data from Preqin back to 2000. By looking at average non-crisis cash flows, and using median net IRR data by vintage back to 2005, we have come up with a maximum drawdown by vintage, which was used to compute the average drawdown in non-crisis periods. We assume that the extension leads to an extra 1.75 years of average calls, which is consistent with the historical data.

In theory, investors are compensated for this through the higher returns available in private assets over the full life cycle of the private investment. In other words, to harvest the illiquidity risk premium in private markets, investors need to be able to stay the course, weathering any variation in the cash flow profile over the full cycle. This means that cash calls would need to be funded from elsewhere in the portfolio.

The ability to accept this type of risk ranges widely across investor types. Those that may be subject to redemptions or fund withdrawals (e.g., mutual fund managers) are less able to bear uncompensated illiquidity risk than those with a long-term pool of capital to deploy (e.g., sovereign wealth investors). Further, during times of market crisis, when investors are already seeking to cut exposure to public markets, threats to liquidity are generally correlated and can compound to become a serious issue for investors. Investors could face liquidity demands arising from redemptions and a prudent desire to hold higher portfolio cash buffers. At the same time, on the private asset side there may be cash calls to finance, calls that are best covered from public assets — and thus, avoiding uncompensated illiquidity traps in public markets becomes a priority. To fully assess the illiquidity risk in a portfolio, all of these factors need to be considered holistically.

Taking high yield (HY) bonds as an example of a potentially illiquid public asset with both market and illiquidity risk, we can ask whether, over a defined time horizon, the probability of being forced to crystallize a loss under adverse liquidity conditions is appropriately compensated (see Addendum, "Modeling the cost of high yield trading under illiquid conditions"). Early in the economic cycle, when credit spreads are wide, the illiquidity premium in an asset such as high yield credit may well offer an additional return compared with a replicating stock-bond portfolio.[5] However, as the cycle matures and credit spreads tighten, there will come a tipping point — some breakeven level of spread — where the return in credit is not sufficient to offset the probability-weighted risk of a loss over a defined time horizon. Effectively, the illiquidity risk has at that point become uncompensated and investors may be better served expressing their desired level of market risk via a replicating stock-bond portfolio.

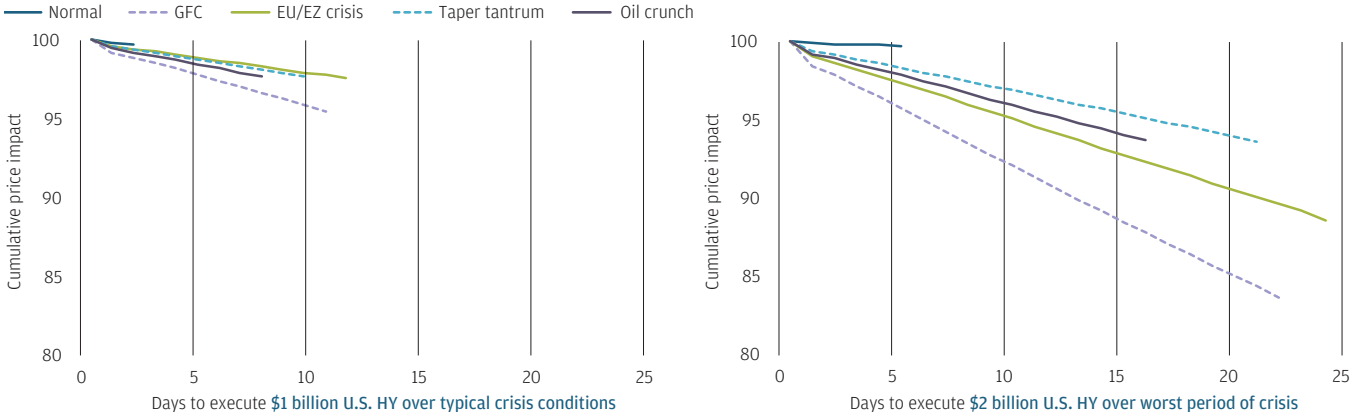
The scale of the potential illiquidity during times of market stress is demonstrated in **Exhibit 8**, again using HY credit as an example. The illiquid credit asset will suffer from wider bid-ask spreads and much reduced transaction volumes; large transactions can take considerable time to execute in markets where prices are dropping sequentially over multiple trading sessions.

Turning to private market assets, as investors have increasingly added private assets to portfolios there is commensurately more focus on the risk that they could be forced to liquidate private investments at an inopportune time to meet an additional capital call. Alternately, redemptions and other portfolio-level cash requirements may force them to exit private investments at an undesirable point. Since such events tend to occur during adverse conditions in public markets and the economy at large, the most relevant question is how bad things might really get.

[5] For the purpose of our analysis, we assume that the market risk of a credit investment can be approximately replicated with a combination of equity and bonds/cash; over the long run, the beta of high yield credit to the S&P 500 is approximately 0.4, so we make a simplifying assumption that a 40/60 stock-bond mix will approximate to high yield over short periods and for the purpose of our modeling exercise.

Large transactions take longer to execute in markets where prices are steadily falling

EXHIBIT 8: PRICE IMPACT AND DAYS TO TRANSACT A SIGNIFICANT SIZE IN U.S. HIGH YIELD CREDIT IN STRESSED CONDITIONS



Source: Financial Industry Regulatory Authority Trade Reporting and Compliance Engine, J.P. Morgan Asset Management; data as of May 31, 2018.

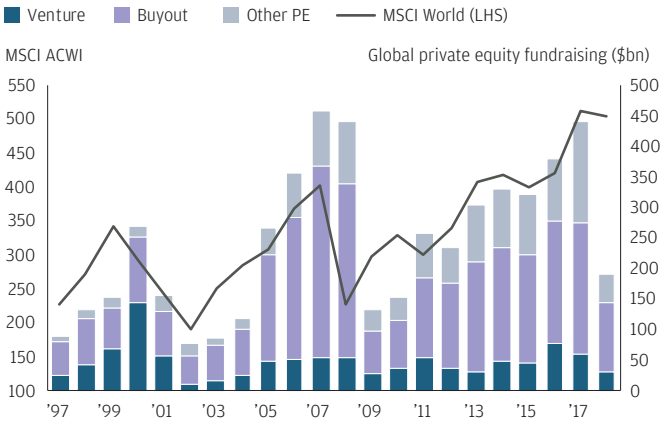
Notes: Based on historical liquidity patterns adjusted for typical third-quarter volumes; assumes ability to trade 10% of market volume in normal markets, with a drop-off of 50% after two days for ongoing sell orders; assumes trade size drops by one-third in stressed markets, with similar drop-off for ongoing sell orders. Bid-ask spreads assumed at 50bps in normal conditions and 300bps in stressed markets. Typical crisis conditions take the average daily price move during the depth of the crisis; worst period extrapolates the worst weekly price action across the full period.

The evolution of the secondary market for private assets allows us to estimate the drawdown investors might be forced to take if they were to instead sell their private assets. Using data on capital calls,[6] capital distributions and secondary market pricing over the past 18 years, it is possible to determine periods of private market stress. Using a composite of secondary market pricing data, we find that private equity assets have sold at an average of 88% of NAV on the secondary market since 2000. As such, we view periods where secondary market pricing was below 88% of NAV and net cash flow was negative (capital calls exceeded capital distributions) as stress periods — as seen in 2000-02 and 2008-09.[7]

As **Exhibit 9** illustrates, there is a tight relationship between private equity fundraising and public equity market performance. This suggests that increased cash demands on an investor correlate with periods of broad market weakness; this is borne out by data showing negative net cash flow from private equity during the 2000-02 and 2008-09 stress periods.

Increased cash demands on investors correlate with periods of broad market weakness

EXHIBIT 9: RELATIONSHIP BETWEEN PRIVATE EQUITY FUNDRAISING AND PUBLIC EQUITY MARKETS



Source: Bloomberg, Thomson One fundraising global private equity and venture capital; data as of June 30, 2018.

The aggregate net cash flow during the two stress periods is negative at around $47 billion per year, and excluding 2008 it is closer to $29 billion per year (**Exhibit 10**). Translating this into terms of the percentage of assets under management (AUM), on average the private equity cash demands during a time of crisis amount to 6.2% of AUM; during the global financial crisis, that percentage was 11.3%.

Private equity cash demands rise in periods of market stress

EXHIBIT 10: AVERAGE NET PRIVATE ASSET CASH FLOWS IN STRESS PERIODS

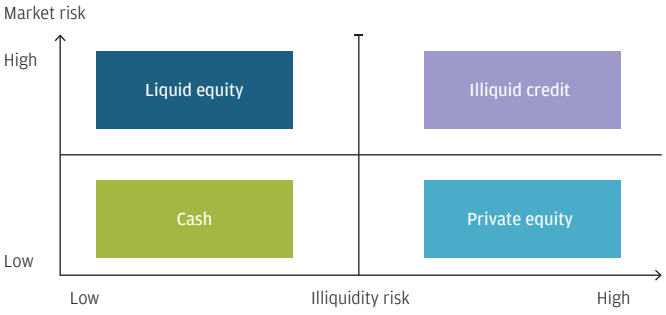
Stress period	Net cash flow ($bn)	Secondary pricing	Amt needed to sell ($bn)
2000	-22	84%	-$27
2001	-23	81%	-$29
2002	-27	85%	-$32
2008	-117	73%	-$161
2009	-43	59%	-$72
Average	-47	76%	-$61
Average ex-2008	-29	77%	-$38

Source: J.P. Morgan Asset Management; data through the end of 2017 and released in an August 2018 report.

Tying these concepts together, we can establish a framework that allows us to simulate the behavior of a portfolio of both private and public assets through the cycle. To this end, we create a stylized portfolio comprising a private asset, a liquid public asset (equity), an illiquid public asset (credit) and cash (**Exhibit 11**).

A stylized portfolio can simulate the behavior of private and public assets through the cycle

EXHIBIT 11: STYLIZED PORTFOLIO MARKET AND ILLIQUIDITY RISK ASSUMPTIONS



Source: J.P. Morgan Asset Management. Notes: The liquid equity, illiquid credit and cash are all public assets. (1) We assume that equity risk can be exited in a single trading session, so there is no ongoing negative price drift; we account for the price impact by taking the average and worst-case equity drawdown days from previous crises. (2) The private asset has market risk only in the event of a forced sale. If we insert the condition that any cash demands hitting the portfolio — from any source — must be funded purely from the portfolio's public assets, we can treat the private asset as having only illiquidity risk.

[6] Defined here as additional calls on investors' cash to support a stressed private equity investment.

[7] The year 2003 is excluded as a stress period despite the below-average secondary market NAV and a negative net cash flow, as both private and public equity markets generated a positive return that year and there were no broader signs of stress in the global economy.

We assume that the market risk of credit can be approximately replicated with some combination of equity and cash so that we compare expected returns and choose whether to accept the additional illiquidity risk associated with credit. We also assume the liquid equity part of the public asset portfolio can be instantaneously exited even in stressed markets with limited additional friction.

Exhibit 12 shows our stylized four-asset portfolio. An unconstrained optimized portfolio tends to heavily allocate to private equity and high yield, given optically good information ratios. However, if we set maximum exposure to each asset at 20%, then in equity beta equivalent terms a 70/30 stock-bond portfolio and a 60/40 stock-bond portfolio can be replicated. The 50/20/20/10 portfolio (P1 in Exhibit 12) is representative of multi-asset portfolios with private asset exposure, so this is the stylized portfolio we test.

Optically, spreads today may appear to offer adequate compensation for illiquidity in both cases, but this assumes both perfect foresight and flawless execution, and makes no allowance for any rise in default rates. We would therefore reasonably expect that most investors would want a bigger cushion built into their breakeven spread assessment.

Our four-asset stylized portfolio can replicate in equity beta equivalent terms a 70/30 and a 60/40 stock-bond portfolio

EXHIBIT 12: SIMULATION PORTFOLIOS (FOUR-ASSET MIX)

	Expected		Equity	Portfolios (inc. HY & PE)		Equivalent (ex. HY & PE)	
Asset	Return	Vol	beta	Weights (P1)	Weights (P2)	Weights (Px1)	Weights (Px2)
U.S. large cap	5.25%	13.75%	1.0	50%	40%	70%	60%
Private equity	8.25%	21.00%	0.7	20%	20%	-	-
U.S. high yield bonds	5.50%	8.25%	0.4	20%	20%	-	-
U.S. cash	2.00%	0.50%	0.0	10%	20%	30%	40%
Excess return				3.58%	3.25%	2.28%	1.95%
Sharpe ratio				0.31	0.31	0.24	0.24

Source: J.P. Morgan Asset Management Multi-Asset Solutions; data as of September 30, 2018.

Our model can estimate how the sale of illiquid public assets will impact portfolio returns

EXHIBIT 13: BREAKEVEN SPREADS FOR ILLIQUID PUBLIC ASSETS (HY) IN PORTFOLIOS OF VARIOUS SIZES AT 15% WITH RECESSION PROBABILITY AVERAGE-CASE STRESS SIMULATION

Total fund	Cash call*	Public assets to sell (base)			Days to	Crisis price	Baseline*	Drawdown	Breakeven
($mn)	Base case	Equity	Cash	HY	transact	impact	spread	impact	HY spread
1,000	87	54	11	22	2	-0.8%	225	11	236
3,000	261	163	33	65	2	-0.8%	225	11	236
5,000	435	272	54	109	2	-0.8%	225	11	236
10,000	869	543	109	217	3	-1.0%	225	15	240
25,000	2,173	1358	272	543	6	-1.8%	225	27	252
50,000	4,345	2,716	543	1,086	12	-3.3%	225	50	275

Source: Financial Industry Regulatory Authority Trade Reporting and Compliance Engine, J.P. Morgan Asset Management; data as of May 31, 2018.
* Baseline spread is the required credit spread to compensate for losses given defaults (3.75% default assumption, 40% recovery rate). Note: Simulation assumes 15% probability of recession, base-case cash call, average crisis price drift.

The extent of the assumed drawdown will determine what spreads are required to hold high yield

EXHIBIT 14: BREAKEVEN SPREADS FOR ILLIQUID PUBLIC ASSETS (HY) IN PORTFOLIOS OF VARIOUS SIZES AT 33% RECESSION PROBABILITY WITH WORST-CASE STRESS SIMULATION

Total fund	Cash call*	Public assets to sell (bear)			Days to	Crisis price	Baseline*	Drawdown	Breakeven
($mn)	90th %ile	Equity	Cash	HY	transact	impact	spread	impact	HY spread
1,000	173	108	22	43	2	-1.4%	225	45	270
3,000	520	325	65	130	2	-1.4%	225	45	270
5,000	867	542	108	217	3	-1.8%	225	59	284
10,000	1,734	1,084	217	433	5	-2.7%	225	89	314
25,000	4,335	2,709	542	1,084	12	-5.9%	225	196	421
50,000	8,669	5,418	1,084	2,167	22	-10.5%	225	345	570

Source: Financial Industry Regulatory Authority Trade Reporting and Compliance Engine, J.P. Morgan Asset Management; data as of May 2018.
* Baseline spread is required credit spread to compensate for losses given defaults (3.75% default assumption, 40% recovery rate). Note: Simulation assumes 33% probability of recession, worst-case cash call, bear-case crisis price drift.

This would further push up breakeven spread requirements – possibly even to levels some way above prevailing spreads for managers of larger portfolios with meaningful exposure to illiquid public and private assets.

We can now consider how the portfolio copes with the varying cash demands that must be funded from public assets alone. These demands come from three sources that we assume are correlated with periods of market stress: cash calls from private assets, portfolio redemptions and increased portfolio cash buffers (with estimates taken from Girardi, Stahel and Wu, 2017[8]). As the cash calls are funded from public assets alone, we can estimate, for varying portfolio sizes and probabilities of market stress, what amount of illiquid public assets (HY) will need to be sold to meet portfolio cash needs and, in turn, what impact that will have on portfolio returns.[9]

Assuming a 15% probability of market stress over a one-year horizon and setting default and recovery rates at through-cycle averages, we see that it is only in extremely large portfolios, or those with outsize illiquid asset concentrations, in which the ex-ante breakeven spread might come anywhere close to recent trading ranges (**Exhibit 13**).

If we were to raise the probability of stress over the next 12 months to 33% – equivalent to assuming that the cycle may end in the next three years – then the breakeven spread the manager of a $10 billion portfolio should demand to hold high yield increases by 18 basis points (bps) to 258bps for a mild drawdown and by 49bps to 314bps for a severe drawdown (**Exhibit 14**).

Moreover, later on in the economic cycle, as recession risks rise objectively for all investors, even managers of smaller portfolios may begin to find that the ex-ante breakeven spread in illiquid public assets is uncomfortably close to prevailing trading levels.

CONCLUSIONS AND KEY FINDINGS

In this paper, we have explored the shifting nature of public and private asset markets – first from the perspective of firms that are raising capital and then from the perspective of investors that must evaluate the trade-off between returns and illiquidity in their portfolios.

The evolution in market structure that drove the growth in private asset markets and the transition of public equity markets toward more of an income asset is unlikely to reverse, in our view. A larger, and more easily accessible private asset market opens up new potential return streams for investors, particularly those seeking exposure to growth, innovation and corporate restructuring as drivers of returns. Investors are generally quite familiar with the subtleties of return differences between public and private markets. However, the growth in private assets likely demands that greater attention be paid to how illiquidity risk can manifest itself in portfolios – in particular, how it can arise, and interplay, within diversified portfolios.

One significant conclusion from our analysis is that while larger and more sophisticated investors have a greater propensity to take on private market illiquidity risk, the ability to absorb unexpected public market illiquidity episodes decreases as fund size grows. Unlike so many issues in investing and finance, there is no economy of scale for managing public market illiquidity. Indeed, there are *dis*economies of scale that can only be mitigated by proactively managing illiquidity risk in the public asset side of the portfolio so that the more stable and desirable private market illiquidity risk premium can be harvested.

Investment horizon may be a significant mitigating factor. The philosophy behind our modeling of breakeven spreads in high yield credit – to compensate for illiquidity risk as well as default assumptions – is that if we can avoid being forced sellers of an asset and crystallizing losses from any sale transaction greater than accrued returns, then we can manage a portfolio more efficiently. Investors with a long investment horizon, operating funds that are less subject to redemptions at times of market stress, are commensurately more able to assume illiquidity risk in private assets and ride out episodes of uncompensated illiquidity risk in public markets. Nevertheless, recognizing portfolio cash demands across the cycle is essential to prudently planning and managing a portfolio. And understanding that there is a cyclical element to the illiquidity risk premium in public assets is an important subtlety in optimally navigating a sophisticated multi-asset portfolio through the cycle.

[8] Giulio Girardi, Christof Stahel, and Youchang Wu, "Cash management and extreme liquidity demand of mutual funds," U.S. Securities and Exchange Commission, June 2017. The paper uses a data set that estimates the average monthly cash demand on a multi-asset portfolio in periods of stress to be 1.491% of AUM, with a standard deviation of 0.693%. We use this input to calculate our average and 90th percentile monthly stress period cash demands in our model portfolio simulations.

[9] We can also estimate the ex-ante breakeven spread required to include illiquid public assets in the portfolio, given the probability of market stress over the forecast horizon, using the methodology in the Addendum.

One way to frame this issue is to consider the difference between asset owner and asset manager. An asset owner is not forced, under any circumstances beyond its own preferences or the liquidity demands of its underlying (private) investments, to transact in public markets at a sub-optimal point. By contrast, an asset manager is a fiduciary that must transact not only to meet cash calls from private assets but also to manage redemptions, allocation constraints and associated rebalancing, and planned distributions. Sovereign wealth funds with no immediate distribution demands are probably closer to the asset owner end of the continuum, while mutual funds with daily liquidity commitments and predetermined distributions are likely closest to the asset manager end.

Simply put, the larger the fund and the closer it sits to the asset manager end of the owner/manager continuum, the more sensitive it will be to public market illiquidity risks, and as the cycle matures, there is a rising risk of a liquidity event hitting both public and private markets simultaneously. This may bring forward the point at which larger investors choose to exit more illiquid public asset markets, such as high yield credit, even if the prevailing spreads relative to realized defaults appear attractive. By contrast, smaller funds that are nearer the asset owner end of the spectrum are most insulated and – assuming necessary manager selection skill in, and access to, private asset investments – should be less constrained in harvesting both private and public market illiquidity risk premia over the cycle.

In running simulations of a simple multi-asset portfolio with exposure to both public and private assets, we can draw a few conclusions regarding illiquidity risk and how it might affect different investors:

- Illiquidity is not the same to all actors. If priced appropriately (in PE), it is a significant contributor to returns over the cycle, but in public markets it is more cyclical. The pricing of illiquidity risk should be considered in an overall portfolio context.
- An investor will always want to avoid becoming a forced seller in illiquid markets, public or private. But it will be more desirable to hold illiquid positions (in market weakness) in private markets than in public markets because in private markets illiquidity is a positive driver of returns, whereas in public markets it is a frictional cost that rises in times of market stress.
- Large, sophisticated investors with commitments to liquidity or regular outflows may be more exposed to public market illiquidity risk than their propensity to invest in private market illiquidity risk implies. Mitigating that risk requires a proactive assessment of the compensation for public market illiquidity risk that is being assumed and a disciplined process to reallocate to more liquid public market equivalents at times when public market illiquidity becomes undercompensated.
- Pension investors that have positive cash flow and are fully funded are less likely to face public market illiquidity traps – even given relatively large private asset allocations. But pension funds in negative cash flow or with funding gaps should operate more as asset managers than asset owners in planning for episodes of adverse public market illiquidity. Most importantly, scale is a disadvantage in dealing with public market illiquidity.
- Smaller investors are more nimble but should be mindful of the constraints that public and private market illiquidity place on larger investors and how this might distort market pricing at times of stress. Smaller investors with deep pockets and longer time horizons can even consider that they might, in times of severe market stress, in fact be the ultimate liquidity backstop – in turn profiting from the dislocations that might arise during episodes of illiquidity in public asset markets.

ADDENDUM: MODELING THE COST OF HIGH YIELD TRADING UNDER ILLIQUID CONDITIONS

In our modeling, we have used high yield credit as the archetypal public market asset subject to large illiquidity risk. Here we describe in more detail how we calibrate the frictional costs of exiting a bloc of high yield credit in times of market stress. The additional frictional cost in small transactions arises mostly from the wider bid-ask spread that can be expected in stressed markets. However, for larger transactions the frictional costs are dominated by the constraint on trading volumes, forcing investors to liquidate over multiple sessions, at sequentially lower prices from one session to the next (**Exhibit A1**).

This allows us to estimate what the ex-ante breakeven spread should be able to compensate us for a given probability of being forced to exit the position over a defined horizon. The table takes a one-year horizon and assumes a 15% probability of being a forced seller of varying trade sizes of high yield credit; this approximates the unconditional probability of recession in any given 12-month period. The volume and price impacts are taken from the average experience of periods of market stress from 2008 to the present,[10] and default and recovery rates are set at through-cycle average levels of 3.75% and 40%, respectively.

For an investor that may need to liquidate $1 billion of high yield and anticipates any crisis to be average in its severity, credit spreads above around 270bps compensate for illiquidity risk. But if the investor's subjective view of the probability of recession over the next year were to increase to 33%, then the breakeven credit spread required to compensate fully for illiquidity risk would jump to 320bps and as high as 398bps in a worst-case drawdown scenario. As portfolio size increases – and the potential illiquid asset trade size grows – the ex-ante breakeven spread required to compensate for illiquidity risk increases. Crucially, there is no economy of scale for illiquidity risks and, indeed, there are very apparent diseconomies of scale.

[10] We have tested four explicit periods of stress: the 2008-09 financial crisis, the 2011-12 U.S. debt ceiling and EU financial crisis period, the 2013 taper tantrum and the 2015-16 oil price and credit sell-off. The price action and trading conditions of these periods for high yield are then taken as potential scenarios, and an average price and trading path under stress is derived from these historical episodes for the purpose of estimating the effect of a future period of market stress on credit market trading conditions.

For larger transactions, investors may be forced to liquidate over multiple sessions, at sequentially lower prices

EXHIBIT A1: IMPACT OF SELLING A POSITION IN HIGH YIELD UNDER AVERAGE AND WORST-CASE SIMULATED MARKET STRESS CONDITIONS; IMPLIED EX-ANTE BREAKEVEN SPREAD TO COMPENSATE FOR ILLIQUIDITY RISK

Sale of HY $mn	Days to transact	Crisis price impact		Baseline* spread	Drawdown impact		Breakeven HY spread	
		Average	Worst case		Average	Worst case	Average	Worst case
500	4	1.2%	2.2%	225	19	34	244	259
1,000	10	2.9%	5.2%	225	43	79	268	304
2,000	20	5.6%	10.1%	225	84	151	309	376
3,000	29	8.0%	13.9%	225	120	209	345	434
4,000	36	10.5%	17.7%	225	157	266	382	491
5,000	43	12.6%	20.7%	225	189	311	414	536

Source: Financial Industry Regulatory Authority Trade Reporting and Compliance Engine, J.P. Morgan Asset Management; data as of May 31, 2018.

* Credit spread required to compensate for default losses; estimates based on 15% recession probability, 3.75% default rate and 40% recovery rate.

PORTFOLIO INSIGHTS

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