STATE STREET.

Private Equity Insights

TWENTY-NINTH EDITION | Q1 2023

CURRENT QUARTER PERFORMANCE SUMMARY

The State Street Private Equity Index (SSPEI) demonstrates promising signs of recovery, reporting 2.10% in Q1 2023, up from 1.22% in Q4 2022. Venture Capital (VC) exhibited a positive shift, finally breaking its losing trend since Q1 2022 and achieving a breakeven return of 0.00% in Q1 2023. Buyout and Private Debt funds, on the other hand, performed even better than VC, with returns of 2.73% and 2.28% respectively. However, they slightly lost momentum from their quarterly growth in Q4 2022 (see Exhibit 1).

Exhibit 1. Private Equity Performance by Strategy

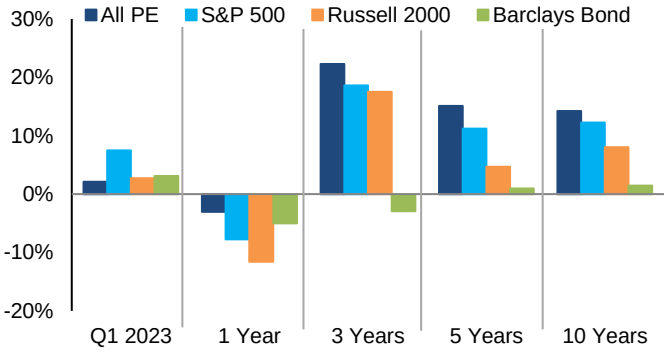
	All PE	Buyout	VC	Private Debt
2023 Q1	**2.10%**	**2.73%**	**0.00%**	**2.28%**
2022 Q4	1.22%	3.22%	-5.49%	3.07%
2022 Q3	-1.36%	-1.44%	-1.99%	0.68%
2022	**-5.54%**	**-1.04%**	**-20.47%**	**3.43%**

Source: State Street®, as of Q1 2023.

Although the Q1 2023 returns indicate continued progress compared to the losses experienced in the previous year, they still fall below the long term mean of 3-4% quarterly returns. When compared to the public market, SSPEI outperformed the US public equity market (proxied by S&P 500 and Russell 2000) and the US bond market (proxied by Bloomberg Barclays US Aggregated Bond Index) across various time horizons ranging from 1 to 10 years. However, in Q1 2023, SSPEI performance experienced a lag due to lethargic valuation updates in the short term (See Exhibit 2).

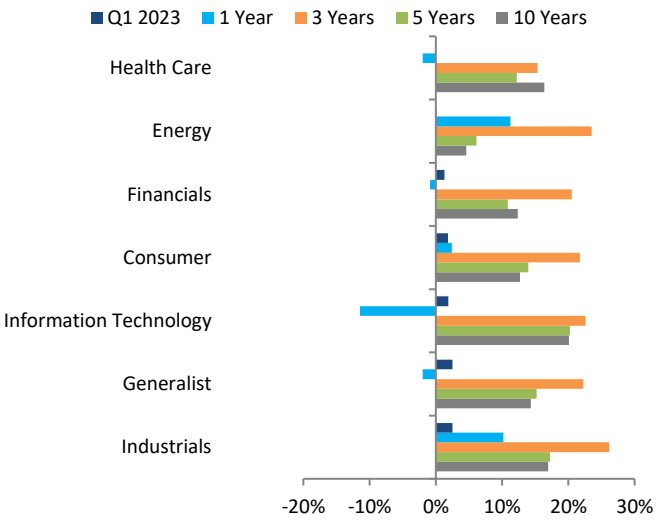
At the one-year horizon, Energy and Industrials sector funds maintain their status as the best performers. However, the Energy sector showed signs of weakening in Q1 2023 with a 0.12% return, while the Industrials sector remained robust at 2.52%, closely followed by Information Technology (IT) funds with a 1.86% quarterly return. This is a sharp rebound from the negative return of -2.25% last quarter for IT funds. At the one-year horizon, however, IT funds still posted a loss of -11.46%. Health Care funds, on the other hand, lagged behind other sectors in Q1 2023 with a marginal growth rate of 0.07% (see Exhibit 3).

Exhibit 2. Investment Horizon Returns



Source: State Street®, DataStream, Bloomberg Barclays US Aggregate Bond Index (total returns as of Q1 2023).

Exhibit 3. Performance of Sector Focused Funds



Source: State Street®, as of Q1 2023.

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DIVERSIFYING PRIVAE EQUITY PORTFOLIOS: CHALLENGES AND BEST PRACTICES

Insights from Harvard University and the Private Capital Research Institute

By Josh Lerner

Introduction: The importance of diversification

The classic English proverb "don't put all your eggs in one basket" captures the basis for one of portfolio management's most fundamental concepts: diversification. Conceptually, rational investors should seek the highest return given the level of risk they are willing to accept. Intuitively, investors can limit their risk by, instead of putting all their funds into a single company, holding a number of assets that do not perform in lockstep.

Modern portfolio theory ("MPT"), pioneered by the late Harry Markowitz, explored this relationship in a formal manner. It shows, just as our intuition suggests, that optimal portfolios (ones with the most favorable risk-return profiles) are constructed through diversification. By combining assets whose returns are not strongly correlated (or, in some cases, are negatively correlated), investors can reduce a portfolio's risk while generating the same expected portfolio return.

Public market investors have long applied MPT concepts when constructing their portfolios. But putting these principles to use in private markets can be more difficult. In this essay, we explore diversification through the lens of private markets, focusing in particular on portfolios of private equity ("PE") funds.

We highlight three key points and their impacts. First, we note that the nature of PE makes diversification more challenging than in public markets. We then discuss that, despite these challenges, there are still best practices derived from MPT that PE participants can apply. To observe how diversification has been applied in private markets, we conclude by looking at an emerging area of the industry: collateralized PE fund obligations.

The challenges of PE portfolio construction

Given the historical performance of PE, it is no wonder why investors continue to flock to the asset class. For perspective, PE assets under management were estimated at $9.1 trillion as of December 2022 – a 3.8x increase from December 2012![1]

The unique properties of PE investments, however, impose a number of challenges when optimizing risk and return that public market investors rarely encounter. In previous essays, we explored the prevailing issues surrounding private market asset valuations – one of which was the "stale pricing problem" of private assets. Because fund managers often do not mark the value of their holdings in a timely manner, it is difficult to understand the true correlation of returns among the various private market asset classes. Calculating correlations of private market asset returns with those of public markets is also challenging.

Figuring out these correlations is not only challenging for practitioners but for scholars too. Academic studies estimate the betas (the measure of co-movement between a security's return and that of the market as a whole) for buyouts from as low as 0.7 to as high as 3.2.[2] For venture capital, research places betas anywhere between 0.6 and 2.8.[3] The range of betas demonstrates how difficult to estimate the correlations of public and private market returns can be, making precise optimization a futile task.

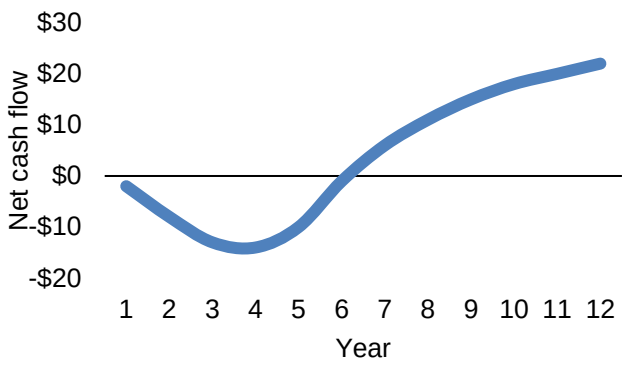
Additionally, the risk-return profile of PE funds differs from that of most public market investments. Inherent risks of private markets include liquidity risks, market risks, and concentration risks. Illiquidity is a defining difference between public and private markets. This results from PE investments being held for years until their value is realized through exits – the "J-curve" effect is a function of illiquidity. The J-curve describes the tendency of funds to report negative returns in initial years and then, in later years, post increasing returns as the investments mature. Participants in PE must be prepared to handle years of unfavorable returns in anticipation of a gradual recovery in which the investment return (ideally) rises to a higher value than the starting point.

[1] Preqin, accessed August 16, 2023.

[2] See Jegadeesh, Kräussl, and Pollet (2014) and Buchner and Stucke (2014) for beta calculations.

[3] See Hwang, Quigley, and Woodward (2005) and Korteweg and Sorensen (2010) for beta calculations.

Figure 1. Illustrative example of the J-curve of net cash flows



Further complicating matters is the wide dispersion of PE returns. For the 20 vintage years spanning 1998 to 2017, the top quartile of global VC funds had an IRR of 17.9% compared to -1.3% for the bottom quartile.[4] Even within PE's best vintage years, manager performance can differ starkly. For instance, while the pooled IRR of vintage 2001 buyout funds was 21.7%, the dispersion of returns across funds was wide: the top quartile IRR was 27.8% versus the bottom quartile's 11.3%. Even in this excellent year, the worst 5% of funds posted a negative IRR of -4.0%.[5] Thus, calculating annualized risk and return measures for PE investments must account for the J-curve and highly dispersed returns.

In terms of market risks, like public markets, PE is vulnerable to periods of "overvaluation." During periods of high competition, bidding wars for portfolio companies can erupt, driving up deal prices. Whereas public market investors have flexibility of entry and exit into markets given their opinion on valuation levels, illiquidity generally locks PE fund investors into their investments until exit.[6] As a result, overpaying for deals in this way further increases the chance of poor PE returns, especially during downturns.[7]

An additional market risk for buyout funds in particular is the cost of debt, given their use of leverage in deals. Axelson and co-authors found that managers tend to use as much leverage as possible[8] and that buyout activity intensely follows the credit market cycle.[9] Lastly, PE funds can exhibit concentration risk. While research suggests specialized managers with specialized strategies tend to outperform,[10] funds that exclusively invest in one industry or geography are more susceptible to external factors affecting their specific approach.

What can investors do to diversify their PE portfolios?

The foundations of MPT and diversification hold true for private markets – putting your eggs into different baskets is a wise rule. A singular PE fund spreads risk over investments in different companies. For limited partners, mitigating risk requires not only careful due diligence of managers but also thoughtful portfolio construction. In the context of a portfolio of funds, diversification involves investing across funds of varying characteristics such as vintage year, strategy, geographic focus, and industry focus, to name a few.

Vintage year is a key consideration when diversifying a portfolio of PE funds. Deal pricing environments can vary strongly year-to-year. Moreover, exit environments can rapidly change. For example, the record-breaking IPO window of 2021 slammed shut in 2022. IPO proceeds on the NASDAQ and NYSE totaled $155.8B in 2021 but only $8.6B in 2022 – nearly a 95% drop in one year.[11]

As a result of factors such as these, distinct performance profiles emerge for funds formed in the same vintage year, producing a diversifying effect when a variety of vintages are incorporated into a PE portfolio. Using global buyout funds as an example, the correlation between a vintage year's pooled IRR and the previous vintage year's pooled IRR for vintages of 1998 to 2017 is 0.72. The correlation drops to 0.25 for two-year vintage differences (2000 and 1998, 2001 and 1999, etc.) and -0.25 for three-year vintage differences (2001 and 1998, 2002 and 1999, etc.).[12]

[4] State Street Private Equity Index, accessed August 17, 2023.

[5] Ibid.

[6] While there is a growing secondary market for private assets, it does not alleviate the issue as the bid-ask spreads (one measure of an asset's liquidity) are generally wide.

[7] Brown, Gregory W., and Steven N. Kaplan. "Have Private Equity Returns Really Declined?" The Journal of Private Equity 22, no. 4 (2019): 11–18.

[8] Ulf Axelson, Per Strömberg, and Michael S. Weisbach, "Why Are Buyouts Levered? The Financial Structure of Private Equity Funds," *The Journal of Finance* 64, no. 4 (2009): 1549–82.

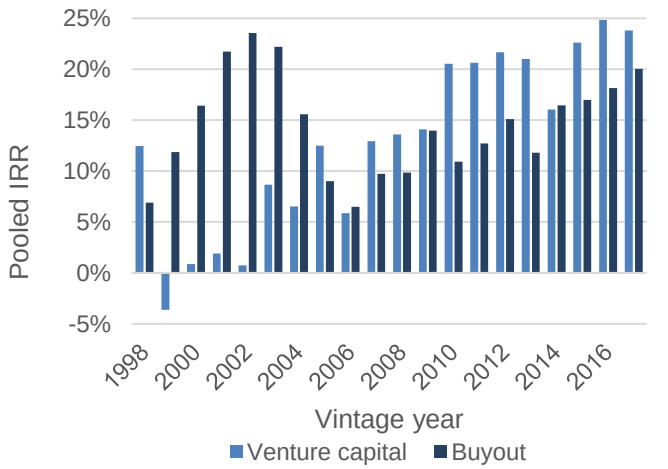
[9] Ulf Axelson et al., "Borrow Cheap, Buy High? The Determinants of Leverage and Pricing in Buyouts," *The Journal of Finance* 68, no. 6 (2013): 2259, doi:10.1111/jofi.12082.

[10] See Gejadze, Giot, and Schwienbacher (2015) and Gompers, Kovner, and Lerner (2009) for two examples of research into specialization's effect on PE returns.

[11] EY Global IPO Trends Q2 2023.

[12] Author's analyses using return data from the State Street Private Index, accessed August 17, 2023.

Figure 2. Venture capital versus buyout pooled IRRs by vintage year



Source: State Street®, as of Q1 2023.

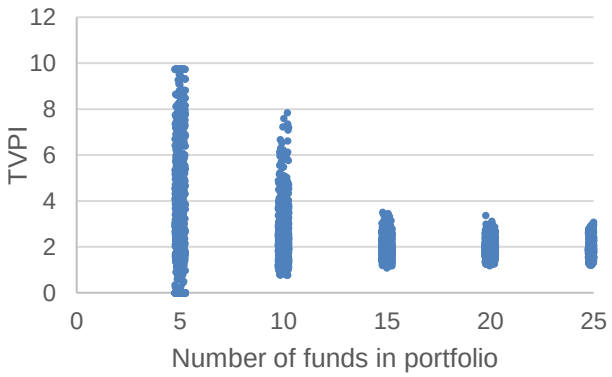
Varying strategies, geographic focuses, and industry focuses also contribute to diversification in a portfolio. For example, different economic conditions present greater or fewer opportunities for buyout versus venture capital investments, given the types of companies each strategy pursues. Whereas venture capital is largely growth-oriented, buyout funds can be value-oriented and take advantage of opportunities stemming from public market distress. This difference is captured in the negative correlation observed between the two strategies: the correlation between buyout and venture capital funds' pooled IRRs for vintages spanning 1998 to 2017 is -0.09.[13]

Geographies and industries also vary in their degrees of investment opportunity. In the same way these factors affect public markets, regions and sectors can face contrasting economic conditions, consumer tastes, development levels, etc.

The simplest approach to diversification is to increase the number of PE funds that one holds. For public stocks, financial advisors suggest a rule of thumb that it takes holding 20 to 30 stocks to achieve meaningful diversification.[14]

We can simulate the impact of PE portfolio diversification on performance using historical data.[15] In this scenario, we look at a series of portfolios of venture capital funds (all of the same vintage year) ranging from 5 to 30 funds in size. We simulate each portfolio's performance 1,000 times. To see the effects of diversification by portfolio size, we plot the range of simulated portfolios' multiples of invested capital (also known as TVPIs) after 10 years against the number of funds each.[16] Figure 3 shows the results.

Figure 3. Range of TVPIs for 1000 simulations of portfolios by number of VC funds in portfolio



As the number of funds increases, the range of potential TVPI outcomes tightens. However, due to minimum investment sizes and issues of access, it can be impractical to reduce risk by increasing the fund count of one's portfolio. To solve these issues, investors have turned to forms of diversified PE vehicles – the classic example being the fund of funds. We now turn to a more recent innovation and growing area of the industry that leverages diversification: collateralized fund obligations.

An example in practice: Securitized PE

The financial industry has long offered structured financial products that take advantage of securitization or packaging similar assets into a single, interest-bearing instrument. A recent evolution in this market is the collateralized PE fund obligation ("CFO"). CFOs package PE fund holdings into a product that promises interest payments to any purchaser of the security. Payments are funded by the distributions paid out

[13] Ibid. It is worth noting that returns have been more correlated since the Great Financial Crisis; the correlation of returns between venture capital and buyout pooled IRRs for vintage years 2008-2017 is 0.55.

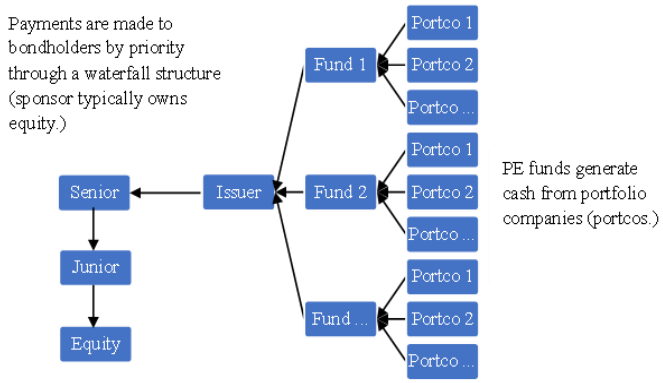
[14] "Peak Diversification: How Many Stocks Best Diversify an Equity Portfolio?," CFA Institute Enterprising Investor, May 6, 2021, https://blogs.cfainstitute.org/investor/2021/05/06/peak-diversification-how-many-stocks-best-diversify-an-equity-portfolio/

[15] Simulations performed using Bella Analytics software; visit https://www.bella-analytics.com/ for more information.

[16] A fund's Total Value to Paid-In Capital (TVPI) is calculated as (total distributions + remaining net asset value) / total contributions.

from the product's underlying PE funds. Like many asset-backed securities, these offerings are often "tranched" and include senior bonds, junior bonds, and equity (typically held by the sponsor). Senior bond payments are made first and thus entail less risk at the expense of a lower coupon rate. Figure 4 shows the basic structure of a CFO.

Figure 4. CFO structure (arrows indicate the direction of cash flow)



The ability to issue CFOs largely depends on the levels of diversification built into them. The size of securitized PE portfolios has ranged from 10 to 64 funds.[17] Typically, these funds are run by many different managers who the issuer has vetted. The vintage years, strategies, geographic focuses, and industry focuses of funds are typically highly interspersed. Some issuers also incorporate other private asset classes, such as infrastructure or real estate funds, into their offerings. As a result, the pool of cash flows from which the bond payments are paid is generated by hundreds of private companies of various sizes, sectors, and business models – in effect, the "market portfolio" for private assets. The diversity across the underlying funds within a CFO ensures that the cash flows are derived from varied sources and the impact of any one poor investment is minimized. Of the six PE-based CFOs launched between 2003 and 2006 known to the ratings agency Fitch, all of them weathered the Great Financial Crisis and repaid their rated bonds in full.[18]

CFOs offer many advantages to both their investors and issuers. Investors eager to gain exposure to PE have another way to do so. In particular, certain classes of investors whose mandates would prevent them from direct investment in PE funds can access PE-derived cash flows in the structured and rated format of CFOs. For example, insurers have been one of the biggest purchasers of CFOs.[19] On the other side, issuers have used these products for liquidating portions of their PE portfolio. From their beginnings in the early 2000s, CFOs provided liquidity for limited partner interests in PE funds. More recently, large PE firms have issued CFOs for fundraising. The slowdown in PE activity over the last year has pushed firms to find capital through alternative means including securitization.[20] Some of the largest names in PE, including Blackstone, KKR, Ares, and Coller Capital, have privately issued their own versions of CFOs by bundling stakes of different funds together.[21]

Conclusion: Diversifying in PE is more difficult but still achievable

Diversification is a central consideration for any investor – both public and private. However, the unique risk-return profile of PE and the underlying nature of the asset class makes diversification more challenging than in public markets. Reducing risk in a portfolio of PE funds revolves around increasing the number of funds held and having a mix of strategies, vintage years, geographic focuses, and industry focuses. PE participants would do well to consider how their investments interact along these lines. One emerging area of the private capital industry in which these ideas of diversification are central is securitization. Groups have constructed diversified portfolios of PE funds whose cash flows have been packaged into bonds – the collateralized fund obligation. If well designed and fairly priced, CFOs helpfully offer additional exposure for investors to PE and liquidity for issuers.

17 Cornelius, Peter, Christian Diller, Didier Guennoc, and Thomas Meyer, "Mastering Illiquidity: Risk Management for Portfolios of Limited Partnership Funds," *John Wiley & Sons*, (2013).

18 Kaye Wiggins, "Collateralised Fund Obligations: How Private Equity Securitised Itself," *Financial Times*, November 25, 2022, sec. Capital markets, https://www.ft.com/content/e4c4fd61-341e-4f5b-9a46-796fc3bdcb03.

19 Important to note that insurer purchases of CFOs have frozen due to recent regulatory inquiries by the National Association of Insurance Commissioners: see https://www.ft.com/content/b82dca43-9a92-4fc3-aca8-e4245d5cf5f3 for more information.

20 Allison McNeely, Laura Benitez, and Silas Brown, "Private Equity Deal Rut Spurs Firms to Raise Cash Creatively," Bloomberg, August 3, 2023, https://www.bloomberg.com/news/articles/2023-08-03/private-equity-deal-drought-spurs-firms-to-raise-cash-creatively#xj4y7vzkg.

21 Wiggins, "Collateralised Fund Obligations: How Private Equity Securitised Itself."

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The Private Capital Research Institute is a not-for-profit 501(c)(3) corporation formed to further the understanding of private capital and its global economic impact through a commitment to the ongoing development of a comprehensive database of private capital fund and transaction-level activity supplied by industry participants. The PCRI, which grew out of a multi-year research initiative with the World Economic Forum, also sponsors policy forums.

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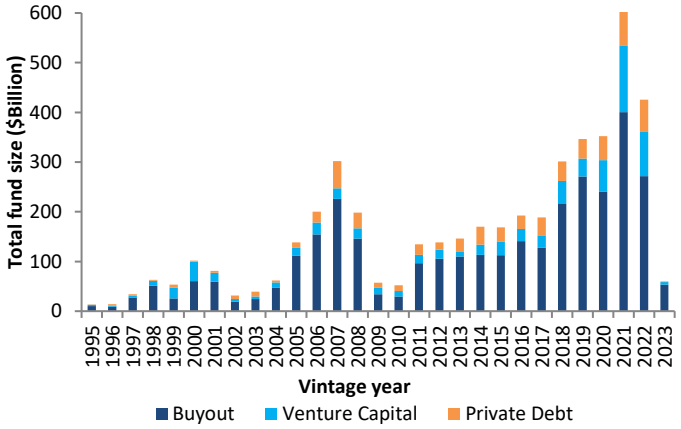
Fund Raising and Dry Powder

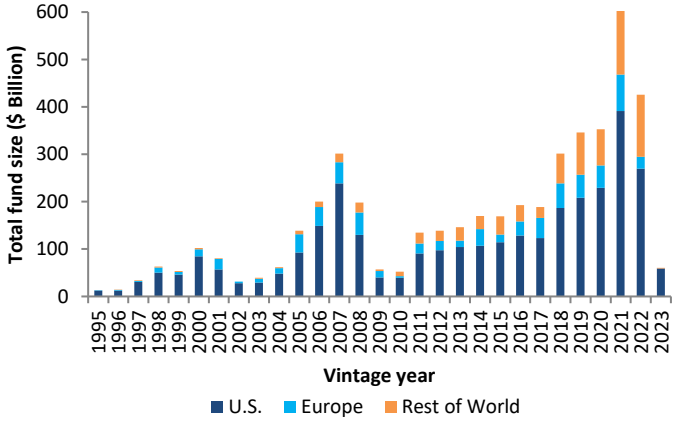
Fundraising activity saw a continued slowdown in Q1 2023, with the SSPEI constituent funds raising $60 billion. A linear projection of the capital raised for the full year of 2023, which only includes the funds that already started making capital calls in Q1 2023, is $240 billion. This estimate corresponds to only 56% of total fund raised in 2022 and 40% of the funds raised in 2021. While fundraising slowed across all strategies in Q1 2023, VC and Private Debt funds experienced a particularly drastic slowdown, with $5 billion and $2 billion total funds raised, respectively. Buyout funds, on the other hand, raised $53 billion (see Exhibit 4A). Across regions, while the US raised $59 billion in Q1, Rest of World funds only raised $1 billion and Europe funds in SSPEI failed to raise any funds in Q1 2023 (see Exhibit 4B).

Exhibit 4. Total Fund Size (USD Billion)

(A) By Strategy



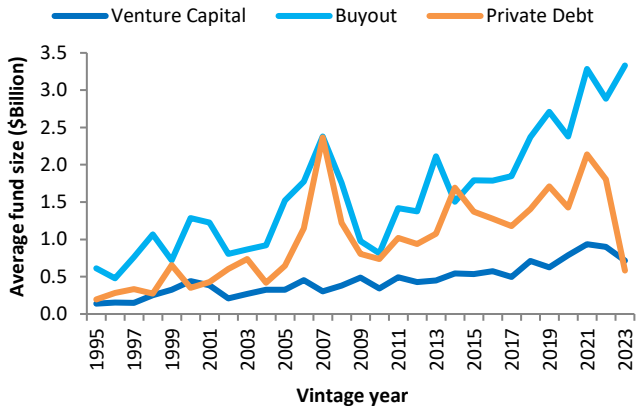
(B) by Region



Source: State Street®, as of Q1 2023.

Despite the decline in the total amount raised, the average fund size rose to a historical high of $2.3 billion in Q1 2023. This increase is driven by a 15% quarterly rise in the average fund size of Buyout funds. The average fund sizes of VC and Private Debt funds, on the other hand, decreased significantly from $0.9 billion and $1.8 billion at the end of 2022 to $0.7 billion and $0.6 billion in Q1 2023, respectively. This apparently sharp drop in average fund size for Venture Capital and Private Debt funds is likely a result of the small sample of 2023 vintage year funds so far in these two strategies (see Exhibit 5).

Exhibit 5. Average Fund Size (USD Billion)

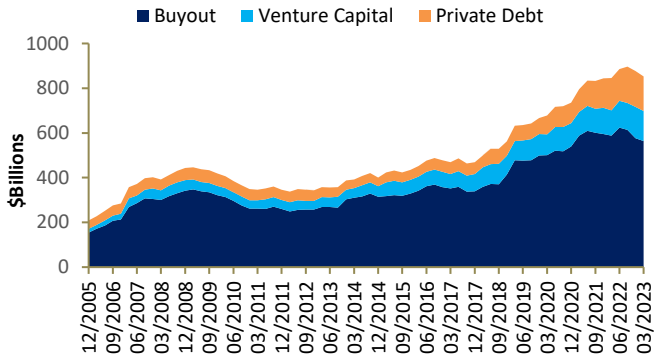


Source: State Street®, as of Q1 2023.

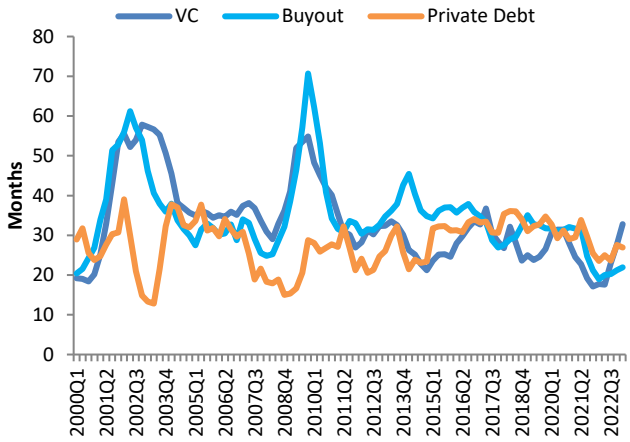
Dry powder is the part of the fund's committed capital that has not yet been called by the fund manager. It represents the amount of capital that can be used for future investment opportunities. As of Q1 2023, SSPEI posted a dry powder of $853 billion, which decreased from $877 billion in Q4 2022, consistent with its downward trend since Q3 2022 (see Exhibit 6A). Although the dollar amount of dry powder decreased in Q1 2023, the quarterly dry powder normalized by the monthly average contribution of the past 12 months, which measures how long the current dry powder inventory can last at the recent average capital call rate without new fund raising activities, continued to increase for Buyout and VC strategies and remained roughly constant for Private Debt funds in Q1 2023 (see Exhibit 6B), indicating slower deployment of committed capital by the GPs. The increase in dry powder inventory is expected to persist if the trend of slowing down in capital calls continues (see Exhibit 7A).

Exhibit 6. Dry Powder

(A) Monthly Dry Powder



(B) Quarterly Dry Powder Normalized by Average Contribution



Source: State Street ®, as of Q1 2023.

Cash Flow Activity

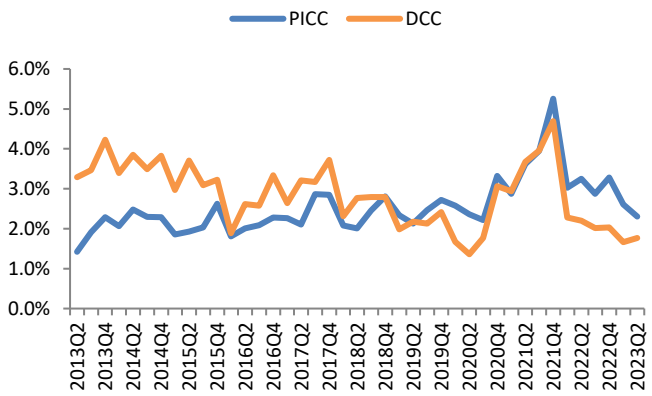
After a sharp decline in Q1 2022, the downward trend of quarterly Paid-in Capital over Committed Capital (PICC) persisted in Q2 2023. After experiencing a similar fall in Q1 2022, the quarterly Distribution over Committed Capital (DCC) has also been in a downward trend, while marginally increasing in Q2 2023. Although PICC stayed much higher than DCC in 2022, the gap between the two continued to close in Q2 2023. This gap translates into a negative net cash flow for all PE strategies, which is attributable to Buyout and VC funds (see Exhibit 7A and 7B).

Exhibit 7B provides a closer look at the net cash flows among different PE strategies. While the net cash flow of Buyout and VC funds remained negative, which is consistent with their recent behavior, the net cash flow of Buyout funds slightly

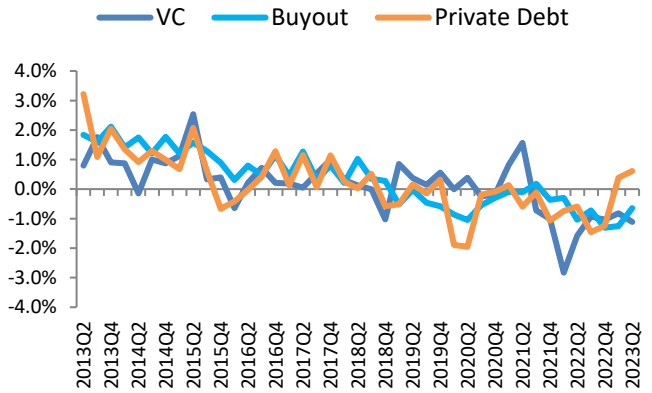
increased to its highest level since Q1 2022, mainly due to a lower PICC level. Private Debt funds, on the other hand, continued to experience a positive net cash flow and recorded a new high since Q4 2017, mainly due to a higher DCC level.

Exhibit 7. Quarterly Cash Flow Ratios Normalized by Commitment

(A) Contribution and Distribution for All PE



(B) Net Cash Flow By Strategy



Source: State Street ®, as of Q1 2023.

Valuations

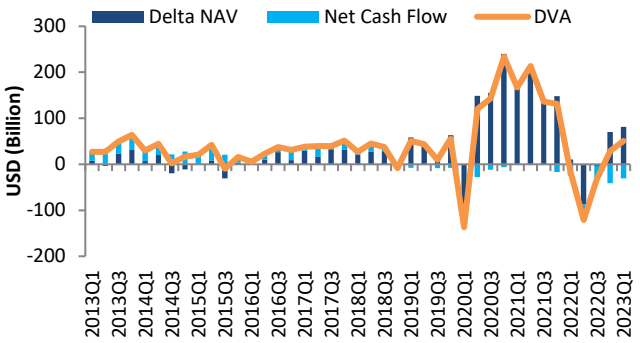
The Dollar Value Added (DVA) is the sum of NAV changes and net cash flows. It measures the realized and unrealized gain and loss in dollar amounts.

$$DVA = EndingNAV - BeginningNAV + Distribution - Contribution$$

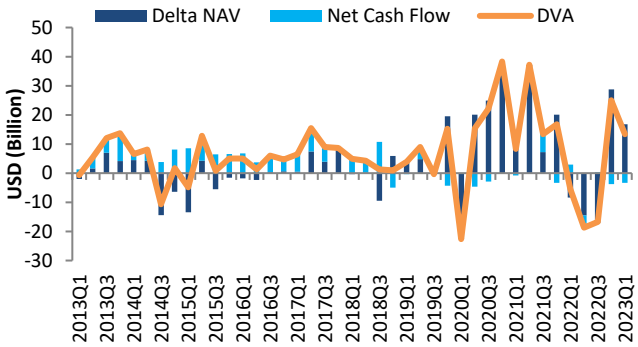
The quarterly DVA of all PE funds continued to rebound by jumping from $29 billion in Q4 2022 to $51 billion in Q1 2023. The positive DVA in Q1 2023 is due to the increase in NAVs being larger than the negative net cash flows (see Exhibit 8A). As shown in Exhibit 8D, the increase in NAVs is mainly attributable to Buyout funds, as VC and Private debt funds posted only marginal increases in their NAVs. Exhibit 8B shows that Europe funds experienced a largely positive DVA in USD in Q1 2023. Unlike last quarter, this jump is not entirely driven by the relative depreciation of the US dollar against the Euro in Q1 2023. Exhibits 8C shows that Europe funds also experienced a significantly positive DVA in EUR in Q1 2023.

Exhibit 8. Dollar Value Added

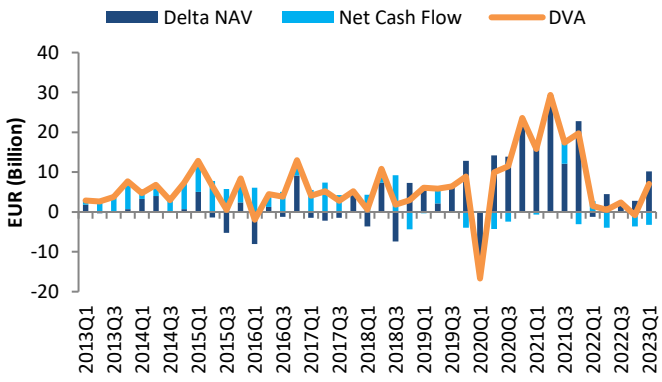
(A) All PE



(B) Europe (USD)

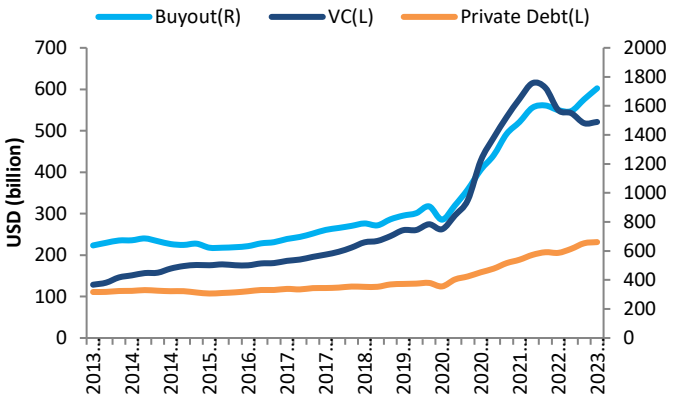


(C) Europe (EUR)



Source: State Street ®, as of Q1 2023.

(D) NAV by Venture Capital, Buyout, and Private Debt



Source: State Street ®, as of Q1 2023.

NEXT QUARTER PERFORMANCE FORECAST

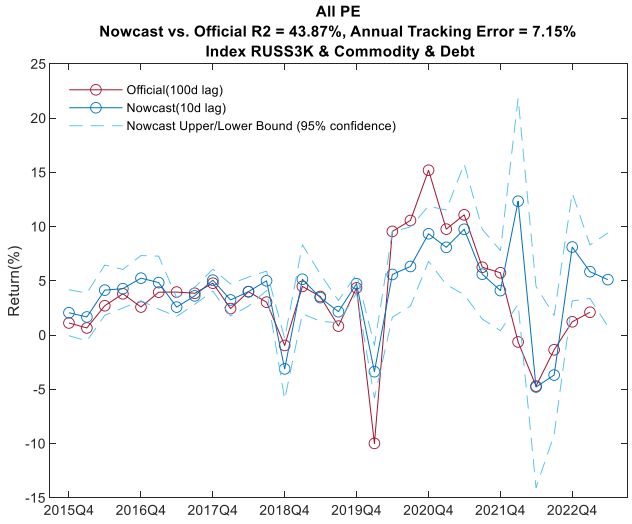
Nowcasting

Inspired by the concept of nowcasting, SSPEI research team developed a model, aspiring to estimate the concurrent performance of private equity market, of which the reporting is otherwise delayed at least by one quarter. We hereby only share the model predictions for Q2 2023 without going into theoretical background. For model details, please refer to State Street Private Equity Insights Q3 2021 publication.[22] Nowcasting results are out-of-sample predictions based on the regression coefficients from the past 5 year rolling window and the observed public market returns and private market cash flows.

This quarter, the nowcasting model successfully predicted Q1 2023 return for Private Debt strategy, but over-predicted the returns of all other strategies. Shown in Exhibit 12, the actual Q1 2023 returns of All PE, Buyout, Venture Capital and Private Debt were 2.10%, 2.73%, 0.00% and 2.28% respectively. Correspondingly, the nowcasting model predicted returns were 5.84%, 4.91%, 11.54% and 2.11%. Despite the model predicted downward corrections in Q1 for All PE and Buyout, the realized returns fell under the lower bounds of the 95% confidence intervals of the predicted returns for all strategies except for Private Debt. Although the model over-predicted Venture Capital return due to strong Q1 performance, a 17.05% increase of Nasdaq Composite index, Venture Capital in reality was able to end the loss and break just even in Q1 2023.

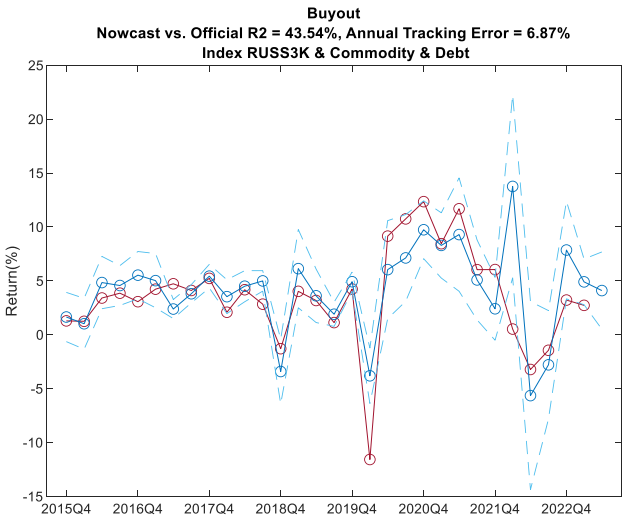
Looking forward, our nowcasting model expects the Q2 2023 returns of all strategies to remain at positive levels, and for All PE, Buyout, and Venture Capital to see an increase from their realized returns this quarter, while Private Debt return continues to adjust downward. The predicted returns for the strategies, All PE, Buyout, Venture Capital and Private Debt are 5.10%, 4.10%, 13.45%, and 1.12% respectively. Though 13.45% may be an overestimation again, but the model thinks Venture Capital return will directionally increase in the following quarter. In Q2 2023, while most public indices used in model saw positive returns, the commodity index had a decreased of -2.56%, which is the main driver of the downward adjustments in our nowcasting predictions.

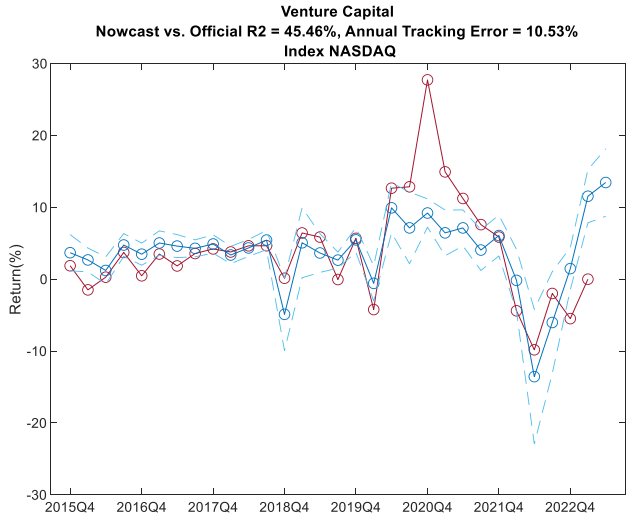
Exhibit 12. Actual vs. Out-of-sample Nowcast IRRs

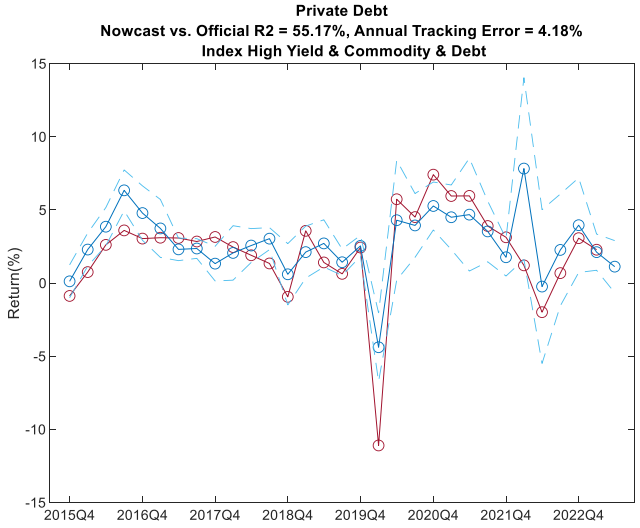


Source: State Street ®, as of Q1 2023.

[22] State Street Private Equity Insights Q3 2021
https://globalmarkets.statestreet.com/portal/peindex/ publications







Source: State Street ®, as of Q1 2023.

DISCUSSION – CHANNELS OF FX IMPACT AND HEDGING

Since the beginning of 2022, currency volatility had an unprecedented wild ride in response to inflation and rising interest rates. The USD became exceedingly volatile; the DXY index rose 15.53% in the first nine months of 2022, followed by a sharp decline in Q4 for 8.46% (See Exhibit 13). As a result, the foreign exchange risk is back under the spotlight of many private equity investors.

Exhibit 13. US Dollar index (DXY)

Source: MarketWatch.com, accessed on 6/9/2023.
(https://www.marketwatch.com/investing/index/dxy/charts?mod=mw_quote_tab)

The decision of hedging FX exposure or not could have some profound impacts on the investment returns. Exhibit 14 shows the spread between USD denominated return (i.e. unhedged) and the foreign currency denominated return (i.e. fully hedged) of funds with a foreign country focus. In the short term, the IRR spreads between USD-based index and foreign currency-based index for Q4 and the calendar year of 2022 are dramatic, corresponding to the DXY index movements in 2022. In the long term, the annualized IRR spreads, such as -3.58% of UK focused funds over a ten year horizon, are also economically significant.

In addition to the return spreads, the currency exposure of PE investments also increases their return volatility. Using the SSPEI dataset, we examined the EUR and USD based returns of the constituent funds denominated in Euro (Exhibit 15) and find that the volatility of USD based return increases due to the presence of FX fluctuations. Meanwhile, the mean USD based return, as expected, is higher than the mean EUR based return during the USD/EUR depreciation period in 2000-2008, and becomes lower during the USD/EUR appreciation period in 2009-2022 (Exhibit 15(A)).

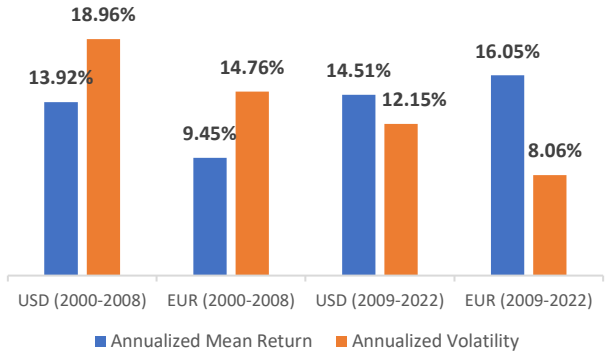
Exhibit 14. Annualized spread between USD denominated return and foreign currency denominated return of SSPEI funds with a foreign country focus

Country Focus	Q4	1 Year	3 Year	5 Year	10 Year	Since Inception
Europe	8.27	-6.22	-1.91	-2.70	-2.43	-2.02
UK	7.77	-11.94	-3.56	-2.57	-3.58	-1.59
Japan	9.68	-8.34	-5.83	-3.46	-9.35	-0.93
China	2.11	-7.92	0.25	-1.51	-1.13	1.32

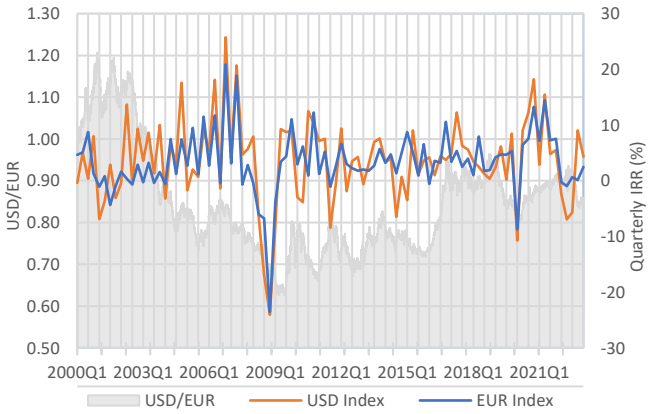
Source: State Street ®, as of Q4 2022.

Exhibit 15. USD vs EUR based return of SSPEI Euro-denominated funds

(A). Annualized returns and volatility (2000-2022)



(B). Quarterly rolling USD and EUR based returns



Source: State Street ®, as of Q1 2023.

FX risk impacts LPs and GPs through various aspects of exposures, such as dealmaking, valuation, cash flow and liquidity management, fundraising, asset allocation, performance benchmarking etc.

For many LP investors, PE funds denominated in foreign currency or with an international focus have become a non-negligible component of their investment portfolios. A LP faces direct FX exposure to one currency by committing to a foreign currency denominated fund, as well as indirect FX portfolio exposure to potentially many currencies in which the fund's holding companies are based.

Different LPs may have different hedging demands depending on their approaches towards currency exposures. Some sophisticated LPs choose to hedge by themselves[23]. For instance, the California State Teacher's Retirement System (CalSTRS) discloses that CalSTRS designed the Currency Management Program (CMP) to use a strategic allocation to global public and private assets, including Private Equity and Real Estates, for the purpose of preserving the diversification benefits of holding foreign denominated assets, while protecting the translation value of non-US investment assets against the risk of USD strengthening, and exploring the opportunities for alpha generation within the currency markets[24]. This is particularly challenging for LPs for reasons such as: 1) inability to accurately track FX exposure at portfolio level due to lack of data transparency in private markets, 2) indirect currency exposure to portfolio companies, 3) timing uncertainty of the cash flows, and 4) different reporting lags between private and public markets.

Others LPs may prefer a less resource-demanding approach by committing to a feeder or parallel fund raised by GPs but denominated in LPs' home currency to mitigate the fund level FX risks associated with cash flows and valuations; a subset of LPs, who are fully averse towards currency exposure from holding companies and expect GPs to run the hedge at asset level, may choose to commit to fully hedged vehicles that some

[23] Waters, Tobias. "Currency Chaos: GPs and LPs Seek Comfort in Hedging." Private Equity International, 20 Oct. 2022, www.privateequityinternational.com/currency-chaos-gps-and-lps-seek-comfort-in-hedging/.

[24] Currency Management Program Policy - CALSTRS, www.calstrs.com/files/b1a197981/F-CurrencyManagmentProgramPolicy04-2023.pdf.

GPs may offer with additional fees for covering the hedging costs[25].

On the GP side, currency fluctuations can be disruptive to GP's private equity dealmaking. Managers investing internationally may find the costs of deals to increase between signing and close in a high volatility FX market. If the home currency of the target company strengthens relative to the base currency of the fund, the purchase becomes more expensive; if otherwise weakens, the sale of the investment becomes less valuable. For this reason, PE managers often choose to hedge the foreign currency risks for such transactions with FX derivatives, of which FX forward contract is one of the most common choices. In addition, quarter-to-quarter assets valuation is subject to foreign currency exposure as well. Some PE managers may employ asset valuation level hedging such as a rolling FX forward program throughout the entire holding period[26].

To gain competitiveness in fundraising and to attract a broader LPs client base, PE managers often raise, as mentioned, multi-currency feeder funds and potentially fully hedged sleeves to meet various hedging demands of LPs. However, structuring such funds can be complicated in the back office as hedging and reporting in dual or multiple currencies are hard to coordinate and requires extensive work. For example, when PE managers raise a fund in one base currency but have offices outside the jurisdiction of that currency, the GP will receive the management fees in the fund's base currency, while having to pay for expenses in another[27].

There are many aspects of FX risks in PE that are worth the attention from investors and researchers, which leave us a substantial room for exploring the approaches to FX hedging implementation.

ABOUT THE STATE STREET PRIVATE EQUITY INDEX

Participants in private capital markets need a reliable source of information for performance and analytics. Given the non-public nature of the private equity industry, collecting comprehensive and unbiased data for investment analysis can be difficult. The State Street Private Equity Index ("SSPEI") helps address the critical need for accurate and representative insight into private equity performance.

Derived from actual cash flow data of our Limited Partner clients who make commitments to private equity funds, SSPEI is based on one of the most detailed and accurate private equity data sets in the industry today. These cash flows received as part of our custodial and administrative service offerings are aggregated to produce quarterly Index results. Because the SSPEI does not depend on voluntary reporting of information, it is less exposed to biases common among other industry indexes. The result is an index that reflects reliable and consistent client data, and a product that provides analytical insight into an otherwise opaque asset class.

- Currently comprises more than 3,800 funds representing more than $4.7 trillion in capital commitments as of Q1 2023
- Global daily cash-flow data back to 1980.
- The Index has generated quarterly results since Q3 2004.
- Published approximately 100 days after quarter-end.

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[25] Establishing and operating hedged sleeves. Chatham Financial. (n.d.). https://www.chathamfinancial.com/insights/establishing-and-operating-hedged-sleeves

[26] "The Importance of FX for Private Equity Firms." MillTechFX, milltechfx.com/resources/blog/why-is-fx-important-for-private-equity-firms.

[27] Why is FX important for private equity firms?. MillTechFX. (n.d.). https://milltechfx.com/resources/blog/why-is-fx-important-for-private-equity-firms

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