

Hedge Fund Trend Monitor

Hedge fund crowding reaches new record as popular positions enjoy momentum

In this report we analyze the holdings of 735 hedge funds with \$2.4 trillion of gross equity positions at the start of 4Q 2023 (\$1.6 trillion long and \$797 billion short).

The combination of elevated hedge fund concentration and the strong performance of popular stocks has supported returns this year but lifted our crowding index to a record high. Our Hedge Fund VIP list of the most popular long positions has returned +31% YTD, and most of the “Magnificent 7” mega-cap tech stocks remain at the top of the list. Mirroring the increasing concentration in the equity market, concentration in hedge fund portfolios has risen; the typical hedge fund holds 70% of its long portfolio in its top 10 positions. These dynamics have also lifted hedge fund exposure to the Momentum factor to a near record.

While riding the momentum of popular tech stocks, funds searched for alpha in the Health Care and Consumer sectors. After improving for most of 2023, the stock-picking environment has recently deteriorated as stock correlations and the macro share of stock returns have risen while return dispersion has declined. Nonetheless, the latest filings show hedge funds looking for opportunities amid the volatility created by GLP-1 enthusiasm and consumer uncertainty. LLY, ABT, and HD ranked on our Rising Stars list of stocks with the largest increase in hedge fund popularity last quarter, while BSX and DKS are among the Falling Stars. The popularity of small-caps also reflects the hunt for alpha.

Ben Snider

+1(212)357-1744 | ben.snider@gs.com
Goldman Sachs & Co. LLC

Jenny Ma

+1(212)357-5775 | jenny.ma@gs.com
Goldman Sachs & Co. LLC

David J. Kostin

+1(212)902-6781 | david.kostin@gs.com
Goldman Sachs & Co. LLC

Ryan Hammond

+1(212)902-5625 | ryan.hammond@gs.com
Goldman Sachs & Co. LLC

Cormac Conners

+1(212)357-6308 | cormac.x.conners@gs.com
Goldman Sachs & Co. LLC

Lily Calcagnini

+1(212)357-5913 | lily.calcagnini@gs.com
Goldman Sachs & Co. LLC

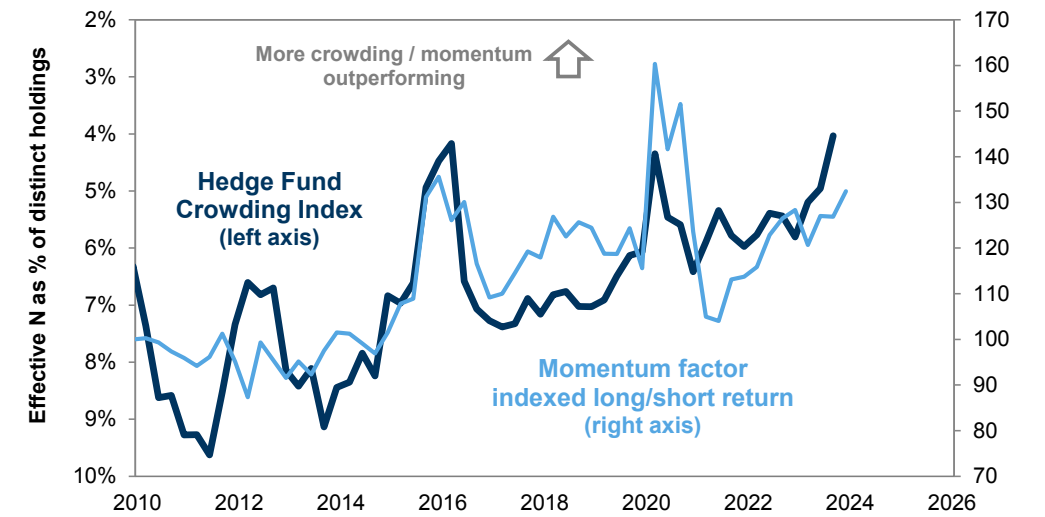
Daniel Chavez

+1(212)357-7657 | daniel.chavez@gs.com
Goldman Sachs & Co. LLC

Table of Contents

5 key points from the Goldman Sachs Hedge Fund Trend Monitor	4
Performance, leverage, and short interest	5
Macro vs. micro returns	9
Thematic and factor rotations: Momentum, Magnificent 7, and small-caps	11
Concentration, crowding, and turnover	14
Sector positions	16
The Hedge Fund VIP List: “The stocks that matter most”	20
The most concentrated hedge fund positions	22
Rising and falling stars	24
ETF ownership	26
The Very Important Short Position List	27
Appendix A: Hedge fund data tables	29
Change in popularity: Largest increase and decrease in number of hedge fund owners	29
Concentrated shorts: Highest short interest outstanding as a percentage of market cap	30
Appendix B: 100 largest hedge funds in our analysis ranked by equity assets	31
Appendix C: Drawbacks of our hedge fund holding analysis	32
Disclosure Appendix	33

Exhibit 1: Hedge fund crowding has risen as popular positions have gained momentum



Source: Goldman Sachs Global Investment Research

5 key points from the Goldman Sachs Hedge Fund Trend Monitor

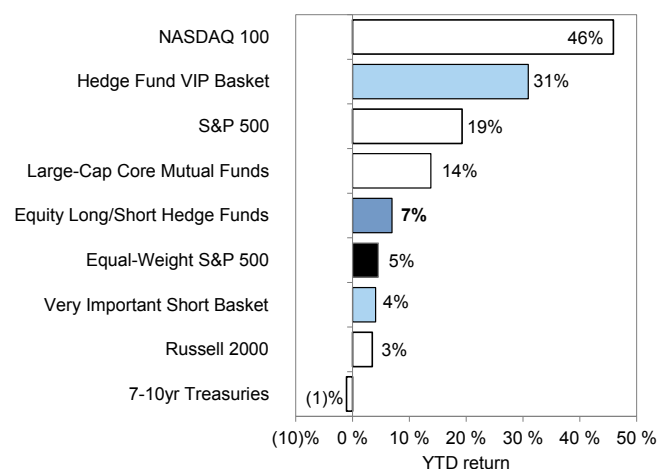
This Hedge Fund Trend Monitor analyzes 735 hedge funds with \$2.4 trillion of gross equity positions (\$1.6 trillion long and \$797 billion short). Our analysis of positions at the start of 4Q 2023 is based on 13-F filings as of November 15, 2023.

- 1. PERFORMANCE: The most popular hedge fund long and short positions have supported returns despite a deteriorating stock-picking environment** Our Hedge Fund VIP list of the most popular long positions (ticker: [GSTHHVIP](#)) has returned +31% YTD, handily outperforming the S&P 500 (+19%), the equal-weight S&P 500 (+5%) and the most shorted stocks ([GSCBMSAL](#), +0%). This outperformance has persisted despite the market volatility in recent months, with popular long positions outperforming concentrated shorts in most sectors. However, the improvement in the alpha-generation backdrop that took place earlier in 2023 has reversed, with the “micro” share of stock returns declining in 4QTD.
- 2. LEVERAGE AND SHORT INTEREST: Hedge funds have lifted net exposures modestly while maintaining record gross leverage.** Elevated gross exposures help explain the extreme recent volatility of heavily shorted stocks. However, short interest in the typical stock remains low as funds have increasingly hedged using macro products like ETFs and futures rather than single stock shorts.
- 3. MAGNIFICENT 7: Funds bought mega-cap tech during 3Q, lifting their exposures to the “Magnificent 7” to a new high.** The mega-cap tech stocks account for 13% of the aggregate hedge fund long portfolio, twice their weight at the start of 2023 but only half the stocks’ weight in the Russell 3000. Except for TSLA, each of the seven rank among the top 10 members of our Hedge Fund VIP list. MSFT and AMZN have been the top two VIPs for nine consecutive quarters.
- 4. HEDGE FUND VIPS: The mega-caps remain the most popular hedge fund long positions.** The top 6 stocks this quarter (MSFT, AMZN, META, GOOGL, NVDA, UBER) also ranked as the top 6 last quarter. The VIP list contains the 50 stocks that appear most often among the top 10 holdings of fundamental hedge funds. The basket has outperformed the S&P 500 in 59% of quarters since 2001 with an average quarterly excess return of 43 bp. 14 new constituents: ABCM, AER, CPRI, CRH, DDOG, KKR, KVUE, LNG, MU, PGR, PXD, SPLK, TMUS, and UNH.
- 5. SECTORS: Hedge funds added heavily to Tech last quarter, with broad-based increases across industries.** Funds sold Health Care, but it remains the largest sector overweight relative to the Russell 3000. Funds also sold Energy, where tilts are close to the lowest since before the GFC. The consumer remains a point of debate, with consumer firms heavily represented on our list of “controversial” stocks with high ownership and high short interest ([Exhibit 15](#)). CZR, DLTR, HLT, SYF, and WYNN joined our High Hedge Fund Concentration basket ([Exhibit 39](#)). Similarly, funds remained underweight Financials and JPM and C fell out of our VIP list, but CMA, JEF, MKTX, WAL, and ZION ranked among the stocks with the largest decrease in short interest during the last few months.

Performance, leverage, and short interest

Complementary long and short positions have allowed hedge funds to maintain a solid YTD return despite the recent rise in equity market volatility. Our Hedge Fund VIP basket of the most popular hedge fund long positions (ticker: [GSTHHVIP](#)) has returned +31% YTD, handily outperforming the S&P 500 (+19%), a basket of the stocks with the largest outstanding notional dollars of short interest ([GSTHVISP](#), +4%), and a basket of stocks with the highest concentration of short interest relative to float ([GSCBMSAL](#), +0%). During the three months from August through October, the VIP list dropped by -7%, but the most shorted stocks declined by -35%, helping preserve alpha. As a result, based on estimates from [GS Prime Services](#), US equity long/short funds have generated a +7% YTD return.

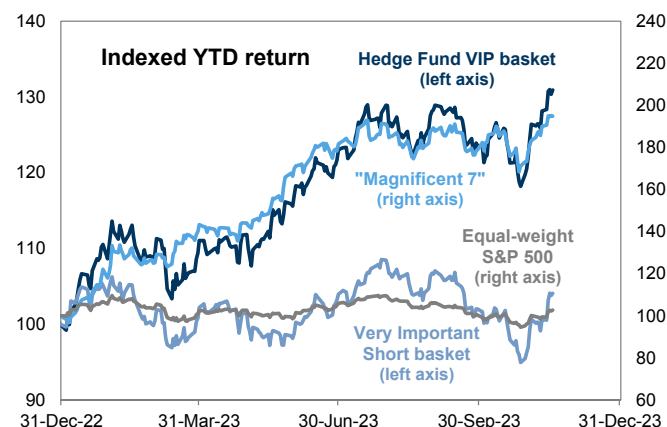
Exhibit 2: GS Prime Services estimates a 7% YTD return for US long/short equity hedge funds
as of November 17, 2023



Hedge fund performance estimates represent weighted averages of fund performance derived from aggregated Goldman Sachs Prime Services client positions for an anonymized basket of Equity Long/Short funds.

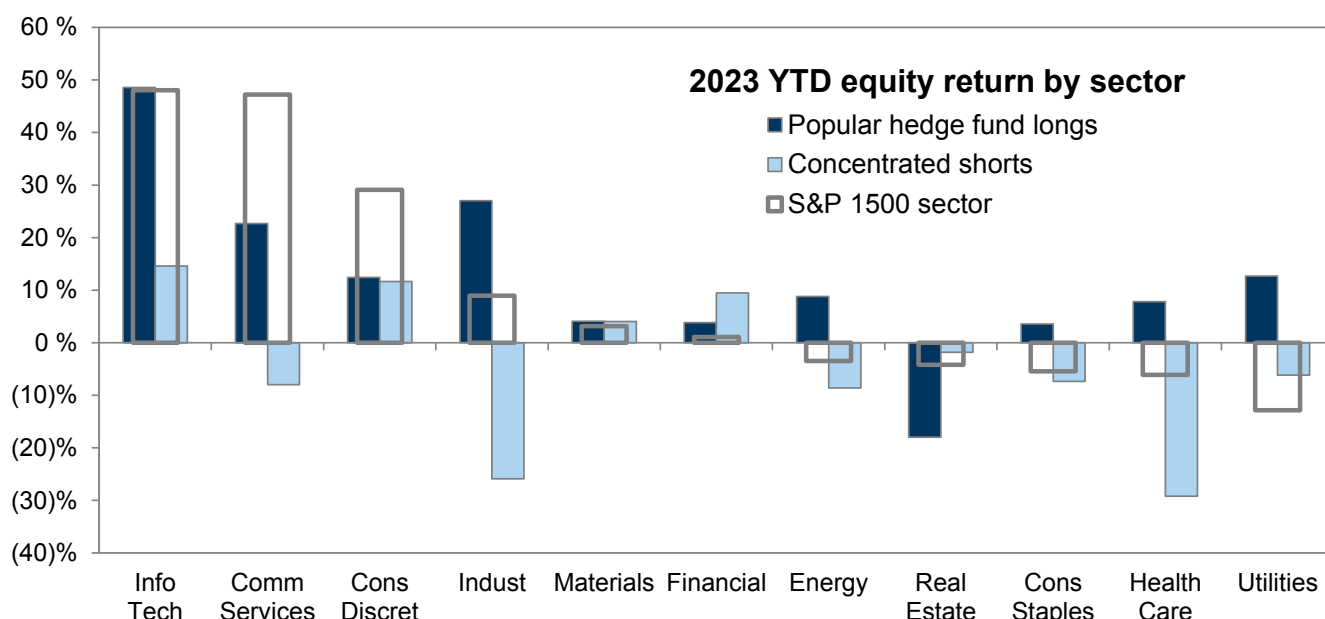
Source: FactSet, Goldman Sachs Prime Services, Goldman Sachs Global Investment Research

Exhibit 3: The most popular hedge fund positions have fared well YTD



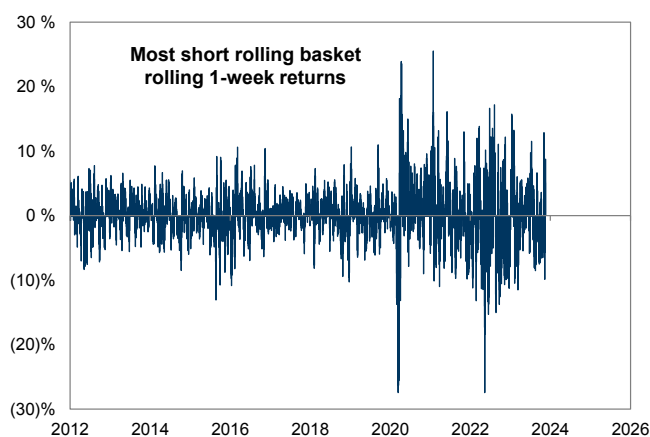
Source: Goldman Sachs Global Investment Research

The most popular hedge fund long positions have outperformed the most concentrated short positions YTD in most sectors. Popular longs have lagged only in Financials and Real Estate.

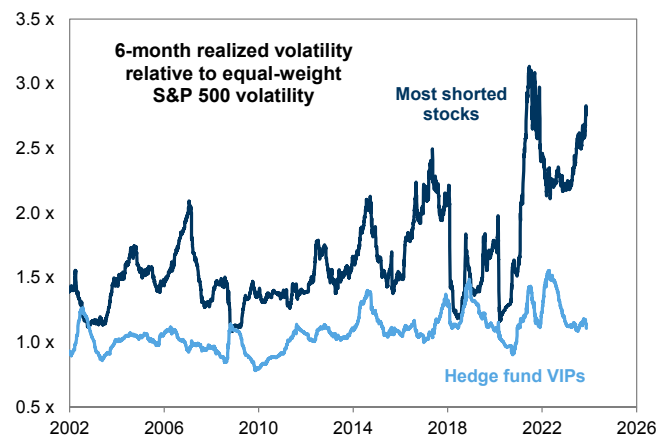
Exhibit 4: The most popular hedge fund long positions have outperformed the most concentrated shorts in most sectors YTD

Source: Goldman Sachs Global Investment Research

The most concentrated short positions have contributed to hedge fund alpha this year but have been extremely volatile. Between 2002 and 2020, our rolling basket of the stocks with the highest short interest relative to float has averaged realized volatility of 1.5-2 times that of the equal-weight S&P 500. However, since the “meme stock” short squeeze in early 2021, the most shorted stocks have been 2-3 times as volatile as the equal-weight S&P 500. While volatility in the most shorted stocks declined modestly in 2022, it has risen again YTD in 2023.

Exhibit 5: Short positions have been particularly volatile in recent years

Source: Goldman Sachs Global Investment Research

Exhibit 6: Highly shorted stocks have recently been highly volatile

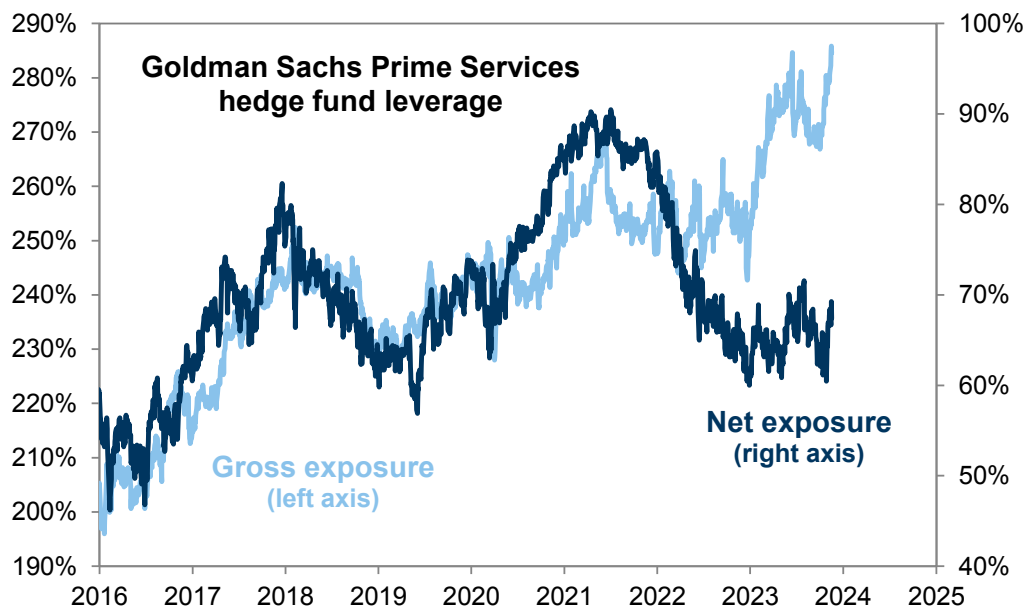
Source: Goldman Sachs Global Investment Research

One possible explanation for the elevated volatility of heavily shorted stocks is the elevated degree of hedge fund gross exposure. Data from Goldman Sachs Prime

Services show hedge funds lifting gross exposures to record highs in early 2023 while net leverage remained constrained. While funds have lifted net exposures modestly YTD, gross exposure currently registers at the highest level on record.

Exhibit 7: Hedge fund gross and net leverage

Aggregated data from Goldman Sachs Prime Services as of 16-Nov-23; should not be relied upon as a comprehensive view of the market

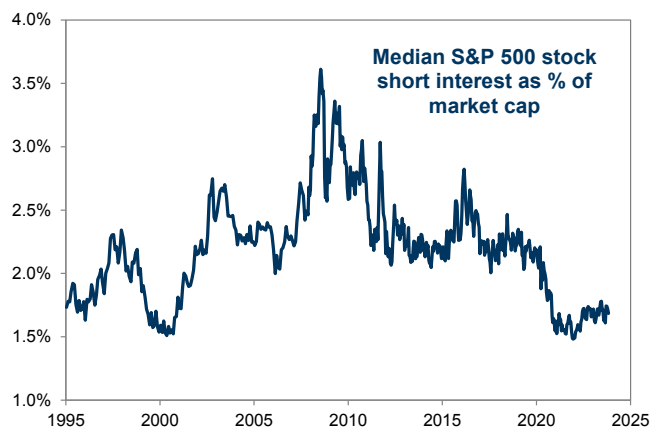


Source: Goldman Sachs Prime Services, Goldman Sachs Global Investment Research

Despite record hedge fund gross exposures, short interest for the typical stock remains close to historical lows.

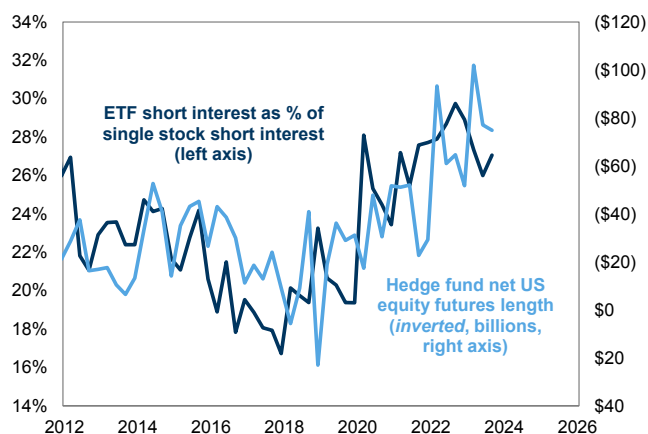
The median S&P 500 stock carries short interest equal to 1.7% of market cap, only modestly above the record low of 1.5% reached last year and in 2000. Rising ETF short interest and large hedge fund short positions in equity futures indicate that funds have increasingly relied on 'macro' products as hedges in lieu of individual stock shorts.

Exhibit 8: Short interest for the typical stock remains low vs. history



Source: FactSet, Goldman Sachs Global Investment Research

Exhibit 9: Funds have increasingly used macro products as shorts



Source: CFTC, Goldman Sachs Global Investment Research

The exhibits below show the stocks with the largest changes in short interest

since the recent market high at the end of July. We screen for Russell 3000 stocks with market caps over \$5 billion for changes in short interest between the end of July 2023 and the most recent available short interest data, which reflect positions at the beginning of November. For stocks with the highest level of short interest, rather than recent changes, see [Exhibit 52](#) in Appendix A.

Exhibit 10: Stocks with largest increases in short interest since end of July

Russell 3000 stocks with market caps over \$5 billion

Company name	Ticker	Industry group	Mkt cap (bn)	Total return		Short interest % of float	
				YTD	Since July	Latest (31-Oct)	Change since end of July
RTX Corp.	RTX	Aerospace & Defense	\$115	(19)%	(8)%	8 %	7 pp
Apellis Pharmaceuticals, Inc.	APLS	Biotechnology	6	(5)	91	17	7
American Airlines Group Inc.	AAL	Passenger Airlines	8	(3)	(27)	16	6
U-Haul Holding Company	UHAL	Ground Transportation	11	(8)	(9)	25	5
Floor & Decor Holdings, Inc.	FND	Specialty Retail	10	29	(22)	17	5
Norwegian Cruise Line Holdings Ltd.	NCLH	Hotels Restaurants & Leisure	6	22	(32)	13	5
Permian Resources Corporation	PR	Oil Gas & Consumable Fuels	7	46	15	18	4
Tractor Supply Company	TSCO	Specialty Retail	22	(9)	(9)	11	4
Chesapeake Energy Corporation	CHK	Oil Gas & Consumable Fuels	11	(10)	(2)	13	4
Hyatt Hotels Corporation	H	Hotels Restaurants & Leisure	12	28	(9)	12	4
Weatherford International plc	WFRD	Energy Equipment & Services	7	83	12	6	4
Affirm Holdings, Inc.	AFRM	Financial Services	7	156	28	20	4
Lululemon Athletica Inc	LULU	Textiles Apparel & Luxury Goods	53	32	12	5	4
Brunswick Corporation	BC	Leisure Products	5	9	(10)	8	3
DaVita Inc.	DVA	Health Care Providers & Services	9	29	(6)	6	3
Cleveland-Cliffs Inc	CLF	Metals & Mining	9	5	(4)	9	3
ResMed Inc.	RMD	Health Care Equipment & Supplies	22	(28)	(33)	4	3
Civitas Resources, Inc.	CIVI	Oil Gas & Consumable Fuels	7	31	(5)	10	3
Expedia Group, Inc.	EXPE	Hotels Restaurants & Leisure	19	56	11	6	3
Sirius XM Holdings, Inc.	SIRI	Media	20	(11)	1	27	3

Source: FactSet, Goldman Sachs Global Investment Research

Exhibit 11: Stocks with largest decreases in short interest since end of July

Russell 3000 stocks with market caps over \$5 billion

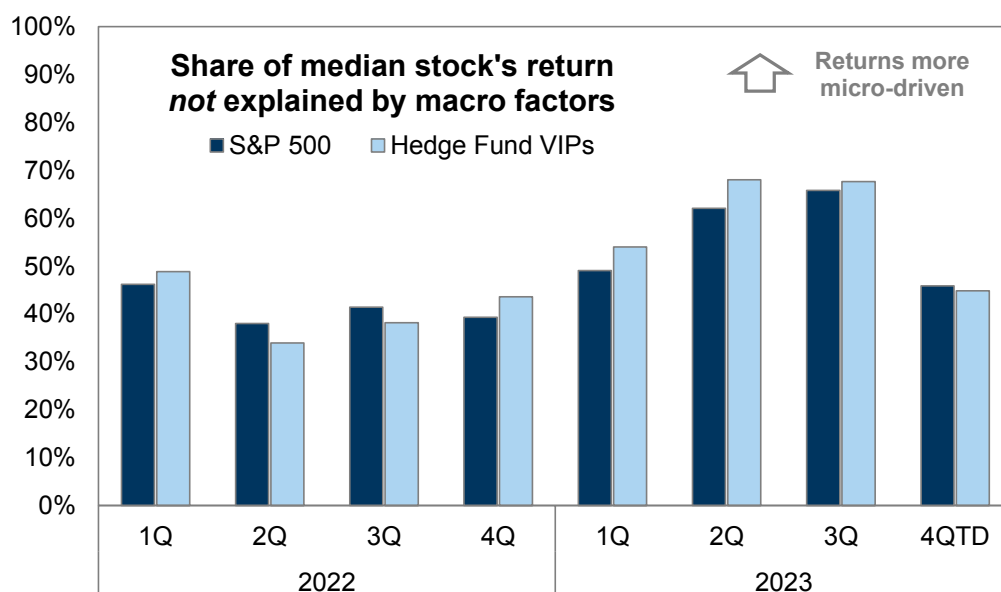
Company name	Ticker	Industry group	Mkt cap (bn)	Total return		Short interest % of float	
				YTD	Since July	Latest (31-Oct)	Change since end of July
Lucid Group, Inc.	LCID	Automobiles	\$10	(38)%	(44)%	28 %	(18)pp
Fluor Corporation	FLR	Construction & Engineering	7	10	23	4	(7)
Globus Medical Inc	GMED	Health Care Equipment & Supplies	6	(39)	(24)	3	(5)
Saia, Inc.	SAIA	Ground Transportation	11	99	(2)	6	(5)
Jefferies Financial Group Inc.	JEF	Capital Markets	7	11	(3)	2	(4)
Freshworks, Inc.	FRSH	Software	5	26	(1)	7	(4)
Zions Bancorporation, N.A.	ZION	Banks	5	(23)	(3)	7	(4)
World Wrestling Entertainment, Inc.	WWE	Entertainment	7	20	(22)	10	(3)
Murphy USA, Inc.	MUSA	Specialty Retail	8	30	18	7	(3)
Ovintiv Inc	OVV	Oil Gas & Consumable Fuels	12	(9)	(2)	3	(3)
Western Alliance Bancorp	WAL	Banks	5	(14)	(4)	5	(3)
Allegro MicroSystems, Inc.	ALGM	Semiconductors & Semiconductor Equipment	5	(7)	(46)	7	(3)
Wayfair, Inc.	W	Specialty Retail	6	43	(39)	28	(3)
MarketAxess Holdings Inc.	MKTX	Capital Markets	9	(17)	(15)	3	(3)
Verisk Analytics Inc	VRSK	Professional Services	34	35	4	2	(2)
Rexford Industrial Realty, Inc.	REXR	Industrial REITs	10	(12)	(14)	3	(2)
United States Steel Corporation	X	Metals & Mining	8	37	35	6	(2)
Dick's Sporting Goods, Inc.	DKS	Specialty Retail	10	0	(16)	10	(2)
Texas Roadhouse, Inc.	TXRH	Hotels Restaurants & Leisure	7	24	(0)	3	(2)
Comerica Incorporated	CMA	Banks	6	(29)	(15)	5	(2)

Source: FactSet, Goldman Sachs Global Investment Research

Macro vs. micro returns

The recent trend toward increasingly micro-driven stock returns has reversed so far in 4Q 2023. Since mid-2022, the alpha generation environment for stock-pickers had consistently improved, helping explain the large coincident increase in hedge fund gross exposures as funds focused on alpha over beta. Earlier in 2023, stock returns had become more micro-driven than they had been since late 2017. However, that dynamic has reversed so far in 4Q, with the macro portion of stock returns increasing.

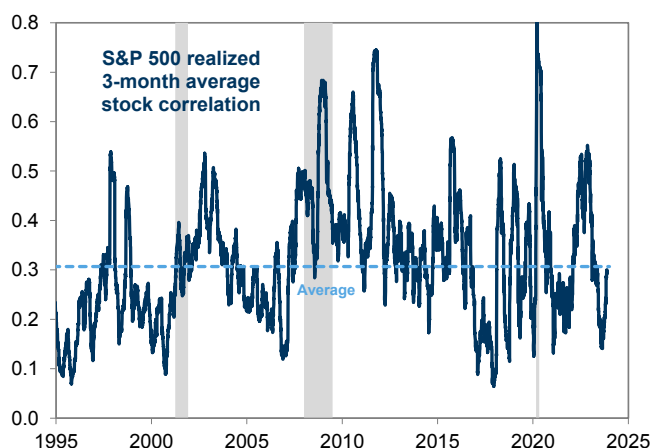
Exhibit 12: The trend toward increasingly micro-driven stock returns has reversed QTD



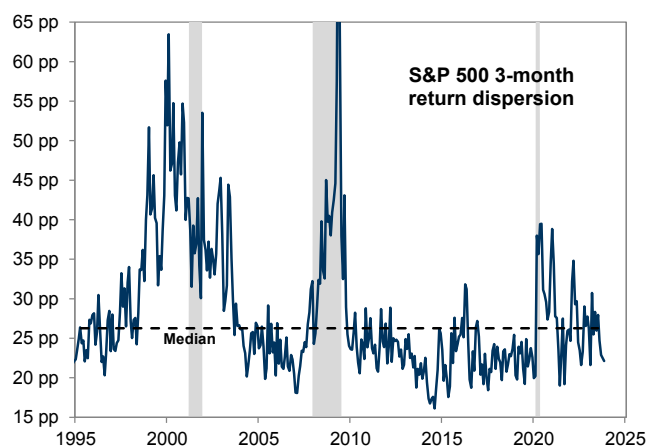
Macro share of returns calculated as the R-squared value of a linear regression of individual stock daily returns on a set of macro drivers including equal-weight S&P 500 returns and interest rates, among others.

Source: Goldman Sachs Global Investment Research

Rising stock correlations and falling return dispersion also reflect the increasingly challenging stock-picking environment. S&P 500 average stock correlations had declined sharply for most of this year before rising back to long-term average levels in recent months. Likewise, return dispersion — measured as the cross-sectional distribution of returns across S&P 500 stocks — had registered above-average levels earlier this year, indicating a favorable environment for alpha generation, before recently declining.

Exhibit 13: S&P 500 average realized stock correlation has recently risen

Source: Goldman Sachs Global Investment Research

Exhibit 14: Falling dispersion narrows the alpha opportunity for stock-pickers

Source: Goldman Sachs Global Investment Research

For investors looking for alpha opportunity, [Exhibit 15](#) shows “controversial” stocks ranking in the top 20% of stocks both in terms of hedge fund long position popularity and short interest relative to market cap.

Exhibit 15: Stocks with market caps > \$2 billion that rank highly on both hedge fund popularity and short interest

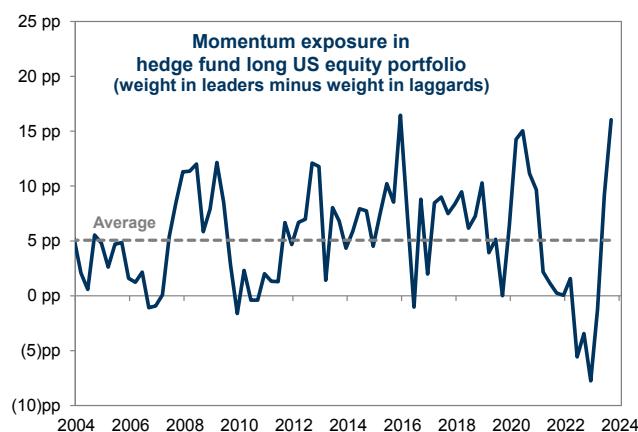
Company	Ticker	Subsector	Mkt cap (bn)	YTD return	US hedge fund ownership		Short int as % of mkt cap
					% of cap owned	# of owners	
Lyft, Inc.	LYFT	Passenger Ground Transportation	\$4	1 %	19 %	56	13 %
RH	RH	Homefurnishing Retail	5	32	17	56	12
Wayfair, Inc.	W	Homefurnishing Retail	6	114	25	51	22
Advance Auto Parts, Inc.	AAP	Automotive Retail	3	(52)	18	50	10
American Airlines Group Inc.	AAL	Passenger Airlines	8	18	11	48	14
Insmet Incorporated	INSM	Biotechnology	4	9	17	48	11
Group 1 Automotive, Inc.	GPI	Automotive Retail	4	47	16	44	14
Chewy, Inc.	CHWY	Other Specialty Retail	9	(26)	12	43	15
Confluent Inc	CFLT	Application Software	6	45	17	42	17
Transocean Ltd.	RIG	Oil & Gas Drilling	5	80	14	42	14
Crinetics Pharmaceuticals Inc	CRNX	Biotechnology	2	(12)	24	42	10
Abercrombie & Fitch Co.	ANF	Apparel Retail	4	89	19	41	13
Macy's, Inc.	M	Broadline Retail	4	(25)	15	41	11
Extreme Networks, Inc.	EXTR	Communications Equipment	2	54	17	40	17
Pacific Biosciences of California, Inc.	PACB	Life Sciences Tools & Services	2	27	12	40	10
Carvana Co.	CVNA	Automotive Retail	4	727	31	38	23
Madrigal Pharmaceuticals, Inc.	MDGL	Biotechnology	3	(38)	30	38	14
PENN Entertainment, Inc.	PENN	Casinos & Gaming	4	(23)	19	38	12
Array Technologies Inc	ARRY	Electrical Components & Equipment	2	9	16	37	14
Cytokinetics, Incorporated	CYTK	Biotechnology	3	(29)	13	35	15

Source: FactSet, Goldman Sachs Global Investment Research

Thematic and factor rotations: Momentum, Magnificent 7, and small-caps

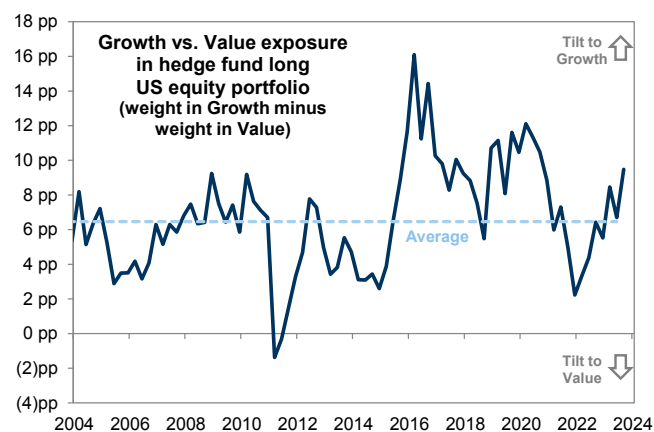
Hedge fund long portfolios have reached a near-record tilt toward Momentum as a factor. Funds maintained their large positions in tech and other secular growth favorites during 2022 despite the sharp underperformance of those stocks, giving portfolios a record anti-Momentum tilt last year. This year, as those stocks have retaken market leadership, portfolios have grown increasingly exposed to Momentum. Likewise, the hedge fund long portfolio tilt to Growth vs. Value has climbed in recent quarters to the highest level since late 2020.

Exhibit 16: Fund portfolios have rarely been more tilted toward Momentum



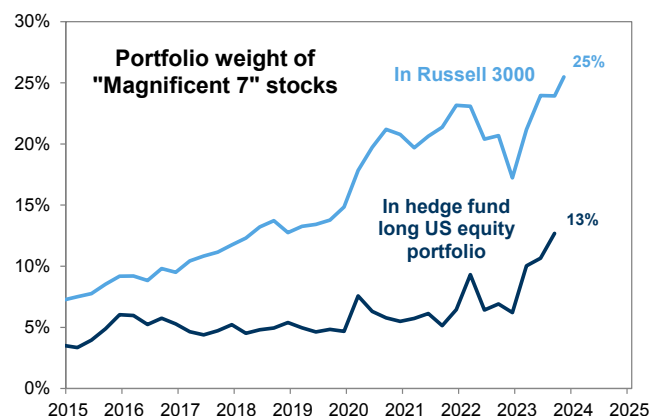
Source: Goldman Sachs Global Investment Research

Exhibit 17: Hedge fund portfolios continued to rotate toward Growth during 3Q

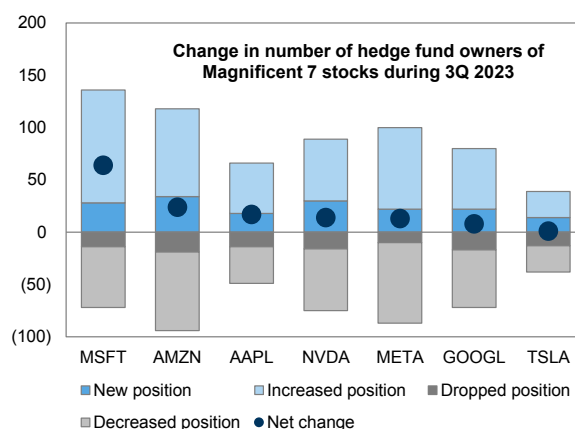


Source: Goldman Sachs Global Investment Research

Funds bought mega-cap tech as the stocks stalled during 3Q, lifting the portfolio weights of the “Magnificent 7” to double their weight at the start of 2023. The “Magnificent 7” mega-cap tech stocks (AAPL, AMZN, GOOGL, META, MSFT, NVDA, and TSLA) account for 13% of the US hedge fund long equity portfolio, with all of the stocks but TSLA ranking among the top 10 constituents of our Hedge Fund VIP list. Likewise, according to GS Prime Services, hedge fund net exposures in these stocks currently rank in the 99th percentile since 2016, compared with just a 12th percentile position at the start of 2023. However, this 13% long portfolio weight is only half the weight accounted for by the seven stocks in the Russell 3000 index (25%). Similarly, while hedge funds carry a 20% net weight in the Info Tech sector, relative to the Russell 3000 this equates to a large underweight tilt (Exhibit 27).

Exhibit 18: The weight of mega-cap tech stocks in hedge fund long portfolios has doubled YTD

Source: Goldman Sachs Global Investment Research

Exhibit 19: Hedge funds added to positions in mega-cap tech stocks during 3Q

Source: Goldman Sachs Global Investment Research

Hedge fund portfolio rotations during 3Q also reflected a focus on GLP-1 drugs.

While AI optimism helped boost hedge fund ownership of the mega-cap tech stocks, GLP-1 enthusiasm lifted LLY to the top of our Rising Stars list of stocks with the largest increase in hedge fund popularity ([Exhibit 43](#)). LLY also remains a member of our Hedge Fund VIP list of the most popular long positions, its third consecutive quarter on the list. However, some positions indicated an expectation of mean-reversion in the GLP-1 trade. ABT and PODD, both members of our Global Banking & Markets division's GLP-1 "At Risk" basket, also ranked as Rising Stars after declining during 3Q. In contrast, BSX, another member of the "At Risk" basket, landed on the Falling Stars list this quarter.

Exhibit 20: AI and GLP-1 themes have captured market focus this year

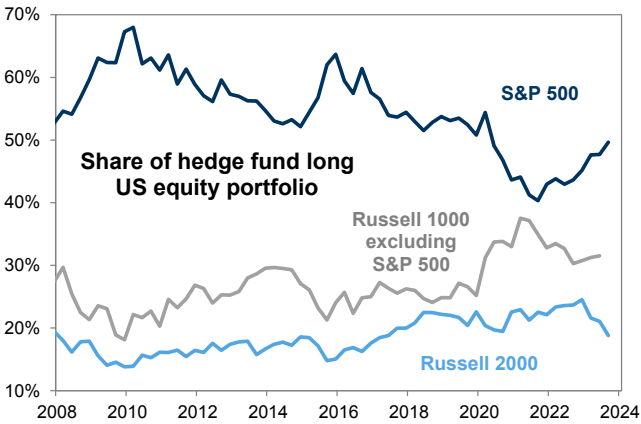
AI basket pair = GSTMTAIP Index; GLP-1 basket pair = GSPUGLPP Index



Source: Goldman Sachs Global Banking & Markets, Goldman Sachs Global Investment Research

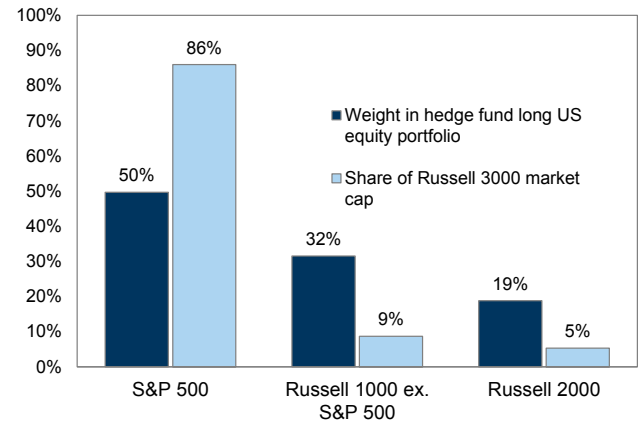
Widespread hedge fund ownership of mega-caps and their recent outperformance has shifted the composition of hedge fund portfolios in favor of large stocks. At the start of 2023, Russell 2000 constituents accounted for 25% of hedge fund long portfolios, but that share registered 19% at the start of 4Q. Nonetheless, funds remain relatively concentrated in mid- and small-caps compared to their shares of overall equity market capitalization.

Exhibit 21: Small-cap weight in hedge fund portfolios has declined as large stocks have outperformed



Source: Goldman Sachs Global Investment Research

Exhibit 22: Hedge funds remain concentrated in small stocks compared to the market



Source: FactSet, Goldman Sachs Global Investment Research

Concentration, crowding, and turnover

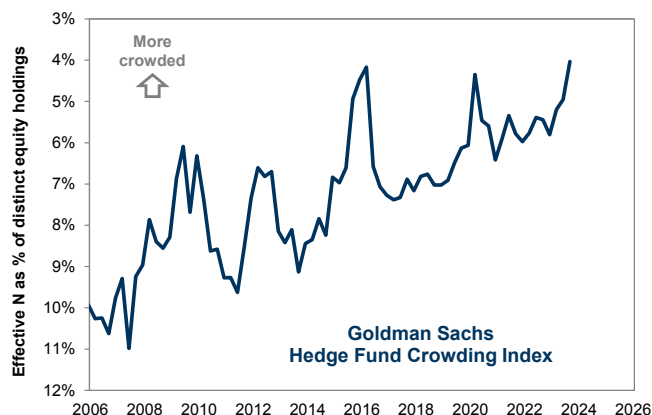
Concentration within the typical hedge fund portfolio and crowding across fund portfolios both increased during 3Q 2023. The typical hedge fund holds 70% of its long portfolio in its top 10 positions, matching the highest concentration on record outside of 4Q 2018. Our Hedge Fund Crowding Index¹ registered the most crowding across hedge fund long portfolios in our 22-year data history.

Exhibit 23: Hedge fund portfolio density increased
holdings as of September 30, 2023



Source: Goldman Sachs Global Investment Research

Exhibit 24: Crowding across hedge funds increased in 3Q
holdings as of September 30, 2023



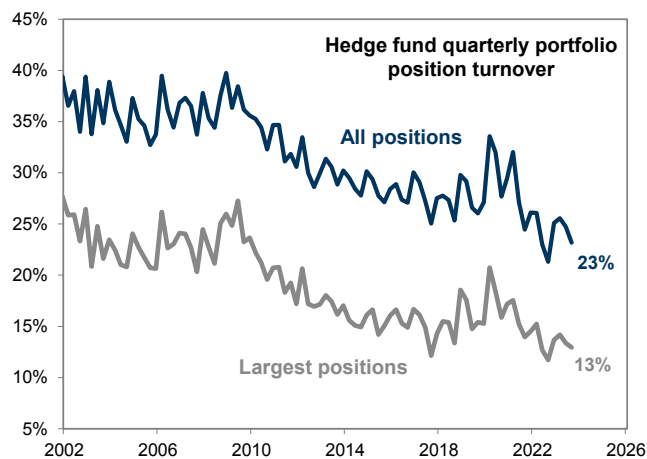
Source: Goldman Sachs Global Investment Research

Portfolio position turnover declined last quarter. During 3Q, the average fund turned over 23% of its distinct equity positions and 13% of the largest quartile of positions. Turnover varied across sectors, dipping the most in Health Care and Financials while increasing in Consumer Staples and Utilities.

¹ Hedge Fund Crowding Index is measured as the effective N (calculated as $1/\sum(\text{weight}^2)$) divided by the number of distinct equities in the aggregate portfolio of hedge funds with between 10 and 200 individual equity positions.

Exhibit 25: Portfolio turnover decreased in 3Q

holdings as of September 30, 2023



Source: Goldman Sachs Global Investment Research

Exhibit 26: Portfolio position turnover varied across sectors

holdings as of September 30, 2023

Hedge fund turnover by sector		
Sector	3Q 2023	Change vs. 2Q 2023
Consumer Staples	21 %	2 pp
Utilities	22	2
Comm Services	21	1
Energy	22	0
Real Estate	19	0
Industrials	23	(1)
Consumer Discretionary	24	(1)
Information Technology	23	(1)
Materials	20	(2)
Financials	18	(3)
Health Care	23	(4)
Total	23 %	(2)pp

Source: Goldman Sachs Global Investment Research

Sector positions

Info Tech remained the largest hedge fund net sector weight at the start of 4Q, capturing 20% of total net exposure, but nonetheless registered the largest “underweight” relative to the Russell 3000 (-486 bp). Health Care remained the largest overweight (+660 bp). Hedge fund and mutual fund sector tilts are generally in the same directions, with Energy and Financials the exceptions: Mutual funds are overweight both sectors versus their benchmarks while hedge funds are underweight relative to the Russell 3000.

Exhibit 27: Hedge fund sector allocations relative to the Russell 3000 and large-cap mutual funds
holdings as of September 30, 2023

Sector	Aggregate hedge fund asset allocation				vs. Russell 3000		Mutual funds
	Long portfolio (\$1.6 tn)	Short portfolio (\$797 bn)	Allocation difference	Net weight	Russell 3000 weight	Hedge fund net tilt	Aggregate large-cap fund tilt
Health Care	16.5 %	13.6 %	287 bp	19.4 %	12.8 %	660 bp	171 bp
Industrials	11.6	10.9	74	12.3	9.7	270	148
Comm Services	8.8	6.8	206	10.9	8.5	233	75
Materials	3.8	3.1	66	4.4	2.7	169	41
Consumer Discretionary	13.1	15.7	(257)	10.6	11.2	(58)	(47)
Utilities	1.9	2.3	(33)	1.6	2.2	(61)	(27)
Energy	5.1	6.2	(116)	3.9	4.6	(73)	82
Real Estate	2.5	4.0	(142)	1.1	2.7	(160)	(116)
Consumer Staples	4.7	5.2	(50)	4.2	6.5	(231)	(94)
Financials	11.5	11.9	(43)	11.0	13.7	(264)	101
Information Technology	20.4	20.3	8	20.5	25.3	(486)	(335)
Total	100.0	100.0	0	100.0	100.0	0	0

Source: FactSet, Goldman Sachs Global Investment Research

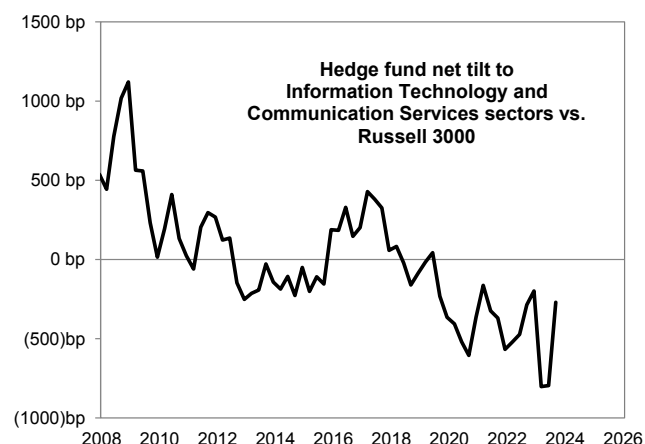
Hedge funds rotated sharply toward the Tech sector during 3Q. Funds increased their net tilt to Info Tech by 489 bp, the largest change of any sector, reducing their underweight tilt from nearly the largest on record in mid-2023 to roughly the average tilt of the last few years. In contrast, hedge funds chopped exposure to Energy (-167 bp), Health Care (-160 bp), and Industrials (-132 bp).

Exhibit 28: Changes in hedge fund sector tilts during 3Q
excludes ETF positions

Hedge fund net sector tilts vs. Russell 3000				
Sector	Latest filings	Previous quarter	Change	YTD return
Info Tech	(458)bp	(948)bp	489 bp	50 %
Comm Services	188	152	36	49
Consumer Discretionary	(58)	(88)	30	33
Real Estate	(141)	(161)	20	(0)
Utilities	(46)	(49)	3	(10)
Consumer Staples	(214)	(207)	(7)	(3)
Materials	151	199	(48)	4
Financials	(231)	(167)	(65)	3
Industrials	233	364	(132)	8
Health Care	614	775	(160)	(5)
Energy	(37)	130	(167)	(1)
<i>Total</i>	<i>0 bp</i>	<i>0 bp</i>	<i>0 bp</i>	<i>19 %</i>

Source: FactSet, Goldman Sachs Global Investment Research

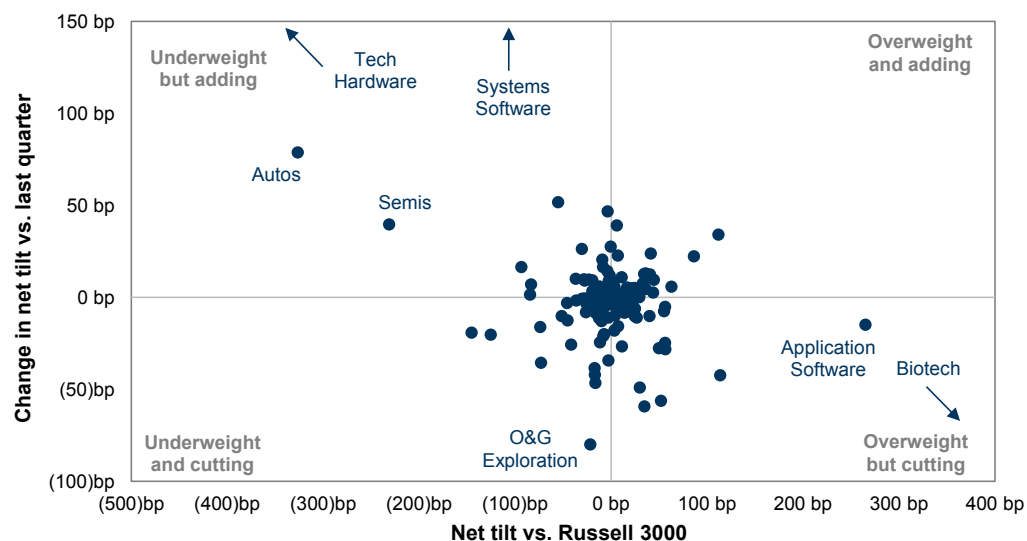
Exhibit 29: Funds added to tech during 3Q
holdings as of September 30, 2023



Source: FactSet, Goldman Sachs Global Investment Research

Within Info Tech, hedge funds became incrementally more overweight relative to the Russell 3000 in 9 of 12 subsectors. The largest increases were in Systems Software and Tech Hardware, driven by MSFT and AAPL as those stocks each dipped by about 10% during 3Q. For the largest changes within Info Tech at the stock level, see [Exhibit 31](#) below, which compares the number of funds establishing new positions or adding to existing positions in each stock versus the number of funds trimming or dropping their positions altogether.

Exhibit 30: Subsector tilts and changes in tilts
holdings as of September 30, 2023



Source: FactSet, Goldman Sachs Global Investment Research

Exhibit 31: Info Tech stocks with the largest net increase in hedge fund popularity last quarter

holdings as of September 30, 2023

Most popular Info Tech increases during 3Q 2023 based on # of funds changing portfolio allocations

Ticker	Name	Subsector	New position	Increased position	Decreased position	Dropped position	Increase - decrease
MSFT	Microsoft Corporation	Systems Software	28	108	58	14	64
TEL	TE Connectivity Ltd.	Electronic Manufacturing Services	23	22	8	7	30
FIVN	Five9, Inc.	Application Software	18	25	10	8	25
HCP	HashiCorp, Inc.	Application Software	20	13	6	3	24
AYX	Alteryx, Inc.	Application Software	22	25	11	14	22
NTGR	NETGEAR, Inc.	Communications Equipment	11	17	3	3	22
DOX	Amdocs Limited	IT Consulting & Other Services	14	19	4	8	21
SLAB	Silicon Laboratories Inc.	Semiconductors	16	16	5	6	21
KLAC	KLA Corporation	Semiconductor Materials & Equipment	17	26	16	7	20
OLO	Olo, Inc.	Application Software	9	16	4	2	19
CSCO	Cisco Systems, Inc.	Communications Equipment	16	28	19	7	18
VMW	VMware, Inc.	Systems Software	20	31	23	10	18
AAPL	Apple Inc.	Technology Hardware Storage & Peripherals	18	48	35	14	17
AVT	Avnet, Inc.	Technology Distributors	15	15	5	8	17
CLS	Celestica Inc.	Electronic Manufacturing Services	17	13	9	4	17

Source: FactSet, Goldman Sachs Global Investment Research

In contrast, hedge funds cut exposure in 6 of 7 Energy subsectors. Integrated Oil & Gas was the sole exception as funds increased exposure to BP and SU. See [Exhibit 32](#) for a list of Energy stocks with the largest net decrease in hedge fund popularity.

Exhibit 32: Energy stocks with the largest net decrease in hedge fund popularity last quarter

holdings as of September 30, 2023

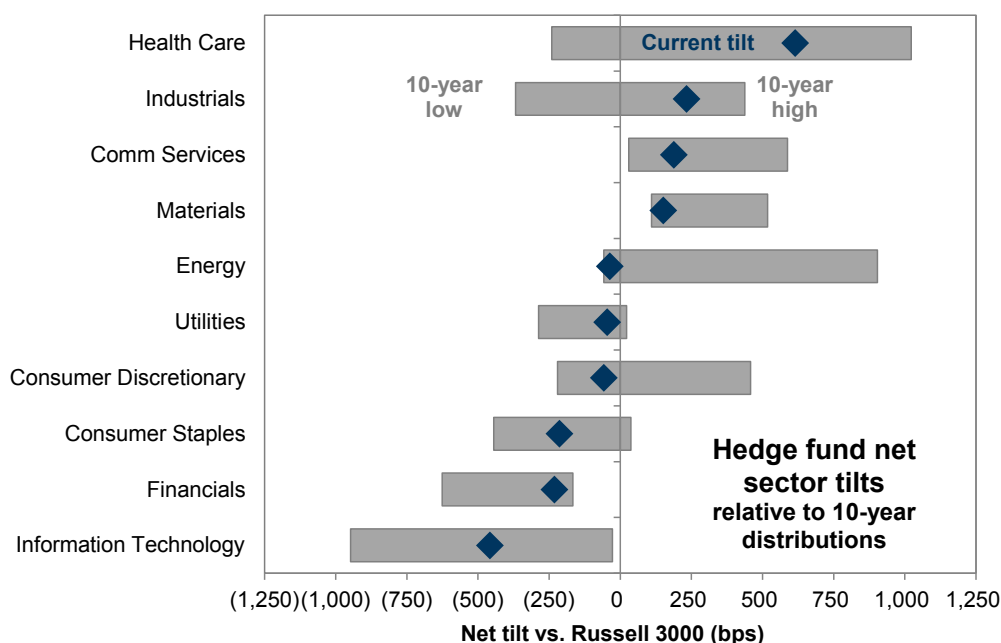
Most popular Energy decreases during 3Q 2023 based on # of funds changing portfolio allocations

Ticker	Name	Subsector	New position	Increased position	Decreased position	Dropped position	Increase - decrease
SLB	Schlumberger N.V.	Oil & Gas Equipment & Services	13	16	23	25	(19)
INSW	International Seaways, Inc.	Oil & Gas Storage & Transportation	6	2	16	10	(18)
CEIX	CONSOL Energy Inc	Coal & Consumable Fuels	6	6	16	14	(18)
ASC	Ardmore Shipping Corp.	Oil & Gas Storage & Transportation	4	1	12	7	(14)
MRO	Marathon Oil Corporation	Oil & Gas Exploration & Production	8	21	32	10	(13)
CVX	Chevron Corporation	Integrated Oil & Gas	10	22	24	21	(13)
TRGP	Targa Resources Corp.	Oil & Gas Storage & Transportation	12	13	24	13	(12)
DTM	DT Midstream, Inc.	Oil & Gas Storage & Transportation	3	5	11	9	(12)
COP	ConocoPhillips	Oil & Gas Exploration & Production	10	22	28	16	(12)
CIVI	Civitas Resources, Inc.	Oil & Gas Exploration & Production	8	6	13	13	(12)
RRC	Range Resources Corporation	Oil & Gas Exploration & Production	5	6	11	11	(11)
LNG	Cheniere Energy, Inc.	Oil & Gas Storage & Transportation	7	18	24	12	(11)
KOS	Kosmos Energy Ltd.	Oil & Gas Exploration & Production	4	7	9	13	(11)
EQT	EQT Corporation	Oil & Gas Exploration & Production	10	17	22	16	(11)
OXY	Occidental Petroleum Corporation	Integrated Oil & Gas	10	23	19	24	(10)

Source: FactSet, Goldman Sachs Global Investment Research

Hedge funds entered 4Q with nearly their smallest net tilt to Energy since 2007. At the other end of the distribution, while Financials is a large underweight, the tilt in that sector ranks in the 92nd percentile vs. the past decade.

Exhibit 33: Hedge fund net sector tilts relative to past decade
 holdings as of September 30, 2023; excludes ETF positions



Source: FactSet, Goldman Sachs Global Investment Research

Exhibit 34: Estimated hedge fund long, short, and net exposure, by sector (\$ in billions)
 holdings as of September 30, 2023

	+ ← Overweight / Underweight → -											
	Health Care	Industrials	Comm Services	Materials	Consumer Discretionary	Utilities	Energy	Real Estate	Consumer Staples	Financials	Information Technology	TOTAL
LONG												
Stock Positions	\$260	\$184	\$139	\$59	\$208	\$30	\$79	\$40	\$73	\$179	\$319	\$1,581
ETF Positions	4	2	2	1	3	1	2	1	2	4	7	30
Hedge Fund LONG	\$264	\$186	\$141	\$61	\$210	\$31	\$81	\$41	\$75	\$183	\$326	\$1,611
SHORT												
Stock Positions	\$90	\$76	\$45	\$21	\$112	\$14	\$40	\$28	\$34	\$77	\$132	\$669
ETF Positions	19	11	9	4	13	4	9	4	8	18	30	128
Estimated SHORT	\$109	\$87	\$54	\$25	\$125	\$18	\$50	\$32	\$42	\$95	\$162	\$797
EXPOSURE												
Gross	\$373	\$272	\$195	\$86	\$336	\$49	\$131	\$72	\$117	\$278	\$488	\$2,408
Net	156	99	87	36	85	13	31	9	34	89	164	814
% Net Long (Net/Long)	59 %	53 %	62 %	59 %	40 %	42 %	39 %	22 %	45 %	48 %	50 %	51 %
Net Sector Weighting (%)												
Hedge Fund Net Exposure	19 %	12 %	11 %	4 %	11 %	2 %	4 %	1 %	4 %	11 %	20 %	100 %
Russell 3000	13	10	9	3	11	2	5	3	7	14	25	100
Over/(Under)weight	660 bp	270 bp	233 bp	169 bp	(58)bp	(61)bp	(73)bp	(160)bp	(231)bp	(264)bp	(486)bp	

Source: FactSet, Goldman Sachs Global Investment Research

The Hedge Fund VIP List: “The stocks that matter most”

Our Hedge Fund VIP list (ticker: GSTHHVIP) contains the top long positions of fundamentally-driven hedge funds. These “stocks that matter most” are the positions that appear most frequently among the top 10 holdings within hedge fund portfolios. For this analysis, we limit our universe to hedge funds with 10 to 200 distinct equity positions in an attempt to isolate fundamentally-driven investors from quantitative funds or funds that mirror private equity investments.

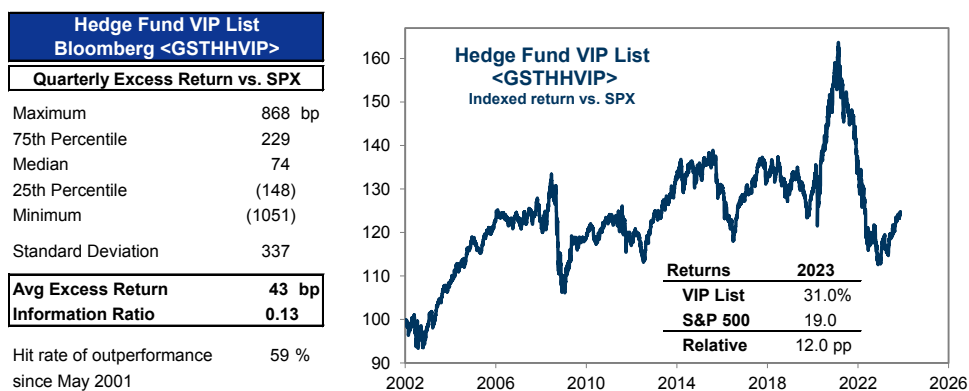
From an implementation standpoint, the Hedge Fund VIP list represents a tool for investors seeking to “follow the smart money” based on 13-F filings. By construction, the VIP list identifies the 50 stocks whose performance will largely influence the long side of many fundamentally driven hedge funds.

The Hedge Fund VIP basket has outperformed the S&P 500 YTD (+31% vs. +19%) and has outperformed the S&P 500 in 59% of quarters since 2001. The basket has been a strong historical performer at the cost of high volatility. The outperformance this year is a reversal from 2021 and 2022, when the basket underperformed the S&P 500 by 30 pp.

Our Hedge Fund VIP basket is not sector-neutral to the S&P 500. The VIP list contains stocks from 10 of the 11 sectors, with Real Estate absent. Information Technology (24%) represents the largest weight in the basket.

Turnover for the basket during 3Q 2023 was around the historical average, with 14 new stocks entering the list (28%). **New constituents** are listed in bold in [Exhibit 36](#).

Exhibit 35: Hedge fund VIPs have outperformed by 43 bp on average each quarter since 2001 (90 quarters) as of November 15, 2023



Source: Goldman Sachs Global Investment Research

GSTHHVIP: The 50 stocks that matter most to hedge funds

Exhibit 36: Very Important Positions (VIP) for hedge funds

new stocks in basket listed in bold; holdings as of September 30, 2023; pricing as of November 14, 2023; based on 554 funds with 10-200 distinct US equity positions

50 stocks that most frequently appear among the largest 10 holdings of hedge funds

Company	Ticker	Sub-sector	Equity cap (\$ bn)	No. of funds with 10 to 200 positions owning stock 30-Sep-23	No. of funds with stock as top 10 holding 30-Sep-23	Average portfolio weight when stock ranks among top 10 holdings	% of equity cap owned by hedge funds 30-Sep-23	Total return YTD
Microsoft Corp.	MSFT	Systems Software	\$2,751	154	111	8 %	2 %	55 %
Amazon.com Inc.	AMZN	Broadline Retail	1,504	156	97	8	2	74
Meta Platforms Inc.	META	Interactive Media & Services	747	126	83	8	4	179
Alphabet Inc.	GOOGL	Interactive Media & Services	1,579	106	51	6	2	51
NVIDIA Corp.	NVDA	Semiconductors	1,227	88	47	9	2	240
Uber Technologies	UBER	Passenger Ground Transportation	110	74	40	8	7	118
Apple Inc.	AAPL	Technology Hardware Storage & Peripherals	2,930	61	36	7	1	45
Seagen Inc.	SGEN	Biotechnology	40	37	27	10	42	66
Visa Inc.	V	Transaction & Payment Processing Services	397	64	25	7	3	20
Advanced Micro Devices	AMD	Semiconductors	194	53	24	6	3	85
VMware, Inc.	VMW	Systems Software	65	37	23	10	7	21
Mastercard Inc.	MA	Transaction & Payment Processing Services	372	55	20	9	2	15
Salesforce Inc.	CRM	Application Software	215	48	18	6	4	67
Broadcom Inc.	AVGO	Semiconductors	402	28	17	4	1	77
MercadoLibre Inc.	MELI	Broadline Retail	72	24	17	5	3	69
Alibaba Group Hldg (ADR)	BABA	Broadline Retail	214	51	16	6	1	(5)
Berkshire Hathaway	BRK.B	Multi-Sector Holdings	769	42	16	9	1	15
First Citizens BancShares	FCNCA	Diversified Banks	21	28	16	6	12	89
Netflix Inc.	NFLX	Movies & Entertainment	199	45	16	7	3	52
Eli Lilly & Co.	LLY	Pharmaceuticals	580	38	15	5	1	69
Kenvue Inc.	KVUE	Personal Care Products	37	38	15	5	8	NM
Apollo Global Mgmt	APO	Diversified Financial Services	50	29	14	6	5	40
UnitedHealth Group	UNH	Managed Health Care	501	34	14	4	1	3
Vertiv Holdings Co.	VRT	Electrical Components & Equipment	16	26	14	7	19	219
Splunk Inc.	SPLK	Application Software	25	29	13	6	10	76
TransDigm Group	TDG	Aerospace & Defense	55	31	13	10	12	58
EQT Corp.	EQT	Oil & Gas Exploration & Production	14	23	12	6	9	20
Fiserv Inc.	FI	Transaction & Payment Processing Services	74	24	12	6	5	21
GoDaddy Inc.	GDDY	Internet Services & Infrastructure	13	18	12	12	14	21
Humana Inc.	HUM	Managed Health Care	62	28	12	8	7	(1)
S&P Global Inc.	SPGI	Financial Exchanges & Data	131	28	12	8	2	21
Tenet Healthcare	THC	Health Care Facilities	6	27	12	6	25	20
AerCap Holdings	AER	Trading Companies & Distributors	14	23	11	8	15	15
Albertsons Companies	ACI	Food Retail	12	27	11	6	8	5
Caesars Entertainment	CZR	Casinos & Gaming	10	28	11	9	12	9
Datadog Inc.	DDOG	Application Software	36	34	11	5	6	48
Energy Transfer LP	ET	Oil & Gas Storage & Transportation	42	23	11	8	2	23
KKR & Co Inc.	KKR	Asset Management & Custody Banks	59	27	11	7	6	45
Palo Alto Networks	PANW	Systems Software	80	35	11	6	4	87
PayPal Holdings	PYPL	Transaction & Payment Processing Services	62	45	11	7	3	(20)
Abcam PLC Sponsored ADR	ABCM	Biotechnology	5	24	10	7	32	49
Capri Holdings Limited	CPRI	Apparel Accessories & Luxury Goods	6	25	10	4	19	(17)
Micron Technology	MU	Semiconductors	85	36	10	7	4	55
Pioneer Natural Resources	PXD	Oil & Gas Exploration & Production	55	28	10	5	4	9
Progressive Corp.	PGR	Property & Casualty Insurance	93	23	10	6	2	23
T-Mobile US Inc.	TMUS	Wireless Telecommunication Services	173	23	10	5	2	5
Vistra Corp.	VST	Independent Power Producers & Energy Traders	13	20	10	6	12	55
Cheniere Energy	LNG	Oil & Gas Storage & Transportation	41	20	9	8	4	16
CRH public limited company	CRH	Construction Materials	42	21	9	8	5	60
Chesapeake Energy	CHK	Oil & Gas Exploration & Production	11	15	8	7	11	(10)
Average			\$324	43	21	7 %	7 %	48 %
Median			63	29	13	7	4	45

Note: Constituents will reflect the new composition of the basket when it is rebalanced following the close on November 22, 2023.

Source: Solactive, FactSet, data compiled by Goldman Sachs Global Investment Research

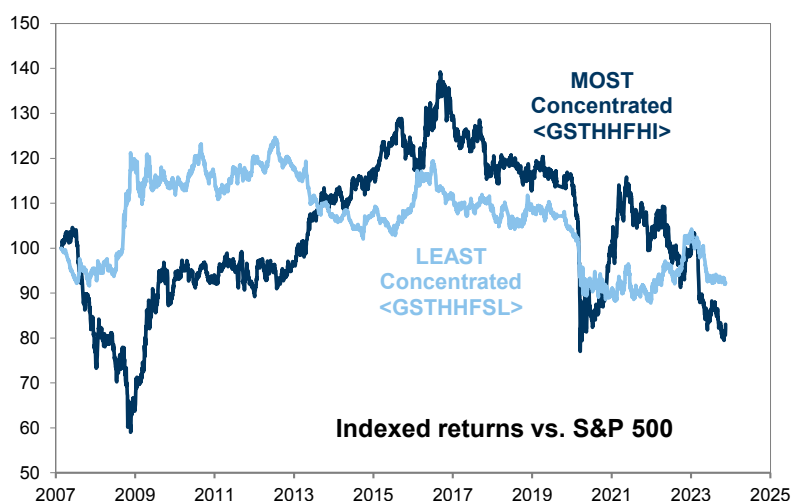
The most concentrated hedge fund positions

Since 2001, the strategy of buying the 20 most concentrated S&P 500 stocks has outperformed the broad index in 59% of quarters, with an average quarterly excess return of 134 bp per quarter. We define “concentration” as the share of market capitalization owned in aggregate by hedge funds. The High Concentration basket is not sector-neutral to the S&P 500, and the stocks tend to be mid-caps, at the lower end of the S&P 500 capitalization distribution. Hedge funds own 12% of the market cap of the average constituent in the High Concentration basket, 3% of the average S&P 500 stock, and less than 1% of the average constituent in our Low Concentration basket.

Exhibit 37: Hedge fund concentration baskets versus the S&P 500

as of November 15, 2023

Hedge Fund Concentration		
Quarterly Relative Return vs. SPX		
	"Most" (GSTHHFHI)	"Least" (GSTHHFSL)
Maximum	2,413 bp	1,225 bp
75th Percentile	529	187
Median	187	(21)
25th Percentile	(296)	(220)
Minimum	(1958)	(1052)
Standard Deviation	676	352
Avg Excess Return	134 bp	1 bp
Information Ratio	0.20	0.00
Hit rate of outperf. since May 2001	59 %	47 %



Source: Goldman Sachs Global Investment Research

The High Hedge Fund Concentration basket has underperformed the S&P 500 by 19 pp YTD and the Low Concentration basket has underperformed by 12 pp. Stocks with low hedge fund concentration often trade with low betas and outperform during periods of market stress. The Low Concentration basket outperformed by 13 pp in 2022.

Eight new High Concentration basket stocks this quarter: CZR, DLTR, HLT, SYF, TPR, TTWO, WDC, WYNN.

Exhibit 38: The most concentrated stocks have underperformed the S&P 500 by 19 pp YTD

as of November 15, 2023

Name	Bloomberg ticker	Performance		Average stock			Turnover	
		YTD	3Q 2023	% owned by hedge funds	Equity cap (\$ bil)	Beta to S&P 500	3Q 2023	Average since 2001
High Concentration	GSTHHFHI	(0)%	(6)%	12%	\$16	1.1	40 %	29 %
Low Concentration	GSTHHFSL	7	(3)	1	157	1.0	55	51
S&P 500		19	(3)	3	79	1.0		

Source: FactSet, Goldman Sachs Global Investment Research

Goldman Sachs S&P 500 hedge fund concentration baskets

Exhibit 39: The 20 S&P 500 stocks with the most concentrated hedge fund ownership <ticker: GSTHHFHI>

holdings as of September 30, 2023; pricing as of November 15, 2023; new constituents in bold

Twenty MOST CONCENTRATED hedge fund holdings in the S&P 500 (Ticker: GSTHHFHI)

Company	Ticker	Sector	Sub-sector	Equity cap (\$ bil)	Total return		% of equity cap owned by hedge funds 30-Sep-23
					During 3Q	2023 YTD	
Incyte Corp.	INCY	Health Care	Biotechnology	12	(7)%	(32)%	27%
Bath & Body Works	BBWI	Consumer Discretionary	Other Specialty Retail	7	(9)	(24)	26
Lamb Weston Holdings	LW	Consumer Staples	Packaged Foods & Meats	14	(19)	8	13
Universal Health Svc.	UHS	Health Care	Health Care Facilities	8	(20)	(5)	13
TransDigm Group	TDG	Industrials	Aerospace & Defense	55	(6)	58	12
Caesars Entertainment	CZR	Consumer Discretionary	Casinos & Gaming	10	(9)	9	12
Expedia Group Inc.	EXPE	Consumer Discretionary	Hotels Resorts & Cruise Lines	17	(6)	40	11
Invesco Ltd.	IVZ	Financials	Asset Management & Custody Banks	6	(13)	(20)	11
American Airlines Group	AAL	Industrials	Passenger Airlines	8	(29)	(4)	11
Everest Group Ltd.	EG	Financials	Reinsurance	17	9	20	11
Western Digital	WDC	Information Technology	Technology Hardware Storage & Peripherals	15	20	45	10
Hilton Worldwide Hldgs	HLT	Consumer Discretionary	Hotels Resorts & Cruise Lines	44	3	33	10
Seagate Tech Holdings	STX	Information Technology	Technology Hardware Storage & Peripherals	15	8	47	9
Tapestry Inc.	TPR	Consumer Discretionary	Apparel Accessories & Luxury Goods	7	(32)	(18)	9
Take-Two Interactive Software	TTWO	Communication Services	Interactive Home Entertainment	26	(5)	47	9
Synchrony Financial	SYF	Financials	Consumer Finance	13	(9)	(5)	9
NRG Energy Inc.	NRG	Utilities	Electric Utilities	11	4	55	9
Qorvo Inc.	QRVO	Information Technology	Semiconductors	9	(6)	4	9
Dollar Tree Inc.	DLTR	Consumer Staples	Consumer Staples Merchandise Retail	26	(26)	(17)	9
Wynn Resorts, Limited	WYNN	Consumer Discretionary	Casinos & Gaming	10	(12)	6	9
GSTHHFHI Basket (average)				16	(8)%	12 %	12%
S&P 500 (average)				79	(5)	7	3

Source: FactSet, data compiled by Goldman Sachs Global Investment Research

Exhibit 40: The 20 S&P 500 stocks with the least hedge fund concentration <ticker: GSTHHFSL>

holdings as of September 30, 2023; pricing as of November 15, 2023; new constituents in bold

Twenty LEAST CONCENTRATED hedge fund holdings in the S&P 500 (Ticker: GSTHHFSL)

Company	Ticker	Sector	Sub-sector	Equity cap (\$ bil)	Total return		% of equity cap owned by hedge funds 30-Sep-23
					During 3Q	2023 YTD	
Veralto Corp.	VLTO	Industrials	Environmental & Facilities Services	18	NM	NM	0.1%
Aflac Inc.	AFL	Financials	Life & Health Insurance	49	11	16	0.3
Accenture Plc	ACN	Information Technology	IT Consulting & Other Services	202	(0)	22	0.3
Zoetis Inc.	ZTS	Health Care	Pharmaceuticals	79	1	19	0.4
Public Service Enterprise Grp	PEG	Utilities	Multi-Utilities	32	(8)	6	0.4
Public Storage	PSA	Real Estate	Self-Storage REITs	46	(9)	(4)	0.4
Welltower Inc.	WELL	Real Estate	Health Care REITs	48	2	37	0.5
U.S. Bancorp	USB	Financials	Diversified Banks	56	2	(13)	0.5
Illinois Tool Works	ITW	Industrials	Industrial Machinery & Supplies & Components	71	(7)	9	0.5
Johnson & Johnson	JNJ	Health Care	Pharmaceuticals	356	(5)	(15)	0.6
Exxon Mobil Corp.	XOM	Energy	Integrated Oil & Gas	422	11	(2)	0.6
Atmos Energy Corp.	ATO	Utilities	Gas Utilities	17	(8)	4	0.6
Stryker Corp.	SYK	Health Care	Health Care Equipment	107	(10)	17	0.6
Tesla Inc.	TSLA	Consumer Discretionary	Automobile Manufacturers	754	(4)	93	0.6
Broadcom Inc.	AVGO	Information Technology	Semiconductors	402	(4)	77	0.6
Costco Wholesale	COST	Consumer Staples	Consumer Staples Merchandise Retail	262	5	30	0.6
Corning Inc.	GLW	Information Technology	Electronic Components	24	(12)	(9)	0.6
Prologis Inc.	PLD	Real Estate	Industrial REITs	101	(8)	(1)	0.6
Blackstone Inc.	BX	Financials	Asset Management & Custody Banks	73	16	43	0.6
Broadridge Financial Solutions	BR	Industrials	Data Processing & Outsourced Services	21	9	37	0.6
GSTHHFSL Basket (average)				157	(1)%	19 %	0.5%
S&P 500 (average)				79	(5)	7	3.4

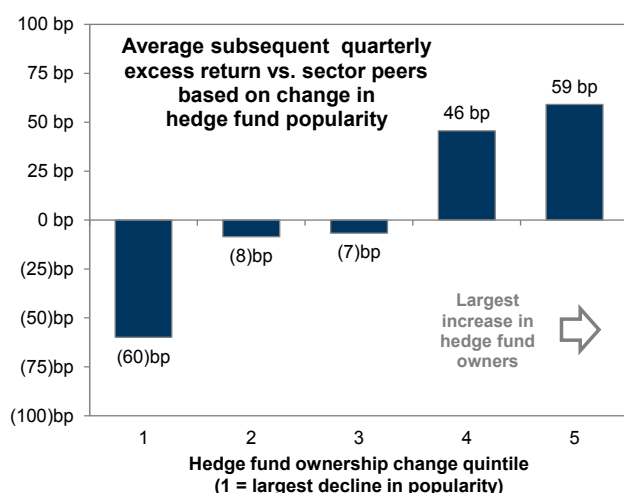
Source: FactSet, data compiled by Goldman Sachs Global Investment Research

Rising and falling stars

Changes in popularity with hedge fund investors can be strong signals for future stock performance. During the last 20 years, stocks with the largest increase in the number of hedge fund investors (“Rising Stars”) have typically gone on to outperform sector peers during the quarters following their rise in popularity. “Falling Star” stocks with the largest decline in number of owners have subsequently underperformed peers by a similar magnitude. The Rising Stars we highlighted based on last quarter’s 13-F filings have outperformed the Russell 1000 and the Falling Stars in recent months.

Exhibit 41: Change in popularity has been a signal for forward returns

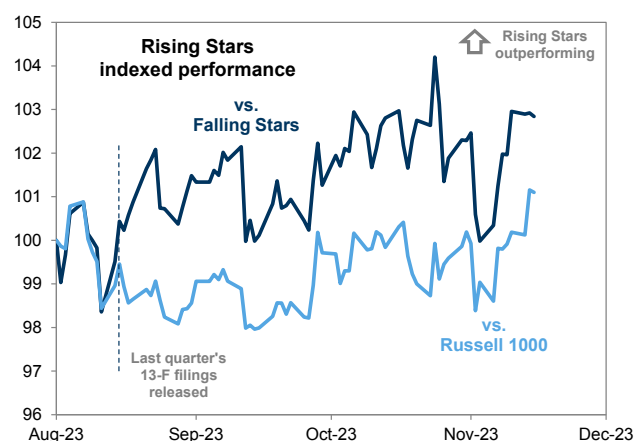
returns since 2002



Source: Goldman Sachs Global Investment Research

Exhibit 42: Last quarter’s Rising Stars have outperformed Falling Stars and the Russell 1000

as of November 15, 2023



Source: Goldman Sachs Global Investment Research

The tables below show our new lists of Rising and Falling Stars based on the most recent position filings. AMZN is the only Rising Star that was in the same list last quarter. None of the Falling Stars appeared in the same list last quarter.

Exhibit 43: Rising stars: Russell 1000 stocks with the largest increase in number of hedge fund owners during 3Q 2023

Company	Ticker	Sector	Market cap (\$bn)	Number of hedge funds owning stock		Percent of equity cap owned by hedge funds		YTD total return
				30-Sep	Chg	30-Sep	Chg	
Kenvue, Inc.	KVUE	Consumer Staples	\$38	82	48	8 %	6 pp	NA
Eli Lilly and Company	LLY	Health Care	559	101	25	1	0	62
United States Steel Corporation	X	Materials	8	62	22	19	4	38
Abbott Laboratories	ABT	Health Care	170	81	21	1	0	(9)
D.R. Horton, Inc.	DHI	Consumer Discretionary	43	70	19	5	2	44
American Water Works Company, Inc.	AWK	Utilities	25	51	18	2	(1)	(13)
Quanta Services, Inc.	PWR	Industrials	27	58	17	6	0	29
Home Depot, Inc.	HD	Consumer Discretionary	308	74	17	1	0	(0)
Splunk Inc.	SPLK	Information Technology	25	71	17	10	2	75
Capri Holdings Limited	CPRI	Consumer Discretionary	6	58	17	19	7	(16)
HashiCorp, Inc.	HCP	Information Technology	2	41	17	11	3	(24)
Cousins Properties Inc.	CUZ	Real Estate	3	35	16	11	7	(15)
HF Sinclair Corporation	DINO	Energy	10	50	16	7	2	9
Insulet Corporation	PODD	Health Care	12	55	16	6	3	(41)
Antero Resources Corporation	AR	Energy	8	58	16	10	3	(13)
Huntington Ingalls Industries, Inc.	HII	Industrials	9	40	16	4	(1)	4
Align Technology, Inc.	ALGN	Health Care	16	52	15	3	0	(3)
Willis Towers Watson plc	WTW	Financials	25	48	15	6	3	(0)
Amazon.com, Inc.	AMZN	Consumer Discretionary	1,480	228	15	2	0	70
Coherent Corp.	COHR	Information Technology	5	39	14	6	3	3
Rising star median			\$20	58	17	6 %	2 pp	(0)%

Source: FactSet, Goldman Sachs Global Investment Research

Exhibit 44: Falling stars: Russell 1000 stocks with the largest decrease in number of hedge fund owners during 3Q 2023

Company	Ticker	Sector	Market cap (\$bn)	Number of hedge funds owning stock		Percent of equity cap owned by hedge funds		YTD total return
				30-Sep	Chg	30-Sep	Chg	
Apellis Pharmaceuticals, Inc.	APLS	Health Care	\$6	27	(27)	24 %	1 pp	(6)%
Dick's Sporting Goods, Inc.	DKS	Consumer Discretionary	7	30	(21)	11	(8)	0
WillScot Mobile Mini Holdings Corp.	WSC	Industrials	7	49	(21)	12	(0)	(13)
Churchill Downs Inc.	CHDN	Consumer Discretionary	9	21	(19)	3	(1)	15
Teledyne Technologies Inc.	TDY	Information Technology	19	26	(19)	2	(1)	(2)
Global Payments Inc.	GPN	Financials	30	48	(19)	5	(1)	16
Fidelity National Information Services, Inc.	FIS	Financials	32	60	(19)	5	(3)	(17)
eBay Inc.	EBAY	Consumer Discretionary	21	33	(18)	5	(1)	(0)
Cadence Design Systems, Inc.	CDNS	Information Technology	72	57	(17)	5	(1)	65
Jacobs Solutions Inc.	J	Industrials	17	34	(17)	5	0	15
Sensata Technologies Holding PLC	ST	Industrials	5	34	(17)	7	0	(17)
Blackstone Inc.	BX	Financials	74	41	(17)	1	(1)	46
Boston Scientific Corporation	BSX	Health Care	79	65	(15)	6	1	16
BioMarin Pharmaceutical Inc.	BMRN	Health Care	16	50	(15)	11	(1)	(16)
Stericycle, Inc.	SRCL	Industrials	4	13	(15)	2	(1)	(10)
Dover Corporation	DOV	Industrials	19	31	(15)	3	0	4
Repligen Corporation	RGEN	Health Care	9	25	(15)	3	(0)	(8)
Dolby Laboratories, Inc.	DLB	Information Technology	5	25	(15)	4	(2)	27
Element Solutions Inc	ESI	Materials	5	24	(15)	7	(0)	13
Stifel Financial Corp	SF	Financials	6	28	(14)	3	(2)	9
Falling star median			\$13	32	(17)	5 %	(1)pp	2 %

Source: FactSet, Goldman Sachs Global Investment Research

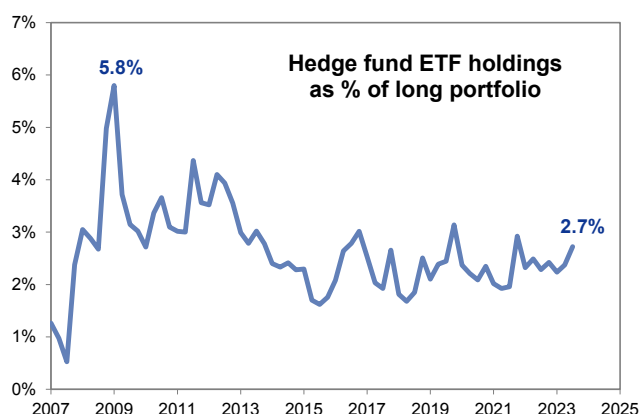
ETF ownership

The ETF share of hedge fund long portfolios increased during 3Q. The current share of 2.7% is the highest since 4Q 2021 and above the average for the past decade.

The \$181 billion of ETF shorts accounts for 80% of gross hedge fund ETF exposure.

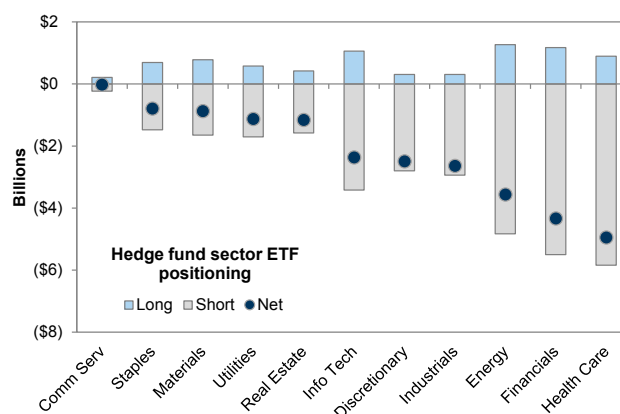
Funds use ETFs more as hedging tools than as directional investments. In contrast, single-stock shorts constitute just 30% of gross single-stock positions.

Exhibit 45: Hedge fund ETF long exposure
holdings as of September 30, 2023



Source: FactSet, Goldman Sachs Global Investment Research

Exhibit 46: Hedge fund positions in sector ETFs
holdings as of September 30, 2023



Source: FactSet, Goldman Sachs Global Investment Research

The table below shows the top 20 ETFs based on hedge fund gross exposure at the start of 4Q 2023.

Exhibit 47: Top 20 ETFs by hedge fund ownership (long and short)
holdings as of September 30, 2023; pricing as of November 15, 2023

			Current ETF Ownership						Change from Jun-2023			
ETF Name	Ticker	Sector/Type	Return		# of HF Investors	Long (\$ bn)	Short (\$ bn)	Net (\$ bn)	Gross (\$ bn)	Change in # of HF Investors	Change in Long Holdings	Change in Short Interest
			3Q	YTD								
SPDR S&P 500 ETF Trust	SPY	Index	(3)%	19 %	93	\$11.8	\$46.7	\$ (34.8)	\$58.5	14	\$5.2	\$ (4.5)
Invesco QQQ Trust Series I	QQQ	Index	(3)	45	48	1.3	21.5	(20.2)	22.8	5	(0.4)	(1.1)
iShares Russell 2000 ETF	IWM	Index	(5)	4	47	2.3	14.5	(12.2)	16.7	(7)	0.4	1.1
iShares iBoxx \$ High Yield Corporate Bond ETF	HYG	Bonds	(0)	6	27	0.3	6.2	(5.8)	6.5	3	0.0	1.7
iShares iBoxx \$ Investment Grade Corporate Bond ETF	LQD	Bonds	(5)	1	17	0.4	5.5	(5.1)	5.9	(10)	(0.6)	2.7
iShares Core S&P 500 ETF	IVV	Index	(3)	19	21	1.7	2.6	(0.8)	4.3	1	(0.7)	(1.0)
Financial Select Sector SPDR Fund	XLF	Financials	(1)	3	37	0.6	3.5	(2.8)	4.1	(5)	0.1	0.2
Industrial Select Sector SPDR Fund	XLI	Industrials	(5)	8	29	0.3	2.9	(2.6)	3.2	4	(0.0)	(0.4)
iShares MSCI EAFE ETF	EFA	DM	(5)	10	18	0.2	3.0	(2.8)	3.2	2	(0.0)	(1.0)
SPDR S&P BIOTECH ETF	XBI	Health Care	(12)	(14)	38	0.4	2.8	(2.4)	3.1	(1)	(0.0)	(0.1)
iShares MSCI Emerging Markets ETF	EEM	EM	(4)	6	29	0.4	2.7	(2.4)	3.1	(1)	(0.0)	0.3
Energy Select Sector SPDR Fund	XLE	Energy	12	(1)	49	0.8	2.3	(1.4)	3.1	(4)	0.2	0.2
iShares 20+ Year Treasury Bond ETF	TLT	Bonds	(13)	(9)	35	0.3	2.3	(2.0)	2.6	9	0.0	0.4
Vanguard S&P 500 ETF	VOO	Index	(3)	19	27	0.7	1.8	(1.1)	2.5	1	(0.1)	0.2
VanEck Semiconductor ETF	SMH	Info Tech	(5)	59	24	0.6	1.9	(1.3)	2.4	0	0.3	0.5
Utilities Select Sector SPDR Fund	XLU	Utilities	(9)	(10)	27	0.6	1.7	(1.1)	2.3	(2)	(0.1)	(0.2)
Health Care Select Sector SPDR Fund	XLV	Health Care	(3)	(5)	33	0.4	1.7	(1.3)	2.1	4	(0.1)	(0.1)
Consumer Staples Select Sector SPDR Fund	XLP	Consumer Staples	(7)	(4)	26	0.7	1.5	(0.8)	2.1	(5)	0.1	(0.3)
SPDR S&P Regional Banking ETF	KRE	Financials	3	(21)	37	0.5	1.6	(1.1)	2.1	(5)	(0.1)	(0.0)
SPDR Gold Shares	GLD	Commodities	(4)	7	45	0.9	1.2	(0.4)	2.1	(3)	0.1	(0.2)
Top 20						25.1	127.7	(102.6)	152.8		4.2	(1.6)
Others						19.2	53.3	(34.1)	72.5		2.6	(0.5)
Total ETF Ownership						\$44.3	\$181.1	(\$136.8)	\$225.3		\$6.8	(\$2.1)

Source: FactSet, Goldman Sachs Global Investment Research

The Very Important Short Position List

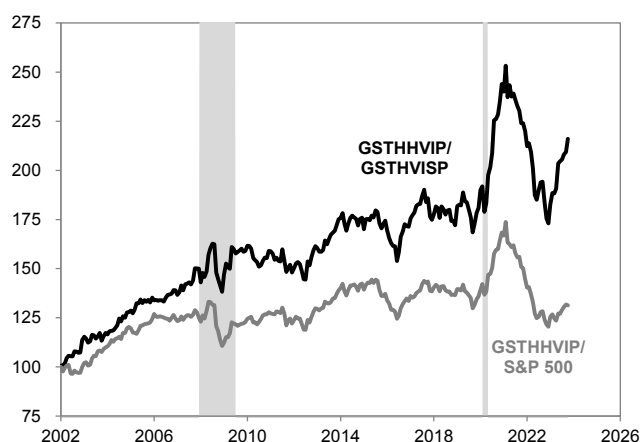
Our Very Important Short Position list (ticker: GSTHVISP) is designed as a short hedge for the Hedge Fund VIP List long portfolio. The equal-weighted basket consists of 50 S&P 500 constituents with the highest total dollar value of short interest outstanding. The VISP basket excludes companies in our long VIP List and stocks with more than 10% of float-adjusted shares held short to allow for sufficient liquidity.

Because the Hedge Fund VIP List consists of 50 equal-weighted stocks, when hedging the long portfolio with the market-cap weighted S&P 500, long positions with S&P 500 weights greater than 2% will be implicitly underweight. By addressing this issue and incorporating information about shorts disclosed by the exchanges, we believe we have created a better approximation of hedge fund short-side performance to use as a hedge.

We use the total dollar value of short interest outstanding as an estimate of hedge fund short portfolio holdings. Short positions in large-cap stocks can be significant on a total dollar value basis even though these stocks typically have less short interest as a percentage of shares outstanding as a result of their size. **Constituents of this basket are not based on 13-F holdings and these are not stocks with the highest percentage of short interest.** See Appendix A for a screen of stocks with the largest outstanding short interest as a share of market cap.

The long GSTHHVIP/short GSTHVISP pair has performed far better than the long GSTHHVIP/short S&P 500 pair. The long/short VIP pair has generated an average quarterly return of 107 bp (4.3% annualized) since 2001, with a 64% quarterly hit rate of outperformance.

Exhibit 48: Hedge fund VIP basket pairs



Source: Goldman Sachs Global Investment Research

Exhibit 49: Information ratio of VIP vs. VISP is 0.26

	Quarterly Relative Return	
	GSTHHVIP vs. SPX	GSTHHVIP vs. GSTHVISP
Maximum	782 bp	1,481 bp
75th percentile	234	340
Median	53	150
25th percentile	(124)	(84)
Minimum	(1057)	(1213)
Standard deviation	330	418
Avg return (bp)	39 bp	107 bp
Information ratio	0.12	0.26
Hit rate of performance since June 2001	58 %	64 %

Source: Goldman Sachs Global Investment Research

GSTHVISP: 50 stocks representing the largest short positions

Exhibit 50: Very Important Short Positions (VISP) for hedge funds

new stocks in basket listed in bold; short interest as of October 31, 2023; pricing as of November 15, 2023

50 stocks that represent the largest short positions									
Company	Ticker	Sub-sector	Equity cap (\$ bil)	Total return YTD	SHORT Interest		LONG Hedge Fund Holdings		
					Short interest as a % of float cap	Value of short interest (\$bil)	No. of funds with stock as top 10 holding	Average portfolio weight when stock ranks among top 10 holdings	% of equity cap owned by hedge funds
Tesla Inc.	TSLA	Automobile Manufacturers	\$754	93 %	3 %	\$16.9	6	5 %	1 %
RTX Corp.	RTX	Aerospace & Defense	117	(19)	8	9.1	3	7	1
Exxon Mobil Corp.	XOM	Integrated Oil & Gas	422	(2)	2	7.5	5	6	1
International Bus. Machines	IBM	IT Consulting & Other Services	137	12	3	3.8	1	4	1
Charter Communications	CHTR	Cable & Satellite	62	22	9	3.5	10	5	3
Chevron Corp.	CVX	Integrated Oil & Gas	277	(17)	1	3.5	2	6	1
Airbnb Inc.	ABNB	Hotels Resorts & Cruise Lines	54	48	7	3.4	3	6	3
Blackstone Inc.	BX	Asset Management & Custody Banks	73	43	5	3.4	3	13	1
Applied Materials	AMAT	Semiconductor Materials & Equipment	129	59	3	2.9	5	8	2
Occidental Petroleum	OXY	Integrated Oil & Gas	55	(1)	7	2.8	3	14	2
Costco Wholesale	COST	Consumer Staples Merchandise Retail	262	30	1	2.4	4	8	1
Walmart Inc.	WMT	Consumer Staples Merchandise Retail	451	20	1	2.4	7	4	1
Lululemon Athletica	LULU	Apparel Accessories & Luxury Goods	55	34	5	2.4	4	6	5
PepsiCo Inc.	PEP	Soft Drinks & Non-alcoholic Beverages	231	(5)	1	2.4	1	3	1
Cisco Systems Inc.	CSCO	Communications Equipment	217	15	1	2.3	1	5	2
Texas Instruments	TXN	Semiconductors	136	(6)	2	2.3	2	4	1
Accenture Plc	ACN	IT Consulting & Other Services	202	22	1	2.3	1	5	0
Home Depot Inc.	HD	Home Improvement Retail	305	(2)	1	2.3	1	3	1
JPMorgan Chase	JPM	Diversified Banks	431	14	1	2.3	8	3	1
Procter & Gamble	PG	Household Products	359	3	1	2.2	1	2	1
Johnson & Johnson	JNJ	Pharmaceuticals	356	(15)	1	2.2	1	4	1
Adobe Inc.	ADBE	Application Software	275	80	1	2.2	9	5	3
Intel Corp.	INTC	Semiconductors	165	53	1	2.1	6	4	1
Lowe's Companies	LOW	Home Improvement Retail	119	4	2	2.1	6	6	3
Digital Realty Trust	DLR	Data Center REITs	41	38	5	1.9	2	3	1
Boeing Co.	BA	Aerospace & Defense	125	9	2	1.9	7	5	2
Comcast Corp.	CMCSA	Cable & Satellite	172	23	1	1.9	3	6	2
DexCom Inc.	DXCM	Health Care Equipment	39	(10)	5	1.9	4	4	4
Bank of America	BAC	Diversified Banks	232	(10)	1	1.9	4	5	1
AbbVie Inc.	ABBV	Biotechnology	244	(11)	1	1.9	2	4	1
NIKE Inc.	NKE	Footwear	130	(9)	1	1.8	4	8	2
Illinois Tool Works	ITW	Industrial Machinery & Supplies & Components	71	9	3	1.8	0	NM	1
McDonald's Corp.	MCD	Restaurants	198	5	1	1.8	3	5	1
Oracle Corp.	ORCL	Systems Software	315	44	1	1.7	6	5	1
Verizon Communications	VZ	Integrated Telecommunication Services	151	(2)	1	1.7	4	4	2
Merck & Co. Inc.	MRK	Pharmaceuticals	259	(6)	1	1.7	4	3	2
Lam Research Corp.	LRCX	Semiconductor Materials & Equipment	93	67	2	1.7	5	10	3
Intuit Inc.	INTU	Application Software	156	44	1	1.7	7	5	2
Newmont Corp.	NEM	Gold	42	(21)	6	1.7	3	10	2
Walt Disney	DIS	Movies & Entertainment	167	5	1	1.6	9	8	3
Amgen Inc.	AMGN	Biotechnology	144	6	1	1.6	0	NM	1
AT&T Inc.	T	Integrated Telecommunication Services	112	(9)	1	1.6	3	5	2
Booking Holdings	BKNG	Hotels Resorts & Cruise Lines	113	57	2	1.6	8	12	5
ON Semiconductor	ON	Semiconductors	30	12	6	1.6	2	4	3
QUALCOMM Inc.	QCOM	Semiconductors	142	18	1	1.5	4	5	2
ServiceNow Inc.	NOW	Systems Software	133	68	1	1.5	7	7	2
United Parcel Service	UPS	Air Freight & Logistics	104	(14)	2	1.5	3	4	2
Gilead Sciences	GILD	Biotechnology	93	(10)	2	1.5	2	8	3
Caterpillar Inc.	CAT	Construction Machinery	126	6	1	1.5	0	NM	1
Moderna Inc.	MRNA	Biotechnology	28	(59)	6	1.5	0	NM	2
Total			\$9,104			\$132.5			
Average			\$182	15 %	2 %	\$2.6	4	6 %	2 %
Median			140	7	1	1.9	3	5	2

Source: FactSet, data compiled by Goldman Sachs Global Investment Research

Appendix A: Hedge fund data tables

Change in popularity: Largest increase and decrease in number of hedge fund owners

Exhibit 51: Change in popularity during 3Q 2023

20 stocks with largest POSITIVE changes in POPULARITY										
			POPULARITY			CONCENTRATION				
Company	Ticker	Sub-sector	Equity cap (\$bn)	Number of hedge funds owning stock		Percent of equity cap owned by hedge funds		Total return since 30-Jun-23	Short interest as % of mkt cap	Avg days volume to liquidate HF position
				30-Sep-23	Chg	30-Sep-23	Chg			
Kenvue, Inc.	KVUE	Personal Care Products	\$38	82	48	8 %	6 pp	(24)%	2 %	6
Eli Lilly and Company	LLY	Pharmaceuticals	559	101	25	1	0	26	1	3
United States Steel Corporation	X	Steel	8	62	22	19	4	38	6	6
Abcam PLC Sponsored ADR	ABCM	Biotechnology	5	49	22	32	17	(5)	2	29
CRH public limited company	CRH	Construction Materials	42	48	22	5	4	8	1	54
Abbott Laboratories	ABT	Health Care Equipment	170	81	21	1	0	(9)	1	3
Hostess Brands, Inc. Class A	TWPK	Packaged Foods & Meats	4	44	20	14	11	32	5	10
D.R. Horton, Inc.	DHI	Homebuilding	43	70	19	5	2	5	2	6
American Water Works Company, Inc.	AWK	Water Utilities	25	51	18	2	(1)	(8)	1	3
Crinetics Pharmaceuticals Inc	CRNX	Biotechnology	2	42	18	24	8	60	10	22
Home Depot, Inc.	HD	Home Improvement Retail	308	74	17	1	0	(0)	1	2
Splunk Inc.	SPLK	Application Software	25	71	17	10	2	42	2	9
Capri Holdings Limited	CPRJ	Apparel Accessories & Luxury Goods	6	58	17	19	7	34	6	9
Quanta Services, Inc.	PWR	Construction & Engineering	27	58	17	6	0	(6)	2	10
HashiCorp, Inc. Class A	HCP	Application Software	2	41	17	11	3	(20)	5	6
Forward Air Corporation	FWRD	Air Freight & Logistics	2	36	17	7	5	(37)	2	6
TETRA Technologies, Inc.	TTI	Oil & Gas Equipment & Services	1	32	17	12	4	39	3	11
St. Joe Company	JOE	Diversified Real Estate Activities	3	28	17	1	1	10	1	4
Antero Resources Corporation	AR	Oil & Gas Exploration & Production	8	58	16	10	3	17	7	5
Insulet Corporation	PODD	Health Care Equipment	12	55	16	6	3	(40)	4	5
Average			\$64	57	20	10 %	4 pp	8 %	3 %	10
Median			10	57	18	7	3	7	2	6

20 stocks with largest NEGATIVE changes in POPULARITY										
			POPULARITY			CONCENTRATION				
Company	Ticker	Sub-sector	Equity cap (\$bn)	Number of hedge funds owning stock		Percent of equity cap owned by hedge funds		Total return since 30-Jun-23	Short interest as % of mkt cap	Avg days volume to liquidate HF position
				30-Sep-23	Chg	30-Sep-23	Chg			
Apellis Pharmaceuticals, Inc.	APLS	Biotechnology	\$6	27	(27)	24 %	1 pp	(47)%	14 %	11
WillScot Mobile Mini Holdings Corp. Class A	WSC	Construction & Engineering	7	49	(21)	12	(0)	(18)	6	13
Dick's Sporting Goods, Inc.	DKS	Other Specialty Retail	7	30	(21)	11	(8)	(10)	9	4
Fidelity National Information Services, Inc.	FIS	Transaction & Payment Processing Services	32	60	(19)	5	(3)	1	1	5
Global Payments Inc.	GPN	Transaction & Payment Processing Services	30	48	(19)	5	(1)	16	1	7
Teledyne Technologies Incorporated	TDY	Electronic Equipment & Instruments	19	26	(19)	2	(1)	(4)	1	3
Churchill Downs Incorporated	CHDN	Casinos & Gaming	9	21	(19)	3	(1)	(13)	3	6
eBay Inc.	EBAY	Broadline Retail	21	33	(18)	5	(1)	(9)	3	5
Cadence Design Systems, Inc.	CDNS	Application Software	72	57	(17)	5	(1)	13	1	9
Blackstone Inc.	BX	Asset Management & Custody Banks	74	41	(17)	1	(1)	14	5	1
Jacobs Solutions Inc.	J	Research & Consulting Services	17	34	(17)	5	0	16	1	10
Sensata Technologies Holding PLC	ST	Electrical Components & Equipment	5	34	(17)	7	0	(26)	4	8
Axonics, Inc.	AXNX	Health Care Equipment	3	25	(16)	8	(4)	13	5	6
Boston Scientific Corporation	BSX	Health Care Equipment	79	65	(15)	6	1	(0)	1	11
BioMarin Pharmaceutical Inc.	BMRN	Biotechnology	16	50	(15)	11	(1)	0	2	15
Dover Corporation	DOV	Industrial Machinery & Supplies & Componen	19	31	(15)	3	0	(6)	1	4
Repligen Corporation	RGEN	Life Sciences Tools & Services	9	25	(15)	3	(0)	10	9	2
Dolby Laboratories, Inc. Class A	DLB	Systems Software	5	25	(15)	4	(2)	6	3	5
Element Solutions Inc	ESI	Specialty Chemicals	5	24	(15)	7	(0)	7	2	14
Levi Strauss & Co. Class A	LEVI	Apparel Accessories & Luxury Goods	2	20	(15)	5	(1)	7	11	2
Average			\$22	36	(18)	6 %	(1)pp	(1)%	4 %	7
Median			13	32	(17)	5	(1)	0	3	6

Source: FactSet, compiled by Goldman Sachs Global Investment Research

Concentrated shorts: Highest short interest outstanding as a percentage of market cap

Exhibit 52: Highest short interest: Stocks over \$1 billion in market cap

50 stocks OVER \$1 billion with largest SHORT INTEREST as % of market cap										
Company	Ticker	Sub-sector	Equity cap (\$bn)	POPULARITY	CONCENTRATION			Total return YTD	Short interest as % of mkt cap	Avg days volume to liquidate HF position
				Number of hedge funds owning stock	Percent of equity cap owned by hedge funds					
					30-Sep-23	30-Jun-23	30-Sep-23			
Upstart Holdings, Inc.	UPST	Consumer Finance	\$2.2	23	7 %	8 %	1 pp	97 %	33 %	1
Plug Power Inc.	PLUG	Electrical Components & Equipment	2.6	34	2	2	(0)	(65)	32	1
DISH Network Corporation Class A	DISH	Cable & Satellite	1.0	38	11	12	1	(75)	27	4
C3.ai, Inc. Class A	AI	Application Software	3.4	20	4	6	2	168	26	0
Sunnova Energy International Inc	NOVA	Renewable Electricity	1.3	34	10	10	1	(41)	25	3
Encore Wire Corporation	WIRE	Electrical Components & Equipment	3.2	35	6	9	2	46	24	6
SL Green Realty Corp.	SLG	Office REITs	2.3	24	8	7	(1)	14	23	2
Sunrun Inc.	RUN	Electrical Components & Equipment	2.5	34	8	8	(1)	(52)	23	2
Carvana Co. Class A	CVNA	Automotive Retail	3.9	38	37	31	(6)	621	23	2
Arbor Realty Trust Inc	ABR	Mortgage REITs	2.6	16	2	1	(1)	15	23	1
Medical Properties Trust, Inc.	MPW	Health Care REITs	2.8	30	2	4	2	(53)	22	2
Trupanion, Inc.	TRUP	Property & Casualty Insurance	1.1	25	11	8	(3)	(46)	22	4
Wayfair, Inc. Class A	W	Homefurnishing Retail	4.4	51	22	25	3	45	22	5
Semtech Corporation	SMTC	Semiconductors	1.0	32	16	26	10	(45)	22	11
Cinemark Holdings, Inc.	CNK	Movies & Entertainment	1.8	53	13	15	2	67	22	6
Koh's Corporation	KSS	Broadline Retail	2.7	38	7	12	5	4	21	3
Luminar Technologies, Inc. Class A	LAZR	Automotive Parts & Equipment	1.0	19	6	3	(3)	(33)	21	1
Twist Bioscience Corp.	TWST	Biotechnology	1.1	21	11	13	3	(16)	21	6
CNX Resources Corporation	CNX	Oil & Gas Exploration & Production	3.4	37	7	13	6	28	21	7
Marathon Digital Holdings Inc	MARA	Application Software	2.3	15	2	3	2	199	20	0
Callon Petroleum Company	CPE	Oil & Gas Exploration & Production	2.3	32	5	8	3	(10)	20	4
GameStop Corp. Class A	GME	Computer & Electronics Retail	4.1	10	1	0	(1)	(28)	20	0
MicroStrategy Incorporated Class A	MSTR	Application Software	6.4	20	9	2	(6)	257	20	0
Nikola Corporation	NKLA	Construction Machinery & Heavy Transportation Equipmer	1.1	15	2	2	(0)	(50)	19	0
Enovix Corporation	ENVX	Electrical Components & Equipment	1.9	20	8	9	1	(7)	18	3
Bank of Hawaii Corp	BOH	Regional Banks	2.3	14	6	6	(0)	(23)	18	3
Sprouts Farmers Market, Inc.	SFM	Food Retail	4.3	20	9	11	2	30	17	7
Extreme Networks, Inc.	EXTR	Communications Equipment	2.2	40	16	17	1	(6)	17	12
Helen of Troy Limited	HELE	Household Appliances	2.5	19	5	4	(1)	(6)	17	2
Springworks Therapeutics, Inc.	SWTX	Biotechnology	1.4	21	17	18	1	(15)	17	17
MannKind Corporation	MNKD	Biotechnology	1.0	25	11	15	3	(29)	17	12
Winnebago Industries, Inc.	WGO	Automobile Manufacturers	2.0	31	8	9	0	28	17	5
TG Therapeutics, Inc.	TGTX	Biotechnology	1.7	39	9	12	3	(5)	17	4
Confluent Inc Class A	CFLT	Application Software	4.4	42	20	17	(3)	(10)	17	9
Blackstone Mortgage Trust, Inc. Class A	BXMT	Mortgage REITs	4.0	12	2	0	(1)	19	17	0
agilon health inc	AGL	Health Care Services	5.1	16	3	3	(0)	(23)	16	4
MoonLake Immunotherapeutics Class A	MLTX	Biotechnology	2.1	28	72	75	3	274	16	87
Riot Platforms, Inc.	RIOT	Application Software	2.2	18	3	3	(0)	215	16	0
Axsome Therapeutics, Inc.	AXSM	Pharmaceuticals	2.8	27	28	27	(0)	(22)	16	14
Mobileye Global, Inc. Class A	MBLY	Automotive Parts & Equipment	3.9	31	16	14	(2)	16	16	5
IonQ, Inc.	IONQ	Technology Hardware Storage & Peripherals	2.7	19	4	3	(1)	277	16	1
BioCryst Pharmaceuticals, Inc.	BCRX	Biotechnology	1.1	40	31	29	(2)	(55)	16	21
Floor & Decor Holdings, Inc. Class A	FND	Home Improvement Retail	9.6	35	9	9	(0)	29	15	6
Herbalife Ltd.	HLF	Personal Care Products	1.3	37	37	37	(0)	(12)	15	22
ODP Corporation	ODP	Other Specialty Retail	1.8	37	21	23	2	6	15	23
Cytokinetics, Incorporated	CYTK	Biotechnology	3.2	35	14	13	(1)	(28)	15	12
Livent Corporation	LTHM	Specialty Chemicals	2.6	27	3	3	0	(27)	15	2
Chewy, Inc. Class A	CHWY	Other Specialty Retail	2.5	43	13	12	(1)	(43)	15	3
Pebblebrook Hotel Trust	PEB	Hotel & Resort REITs	1.5	22	4	5	1	(4)	15	3
Corcept Therapeutics Incorporated.	CORT	Pharmaceuticals	2.6	27	11	12	2	25	15	17
Average			\$2.7	28	12 %	12 %	1 pp	33 %	19 %	7
Median			2.4	28	8	9	0	(6)	18	4

Source: FactSet, Compiled by Goldman Sachs Global Investment Research

Appendix B: 100 largest hedge funds in our analysis ranked by equity assets

Institution Name	Number of Securities Held	Equity Assets (\$ Billions)	Institution Name	Number of Securities Held	Equity Assets (\$ Billions)
Millennium Management LLC	3,604	\$96	Appaloosa LP	31	\$6
Arrowstreet Capital LP	2,054	88	RTW Investments LP	71	5
Citadel Advisors LLC	2,555	67	Stockbridge Partners LLC	17	5
Renaissance Technologies LLC	3,292	58	RA Capital Management LP	68	5
D. E. Shaw & Co. LP	2,542	56	Southpoint Capital Advisors LP	51	5
AQR Capital Management LLC	3,824	55	Oaktree Capital Management LP	203	5
Adage Capital Management LP	801	45	AltaRock Partners LLC	8	4
Two Sigma Advisers LP	2,244	38	Maverick Capital Ltd.	297	4
Acadian Asset Management LLC	3,931	33	SCGE Management LP	26	4
Point72 Asset Management LP	1,806	33	Junto Capital Management LP	70	4
Balyasny Asset Management LP	1,618	32	Starboard Value LP	22	4
Two Sigma Investments LP	2,600	32	Weiss Multi-Strategy Advisers LLC	521	4
Viking Global Investors LP	80	26	Gotham Asset Management LLC	1,274	4
Holocene Advisors, LP	696	23	Trexquant Investment LP	1,283	4
Numeric Investors LLC	2,044	21	Zimmer Partners LP	109	4
Coatue Management LLC	84	21	Skye Global Management LP	27	4
Voloridge Investment Management LLC	1,338	21	Steadfast Capital Management LP	46	4
Squarepoint OPS LLC	2,288	20	Meritage Group LP	49	4
Baker Bros. Advisors LP	102	17	Glenview Capital Management LLC	43	4
Pershing Square Capital Management LP	11	16	Rock Springs Capital Management LP	113	4
Tiger Global Management LLC	51	15	BVF Partners LP	77	4
Alyeska Investment Group LP	450	15	Laurion Capital Management LP	228	3
Farallon Capital Management LLC	113	14	Abrams Capital Management LP	18	3
Echo Street Capital Management LLC	1,278	12	Armistice Capital LLC	234	3
Icahn Associates Holding LLC	15	11	Route One Investment Co. LP	18	3
Lone Pine Capital LLC	26	11	Foxhaven Asset Management LP	28	3
Schonfeld Strategic Advisors LLC	1,376	11	Moore Capital Management LP	285	3
Walleye Capital LLC	1,724	9	Kayne Anderson Capital Advisors LP	101	3
Matrix Capital Management Co. LP	19	9	Valley Forge Capital Management LP	8	3
Cubist Systematic Strategies LLC	1,826	8	Slate Path Capital LP	43	3
Woodline Partners LP	539	8	Jericho Capital Asset Management LP	22	3
Mirova US LLC	63	8	Rubric Capital Management LP	64	3
Hudson Bay Capital Management LP	521	8	GMT Capital Corp.	115	3
ExodusPoint Capital Management LP	1,566	8	Magnetar Financial LLC	367	3
SRS Investment Management LLC	18	8	Gates Capital Management, Inc.	26	3
Trian Fund Management LP	10	7	Perceptive Advisors LLC	87	3
Soroban Capital Partners LP	15	7	EcoR1 Capital, LLC	47	3
Pentwater Capital Management LP	66	7	Atreides Management LP	27	3
Third Point LLC	30	7	Davidson Kempner Capital Management LP	108	3
ValueAct Capital Management LP	16	7	Dorsal Capital Management LLC	22	3
Tudor Investment Corp.	1,373	6	MFN Partners Management LP	12	3
Avoro Capital Advisor LLC	45	6	PAR Capital Management, Inc.	47	3
The WindAcre Partnership LLC	13	6	Sculptor Capital LP	129	3
Verition Fund Management LLC	1,662	6	RWC Asset Advisors (US) LLC	137	3
BlueSpruce Investments LP	10	6	Engineers Gate Manager LP	1,731	3
The Baupost Group LLC	35	6	IndexIQ Advisors LLC	2,382	3
Eminence Capital LP	65	6	PointState Capital LP	47	3
Samlyn Capital LLC	93	6	Senvest Management LLC	50	3
Whale Rock Capital Management LLC	41	6	Scopus Asset Management LP	125	3
Altimeter Capital Management LP	10	6	Kensico Capital Management Corp.	26	3

	Equity Assets (\$ Billions)	As a % of Total
Largest 50	\$1,048	66%
Largest 100	1,226	78
Total 735	\$1,581	100%

Source: FactSet, data compiled by Goldman Sachs Global Investment Research

Appendix C: Drawbacks of our hedge fund holding analysis

Data limitations

One weakness of our analysis is that it excludes any synthetic positions that hedge funds may create through the use of derivative contracts (options, swaps, futures). Such financial instruments are not required to be disclosed in public filings.

We track both natural and leveraged long positions based on filings of hedge fund holdings. However, a hedge fund could offset a long position that we are able to monitor with a synthetic short position in options or futures on the underlying stock or an index of similar stocks that we currently are not able to monitor because the data on such trades and positions is not disclosed. These positions could either magnify or reduce the conclusions of our Hedge Fund Trend Monitor.

Lack of international holdings

Hedge funds are not required to include foreign holdings in their 13-F filings.

Consequently, our analysis may not capture all the long equity positions of hedge funds. While we do not believe this lack of data significantly affects our analysis of holdings by sector and capitalization size, we may overestimate the “density” of hedge fund portfolios.

Incomplete reporting of short positions

Our data is limited to publicly disclosed short interest statistics released by the exchanges. Only US broker-dealers are required to report short positions to these exchanges, so we miss any shorts held in overseas accounts. Swaps and other derivatives are also not captured in this analysis. We assume that hedge funds account for 85% of all short interest in the market and that the short side of hedge fund portfolios mirrors the overall short market in terms of sector allocation.

Timeliness

Another potential weakness of our analysis relates to the timeliness of the reported data. For example, the equity holdings for the 735 hedge funds we studied were based on 13-F filings of positions owned as of September 30, 2023, although these filings were not made public until mid-November 2023.

Importantly, we believe our analysis of hedge fund holdings based on 13-F filings with 45-day delays is generally more reflective of actual current holdings than many market participants are inclined to believe.

Hedge fund holdings turnover is lower than most expect. On average, 77% of stocks that were in hedge fund portfolios on June 30, 2023 also appeared in portfolios on September 30, 2023. Because the overall holdings picture was surprisingly constant, we think it is reasonable to believe that the most recent holdings data remain relevant today.

Disclosure Appendix

Reg AC

We, Ben Snider, Jenny Ma, David J. Kostin, Ryan Hammond, Cormac Connors, Lily Calcagnini and Daniel Chavez, hereby certify that all of the views expressed in this report accurately reflect our personal views, which have not been influenced by considerations of the firm's business or client relationships.

Unless otherwise stated, the individuals listed on the cover page of this report are analysts in Goldman Sachs' Global Investment Research division.

Disclosures

Basket disclosure

The ability to trade the basket(s) in this report will depend upon market conditions, including liquidity and borrow constraints at the time of trade.

Marquee disclosure

Marquee disclosure: Marquee is a product of Goldman Sachs Global Banking & Markets. Any Marquee content linked in this report is not necessarily representative of GS Research views. Because the Marquee platform and third-party platforms (e.g., Bloomberg) are only permitted to reflect changes to these baskets after publication of this note, there will be a delay between the rebalancing of baskets in this note and when the changes to these baskets are reflected on such platforms. If you need access to Marquee, please contact your GS salesperson or email the Marquee team at gs-marquee-sales@gs.com.

Regulatory disclosures

Disclosures required by United States laws and regulations

See company-specific regulatory disclosures above for any of the following disclosures required as to companies referred to in this report: manager or co-manager in a pending transaction; 1% or other ownership; compensation for certain services; types of client relationships; managed/co-managed public offerings in prior periods; directorships; for equity securities, market making and/or specialist role. Goldman Sachs trades or may trade as a principal in debt securities (or in related derivatives) of issuers discussed in this report.

The following are additional required disclosures: **Ownership and material conflicts of interest:** Goldman Sachs policy prohibits its analysts, professionals reporting to analysts and members of their households from owning securities of any company in the analyst's area of coverage.

Analyst compensation: Analysts are paid in part based on the profitability of Goldman Sachs, which includes investment banking revenues. **Analyst as officer or director:** Goldman Sachs policy generally prohibits its analysts, persons reporting to analysts or members of their households from serving as an officer, director or advisor of any company in the analyst's area of coverage. **Non-U.S. Analysts:** Non-U.S. analysts may not be associated persons of Goldman Sachs & Co. LLC and therefore may not be subject to FINRA Rule 2241 or FINRA Rule 2242 restrictions on communications with subject company, public appearances and trading securities held by the analysts.

Additional disclosures required under the laws and regulations of jurisdictions other than the United States

The following disclosures are those required by the jurisdiction indicated, except to the extent already made above pursuant to United States laws and regulations. **Australia:** Goldman Sachs Australia Pty Ltd and its affiliates are not authorised deposit-taking institutions (as that term is defined in the Banking Act 1959 (Cth)) in Australia and do not provide banking services, nor carry on a banking business, in Australia. This research, and any access to it, is intended only for "wholesale clients" within the meaning of the Australian Corporations Act, unless otherwise agreed by Goldman Sachs. In producing research reports, members of Global Investment Research of Goldman Sachs Australia may attend site visits and other meetings hosted by the companies and other entities which are the subject of its research reports. In some instances the costs of such site visits or meetings may be met in part or in whole by the issuers concerned if Goldman Sachs Australia considers it is appropriate and reasonable in the specific circumstances relating to the site visit or meeting. To the extent that the contents of this document contains any financial product advice, it is general advice only and has been prepared by Goldman Sachs without taking into account a client's objectives, financial situation or needs. A client should, before acting on any such advice, consider the appropriateness of the advice having regard to the client's own objectives, financial situation and needs. A copy of certain Goldman Sachs Australia and New Zealand disclosure of interests and a copy of Goldman Sachs' Australian Sell-Side Research Independence Policy Statement are available at: <https://www.goldmansachs.com/disclosures/australia-new-zealand/index.html>. **Brazil:** Disclosure information in relation to CVM Resolution n. 20 is available at <https://www.gs.com/worldwide/brazil/area/gir/index.html>. Where applicable, the Brazil-registered analyst primarily responsible for the content of this research report, as defined in Article 20 of CVM Resolution n. 20, is the first author named at the beginning of this report, unless indicated otherwise at the end of the text. **Canada:** This information is being provided to you for information purposes only and is not, and under no circumstances should be construed as, an advertisement, offering or solicitation by Goldman Sachs & Co. LLC for purchasers of securities in Canada to trade in any Canadian security. Goldman Sachs & Co. LLC is not registered as a dealer in any jurisdiction in Canada under applicable Canadian securities laws and generally is not permitted to trade in Canadian securities and may be prohibited from selling certain securities and products in certain jurisdictions in Canada. If you wish to trade in any Canadian securities or other products in Canada please contact Goldman Sachs Canada Inc., an affiliate of The Goldman Sachs Group Inc., or another registered Canadian dealer. **Hong Kong:** Further information on the securities of covered companies referred to in this research may be obtained on request from Goldman Sachs (Asia) L.L.C. **India:** Further information on the subject company or companies referred to in this research may be obtained from Goldman Sachs (India) Securities Private Limited, Research Analyst - SEBI Registration Number INH000001493, 951-A, Rational House, Appasaheb Marathe Marg, Prabhadevi, Mumbai 400 025, India, Corporate Identity Number U74140MH2006FTC160634, Phone +91 22 6616 9000, Fax +91 22 6616 9001. Goldman Sachs may beneficially own 1% or more of the securities (as such term is defined in clause 2 (h) the Indian Securities Contracts (Regulation) Act, 1956) of the subject company or companies referred to in this research report. Investment in securities market are subject to market risks. Read all the related documents carefully before investing. Registration granted by SEBI and certification from NISM in no way guarantee performance of the intermediary or provide any assurance of returns to investors. Goldman Sachs (India) Securities Private Limited Investor Grievance E-mail: india-client-support@gs.com. Compliance Officer: Anil Rajput | Tel: + 91 22 6616 9000 | Email: anil.m.rajput@gs.com. **Japan:** See below. **Korea:** This research, and any access to it, is intended only for "professional investors" within the meaning of the Financial Services and Capital Markets Act, unless otherwise agreed by Goldman Sachs. Further information on the subject company or companies referred to in this research may be obtained from Goldman Sachs (Asia) L.L.C., Seoul Branch. **New Zealand:** Goldman Sachs New Zealand Limited and its affiliates are neither "registered banks" nor "deposit takers" (as defined in the Reserve Bank of New Zealand Act 1989) in New Zealand. This research, and any access to it, is intended for "wholesale clients" (as defined in the Financial Advisers Act 2008) unless otherwise agreed by Goldman Sachs. A copy of certain Goldman Sachs Australia and New Zealand disclosure of interests is available at: <https://www.goldmansachs.com/disclosures/australia-new-zealand/index.html>. **Russia:** Research reports distributed in the Russian Federation are not advertising as defined in the Russian legislation, but are information and analysis not having product promotion as their main purpose and do not provide appraisal within the meaning of the Russian legislation on appraisal activity. Research reports do not constitute a personalized investment recommendation as defined in Russian laws and regulations, are not addressed to a specific client, and are prepared without analyzing the financial

circumstances, investment profiles or risk profiles of clients. Goldman Sachs assumes no responsibility for any investment decisions that may be taken by a client or any other person based on this research report. **Singapore:** Goldman Sachs (Singapore) Pte. (Company Number: 198602165W), which is regulated by the Monetary Authority of Singapore, accepts legal responsibility for this research, and should be contacted with respect to any matters arising from, or in connection with, this research. **Taiwan:** This material is for reference only and must not be reprinted without permission. Investors should carefully consider their own investment risk. Investment results are the responsibility of the individual investor. **United Kingdom:** Persons who would be categorized as retail clients in the United Kingdom, as such term is defined in the rules of the Financial Conduct Authority, should read this research in conjunction with prior Goldman Sachs research on the covered companies referred to herein and should refer to the risk warnings that have been sent to them by Goldman Sachs International. A copy of these risks warnings, and a glossary of certain financial terms used in this report, are available from Goldman Sachs International on request.

European Union and United Kingdom: Disclosure information in relation to Article 6 (2) of the European Commission Delegated Regulation (EU) (2016/958) supplementing Regulation (EU) No 596/2014 of the European Parliament and of the Council (including as that Delegated Regulation is implemented into United Kingdom domestic law and regulation following the United Kingdom's departure from the European Union and the European Economic Area) with regard to regulatory technical standards for the technical arrangements for objective presentation of investment recommendations or other information recommending or suggesting an investment strategy and for disclosure of particular interests or indications of conflicts of interest is available at <https://www.gs.com/disclosures/europeanpolicy.html> which states the European Policy for Managing Conflicts of Interest in Connection with Investment Research.

Japan: Goldman Sachs Japan Co., Ltd. is a Financial Instrument Dealer registered with the Kanto Financial Bureau under registration number Kinsho 69, and a member of Japan Securities Dealers Association, Financial Futures Association of Japan Type II Financial Instruments Firms Association, The Investment Trusts Association, Japan, and Japan Investment Advisers Association. Sales and purchase of equities are subject to commission pre-determined with clients plus consumption tax. See company-specific disclosures as to any applicable disclosures required by Japanese stock exchanges, the Japanese Securities Dealers Association or the Japanese Securities Finance Company.

Global product; distributing entities

Goldman Sachs Global Investment Research produces and distributes research products for clients of Goldman Sachs on a global basis. Analysts based in Goldman Sachs offices around the world produce research on industries and companies, and research on macroeconomics, currencies, commodities and portfolio strategy. This research is disseminated in Australia by Goldman Sachs Australia Pty Ltd (ABN 21 006 797 897); in Brazil by Goldman Sachs do Brasil Corretora de Títulos e Valores Mobiliários S.A.; Public Communication Channel Goldman Sachs Brazil: 0800 727 5764 and / or contatogoldmanbrasil@gs.com. Available Weekdays (except holidays), from 9am to 6pm. Canal de Comunicação com o Público Goldman Sachs Brasil: 0800 727 5764 e/ou contatogoldmanbrasil@gs.com. Horário de funcionamento: segunda-feira à sexta-feira (exceto feriados), das 9h às 18h; in Canada by Goldman Sachs & Co. LLC; in Hong Kong by Goldman Sachs (Asia) L.L.C.; in India by Goldman Sachs (India) Securities Private Ltd.; in Japan by Goldman Sachs Japan Co., Ltd.; in the Republic of Korea by Goldman Sachs (Asia) L.L.C., Seoul Branch; in New Zealand by Goldman Sachs New Zealand Limited; in Russia by OOO Goldman Sachs; in Singapore by Goldman Sachs (Singapore) Pte. (Company Number: 198602165W); and in the United States of America by Goldman Sachs & Co. LLC. Goldman Sachs International has approved this research in connection with its distribution in the United Kingdom.

Goldman Sachs International ("GSI"), authorised by the Prudential Regulation Authority ("PRA") and regulated by the Financial Conduct Authority ("FCA") and the PRA, has approved this research in connection with its distribution in the United Kingdom.

European Economic Area: GSI, authorised by the PRA and regulated by the FCA and the PRA, disseminates research in the following jurisdictions within the European Economic Area: the Grand Duchy of Luxembourg, Italy, the Kingdom of Belgium, the Kingdom of Denmark, the Kingdom of Norway, the Republic of Finland and the Republic of Ireland; GSI - Succursale de Paris (Paris branch) which is authorised by the French Autorité de contrôle prudentiel et de résolution ("ACPR") and regulated by the Autorité de contrôle prudentiel et de résolution and the Autorité des marchés financiers ("AMF") disseminates research in France; GSI - Sucursal en España (Madrid branch) authorized in Spain by the Comisión Nacional del Mercado de Valores disseminates research in the Kingdom of Spain; GSI - Sweden Bankfilial (Stockholm branch) is authorized by the SFSA as a "third country branch" in accordance with Chapter 4, Section 4 of the Swedish Securities and Market Act (Sv. lag (2007:528) om värdepappersmarknaden) disseminates research in the Kingdom of Sweden; Goldman Sachs Bank Europe SE ("GSBE") is a credit institution incorporated in Germany and, within the Single Supervisory Mechanism, subject to direct prudential supervision by the European Central Bank and in other respects supervised by German Federal Financial Supervisory Authority (Bundesanstalt für Finanzdienstleistungsaufsicht, BaFin) and Deutsche Bundesbank and disseminates research in the Federal Republic of Germany and those jurisdictions within the European Economic Area where GSI is not authorised to disseminate research and additionally, GSBE, Copenhagen Branch filial af GSBE, Tyskland, supervised by the Danish Financial Authority disseminates research in the Kingdom of Denmark; GSBE - Sucursal en España (Madrid branch) subject (to a limited extent) to local supervision by the Bank of Spain disseminates research in the Kingdom of Spain; GSBE - Succursale Italia (Milan branch) to the relevant applicable extent, subject to local supervision by the Bank of Italy (Banca d'Italia) and the Italian Companies and Exchange Commission (Commissione Nazionale per le Società e la Borsa "Consob") disseminates research in Italy; GSBE - Succursale de Paris (Paris branch), supervised by the AMF and by the ACPR disseminates research in France; and GSBE - Sweden Bankfilial (Stockholm branch), to a limited extent, subject to local supervision by the Swedish Financial Supervisory Authority (Finansinspektionen) disseminates research in the Kingdom of Sweden.

General disclosures

This research is for our clients only. Other than disclosures relating to Goldman Sachs, this research is based on current public information that we consider reliable, but we do not represent it is accurate or complete, and it should not be relied on as such. The information, opinions, estimates and forecasts contained herein are as of the date hereof and are subject to change without prior notification. We seek to update our research as appropriate, but various regulations may prevent us from doing so. Other than certain industry reports published on a periodic basis, the large majority of reports are published at irregular intervals as appropriate in the analyst's judgment.

Goldman Sachs conducts a global full-service, integrated investment banking, investment management, and brokerage business. We have investment banking and other business relationships with a substantial percentage of the companies covered by Global Investment Research. Goldman Sachs & Co. LLC, the United States broker dealer, is a member of SIPC (<https://www.sipc.org>).

Our salespeople, traders, and other professionals may provide oral or written market commentary or trading strategies to our clients and principal trading desks that reflect opinions that are contrary to the opinions expressed in this research. Our asset management area, principal trading desks and investing businesses may make investment decisions that are inconsistent with the recommendations or views expressed in this research.

We and our affiliates, officers, directors, and employees will from time to time have long or short positions in, act as principal in, and buy or sell, the securities or derivatives, if any, referred to in this research, unless otherwise prohibited by regulation or Goldman Sachs policy.

The views attributed to third party presenters at Goldman Sachs arranged conferences, including individuals from other parts of Goldman Sachs, do not necessarily reflect those of Global Investment Research and are not an official view of Goldman Sachs.

Any third party referenced herein, including any salespeople, traders and other professionals or members of their household, may have positions in the products mentioned that are inconsistent with the views expressed by analysts named in this report.

This research is focused on investment themes across markets, industries and sectors. It does not attempt to distinguish between the prospects or performance of, or provide analysis of, individual companies within any industry or sector we describe.

Any trading recommendation in this research relating to an equity or credit security or securities within an industry or sector is reflective of the investment theme being discussed and is not a recommendation of any such security in isolation.

This research is not an offer to sell or the solicitation of an offer to buy any security in any jurisdiction where such an offer or solicitation would be illegal. It does not constitute a personal recommendation or take into account the particular investment objectives, financial situations, or needs of individual clients. Clients should consider whether any advice or recommendation in this research is suitable for their particular circumstances and, if appropriate, seek professional advice, including tax advice. The price and value of investments referred to in this research and the income from them may fluctuate. Past performance is not a guide to future performance, future returns are not guaranteed, and a loss of original capital may occur. Fluctuations in exchange rates could have adverse effects on the value or price of, or income derived from, certain investments.

Certain transactions, including those involving futures, options, and other derivatives, give rise to substantial risk and are not suitable for all investors. Investors should review current options and futures disclosure documents which are available from Goldman Sachs sales representatives or at <https://www.theocc.com/about/publications/character-risks.jsp> and https://www.fiadocumentation.org/fia/regulatory-disclosures_1/fia-uniform-futures-and-options-on-futures-risk-disclosures-booklet-pdf-version-2018. Transaction costs may be significant in option strategies calling for multiple purchase and sales of options such as spreads. Supporting documentation will be supplied upon request.

Differing Levels of Service provided by Global Investment Research: The level and types of services provided to you by Goldman Sachs Global Investment Research may vary as compared to that provided to internal and other external clients of GS, depending on various factors including your individual preferences as to the frequency and manner of receiving communication, your risk profile and investment focus and perspective (e.g., marketwide, sector specific, long term, short term), the size and scope of your overall client relationship with GS, and legal and regulatory constraints. As an example, certain clients may request to receive notifications when research on specific securities is published, and certain clients may request that specific data underlying analysts' fundamental analysis available on our internal client websites be delivered to them electronically through data feeds or otherwise. No change to an analyst's fundamental research views (e.g., ratings, price targets, or material changes to earnings estimates for equity securities), will be communicated to any client prior to inclusion of such information in a research report broadly disseminated through electronic publication to our internal client websites or through other means, as necessary, to all clients who are entitled to receive such reports.

All research reports are disseminated and available to all clients simultaneously through electronic publication to our internal client websites. Not all research content is redistributed to our clients or available to third-party aggregators, nor is Goldman Sachs responsible for the redistribution of our research by third party aggregators. For research, models or other data related to one or more securities, markets or asset classes (including related services) that may be available to you, please contact your GS representative or go to <https://research.gs.com>.

Disclosure information is also available at <https://www.gs.com/research/hedge.html> or from Research Compliance, 200 West Street, New York, NY 10282.

© 2023 Goldman Sachs.

No part of this material may be (i) copied, photocopied or duplicated in any form by any means or (ii) redistributed without the prior written consent of The Goldman Sachs Group, Inc.