

Global Equity Strategy

2025 Outlook: The Year of the Alpha Bet

The Year of the Alpha Bet

- We are entering a benign part of the cycle; interest rate cuts that coincide with economic growth tend to be supportive for equities.
- Nevertheless, global equities have already risen 40% since October 2023 leaving them more vulnerable to any disappointments.
- Equity valuations have increased and leave little room for further valuation expansion. We expect index returns to be driven largely by earnings growth.
- We forecast total equity returns in US\$ of 10% through to the end of 2025.
- Given high valuations and unusually high concentration in equity markets, we focus on diversification to improve risk adjusted returns.
- We prefer a more eclectic mix of sector and styles with an increase in focus on Alpha relative to Beta.
- We highlight 4 themes: market broadening opportunities, selective value, geographical diversification and enhanced capital market activity.

Peter Oppenheimer

+44(20)7552-5782 |
peter.oppenheimer@gs.com
Goldman Sachs International

Guillaume Jaisson

+44(20)7552-3000 |
guillaume.jaisson@gs.com
Goldman Sachs International

Sharon Bell

+44(20)7552-1341 | sharon.bell@gs.com
Goldman Sachs International

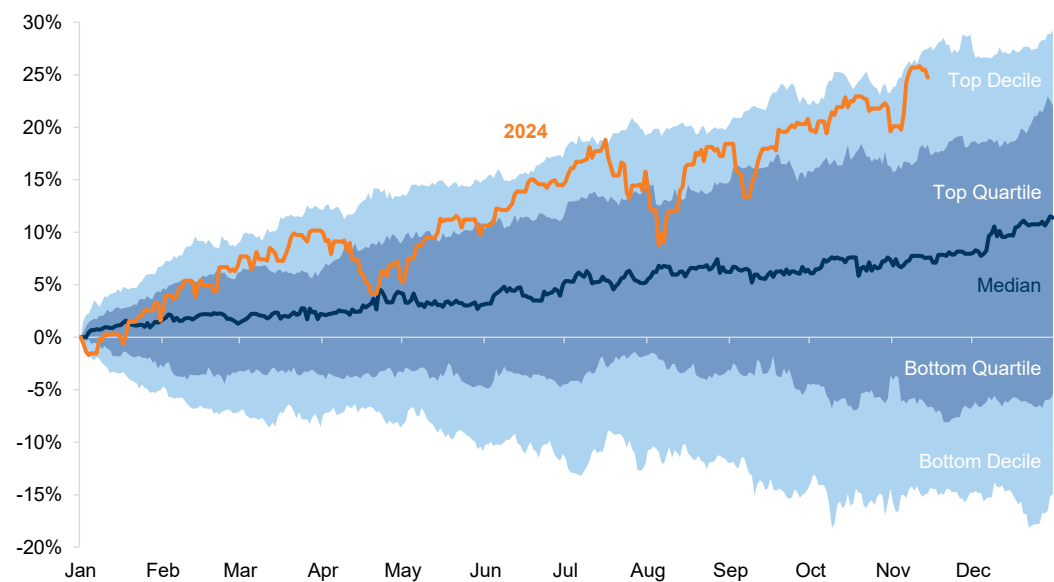
Lilia Peytavin

+33(1)4212-1716 | lilia.peytavin@gs.com
Goldman Sachs Bank Europe SE - Paris
Branch

The Year of the Alpha Bet

It is tempting, as we approach a new year, to assume that the clock resets, and we start anew. While it is true that performance is typically measured in yearly increments, it is also important to recognize that context matters. Some years, like 2021 or 2023, follow periods of falling equity prices and low valuations, while others, like 2025, come after already strong rallies. As [Exhibit 1](#) illustrates, the rise in the S&P 500 in 2024 has been one of the strongest since 1928. More strikingly, the current equity upswing began in October 2023, driven by optimism in peak inflation and the prospect of a 'Fed pivot'. Since then, the MSCI world index is up nearly 40% in price terms alone (and around 60% since the trough triggered by rising interest rates in 2022), the Nasdaq has climbed over 50% and the World's biggest company, Nvidia, has surged 264%.

Exhibit 1: The rise in the S&P in 2024 has been one of the strongest since 1928
Calendarized S&P 500 performance since 1928

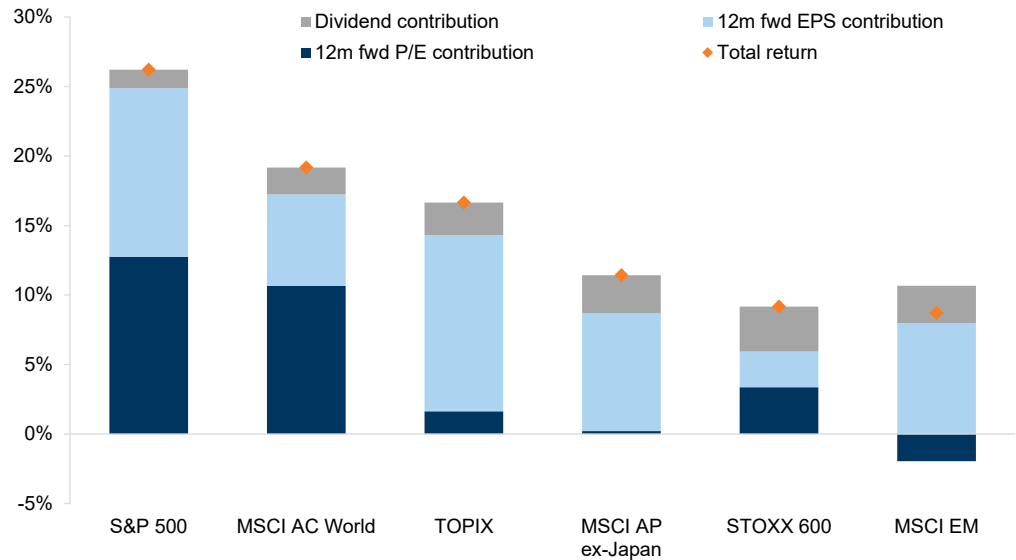


Source: Bloomberg, Datastream, Goldman Sachs Global Investment Research

This spectacular return has, in part, been driven by profit growth. But around half of the equity return globally in 2024 has come from valuation expansion, driven by growing optimism in lower inflation and interest rates ([Exhibit 2](#)).

Exhibit 2: Half of the equity return globally in 2024 has come from valuation expansion reflecting growing optimism in lower interest rates

Global indices YTD return contribution in local currency



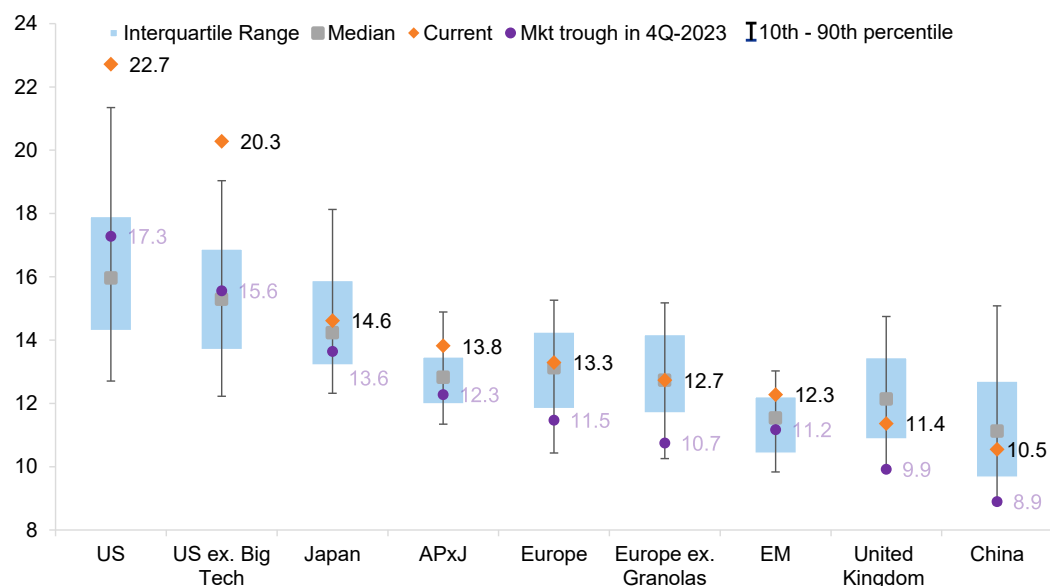
Source: Datastream, Goldman Sachs Global Investment Research

Valuation validation

The expansion of P/E ratios in the current bull market has pushed valuations of equities (as well as credit) to historically high levels, particularly in the US. Outside of the US, while absolute valuations are lower, valuations have increased throughout 2024 (in [Exhibit 3](#) the purple measures the minimum PE ratio in 4Q-2023). Even the weaker economies facing greater structural headwinds (like Europe and China) have seen their stock markets enjoying a sharp re-rating since the Q4 2023 trough, leaving them broadly in line with long-run averages - they are no longer cheap.

Exhibit 3: All regions have experienced a rise in valuations through 2024

12m fwd P/E, MSCI regions; data since 2003



Source: FactSet, Goldman Sachs Global Investment Research

For the US equity market, the 12-month forward PE is well above its previous 20-year high and mean. While this is partly explained by the higher valuation of mega cap technology companies, the US equity market is still trading at close to record valuations even if we exclude these companies. Furthermore, the stretched valuation in the US equity market is reflected across most standard valuation metrics (Exhibit 4), with the median 'absolute valuation metric' in the 97th percentile compared with history.

Exhibit 4: The stretched valuation in the US equity market is reflected across most standard valuation metrics

Data since 1976, unless noted otherwise

Metrics	Aggregate index		Median stock	
	Current	Historical %ile	Current	Historical %ile
EV / sales	3.4	100 %	3.5	97 %
Cash flow yield (CFO)*	5.1 %	100 %	5.8 %	95 %
Price / book*	5.3	99 %	3.7	98 %
EV / EBITDA*	16.5	97 %	13.8	94 %
Forward P/E	22.3	95 %	19.2	95 %
Cyclically adjusted P/E (CAPE)	34.3	96 %	NA	NA
Free cash flow yield*	2.9 %	77 %	3.6 %	63 %
Median absolute metric		97 %		95 %
Yield gap vs. real 10-year UST	240 bp	91 %	310 bp	90 %
Yield gap vs. 10-year UST	6 bp	89 %	76 bp	71 %
Yield gap vs. IG**	-76 bp	88 %	-5 bp	84 %
Median relative metric		89 %		84 %

*data since 1987

**data since 1999

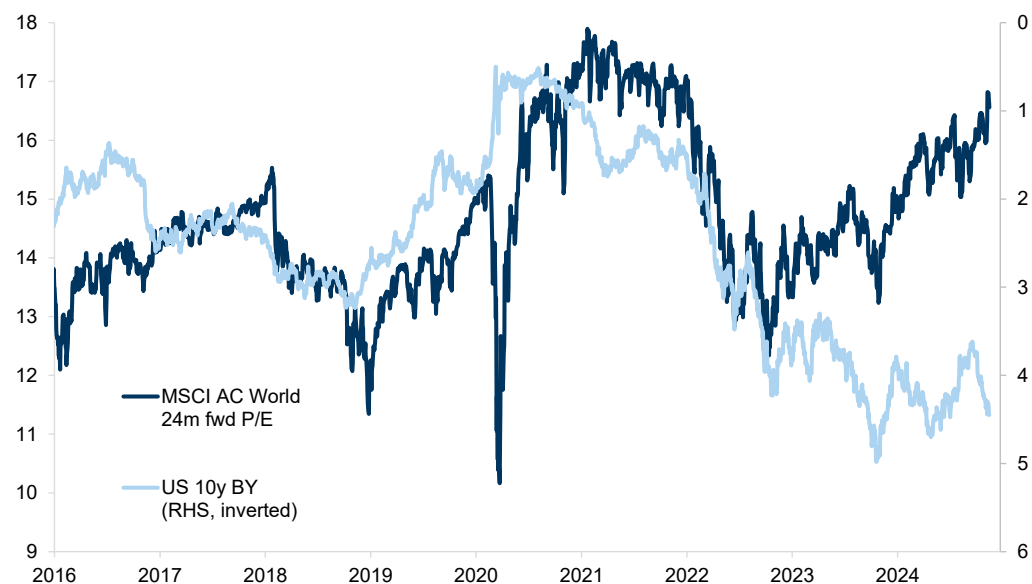
Source: Compustat, Goldman Sachs Global Investment Research

The growth and interest rate mix - priced for perfection

This rise in valuation has, to some extent, been driven and justified by interest rate cuts. Nevertheless, longer-term interest rates have been more sticky, driving a wedge between the 'typical' relationship between bond yields and PE ratios ([Exhibit 5](#)).

Exhibit 5: Long-term interest rates have been rising, driving a wedge between the 'typical' relationship between bond yields and PE ratios

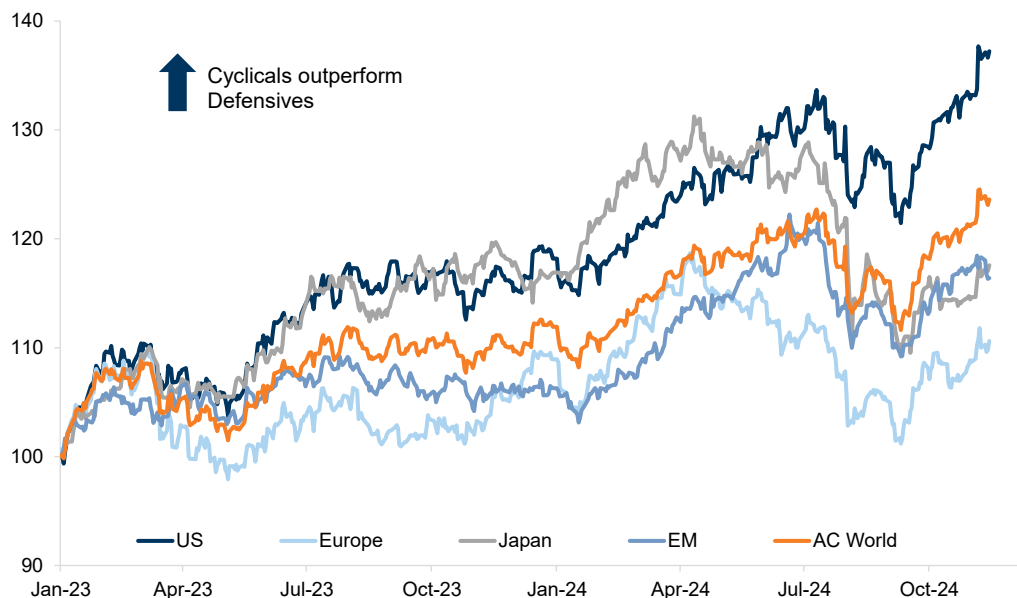
MSCI AC World 24 fwd P/E and US 10y BY (RHS, inverted)



Source: Datastream, Goldman Sachs Global Investment Research

The de-coupling of bond yields and equity valuations implies a fall in the equity risk premium (ERP) which can only be explained by increased confidence in future growth. From a cyclical perspective, this has been reflected in the outperformance of cyclical versus defensive sectors in most regions in recent months, and particularly so in the US ([Exhibit 6](#)).

Exhibit 6: The outperformance of cyclical versus defensive sectors in most regions in recent months, and particularly so in the US, suggests greater confidence in the trajectory of future growth
Cyclicals vs. defensives price performance. Indexed to 100 on 01-Jan 2023



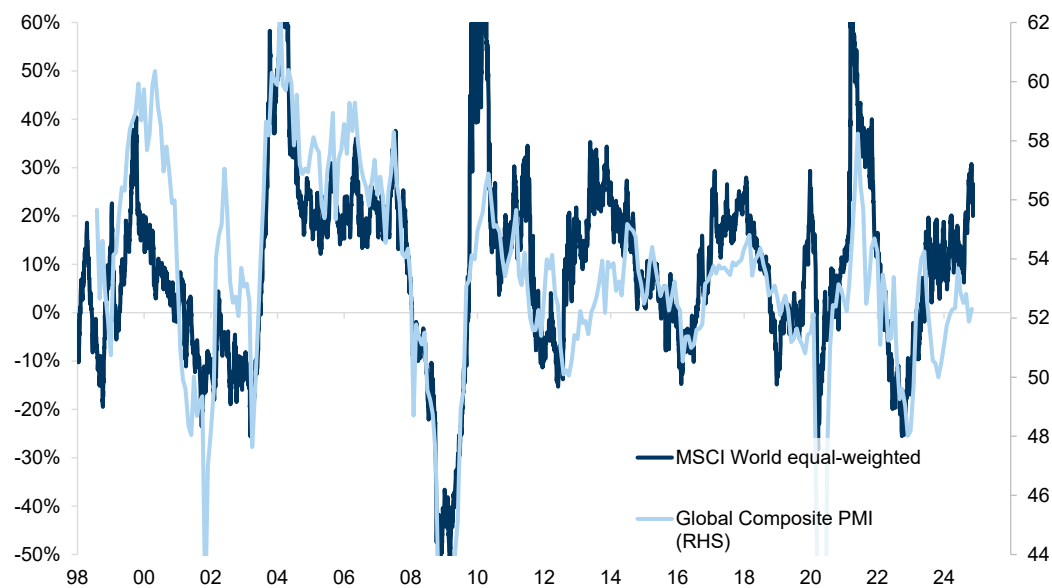
For details on the construction of the indices, please see: Cyclicals vs. Defensives: A global implementation

Source: Datastream, Worldscope, Goldman Sachs Global Investment Research

For much of 2023 and 2024, this growth confidence was particularly elevated in the dominant technology stocks, while others were more subdued. More recently, however, growth optimism has spread beyond the mega cap AI beneficiaries and been reflected in the equal weighted global stock market index ([Exhibit 7](#)). Our economists remain confident about continued growth throughout 2025; for the US, they forecast 2.5% real GDP growth in 2025 compared with a consensus of 1.9%, although they are below consensus in Europe (0.8% compared with a consensus of 1.2%) and see relatively low recession probabilities, particularly in the US. That said, with growth expectations already elevated, there is less room for further optimism, while elevated valuations leave less upside potential for increases in valuation to be a meaningful driver of returns.

Exhibit 7: Stock markets have reflected a broad re-pricing of growth risks

MSCI World equal-weighted y/y returns

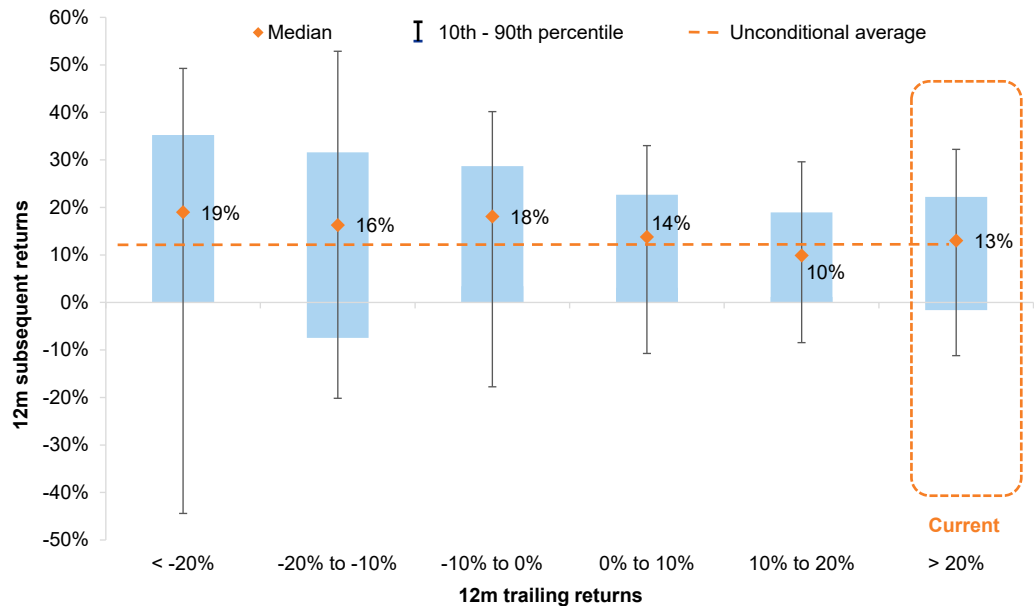


Source: Datastream, Haver Analytics, Goldman Sachs Global Investment Research

Do valuations determine future returns?

The fact that equities have gone up a great deal already does not, in itself, hamper the prospects for further gains from here. As [Exhibit 8](#) shows, taking data back to 1929, the median 1-year forward return in the US equity market does not vary very much based on the past year's performance. That said, the high valuation may have more of an impact on dampening returns.

Exhibit 8: Strong past returns does not imply poor subsequent performance
 1-year forward S&P 500 returns following 1-year trailing returns; history since 1929

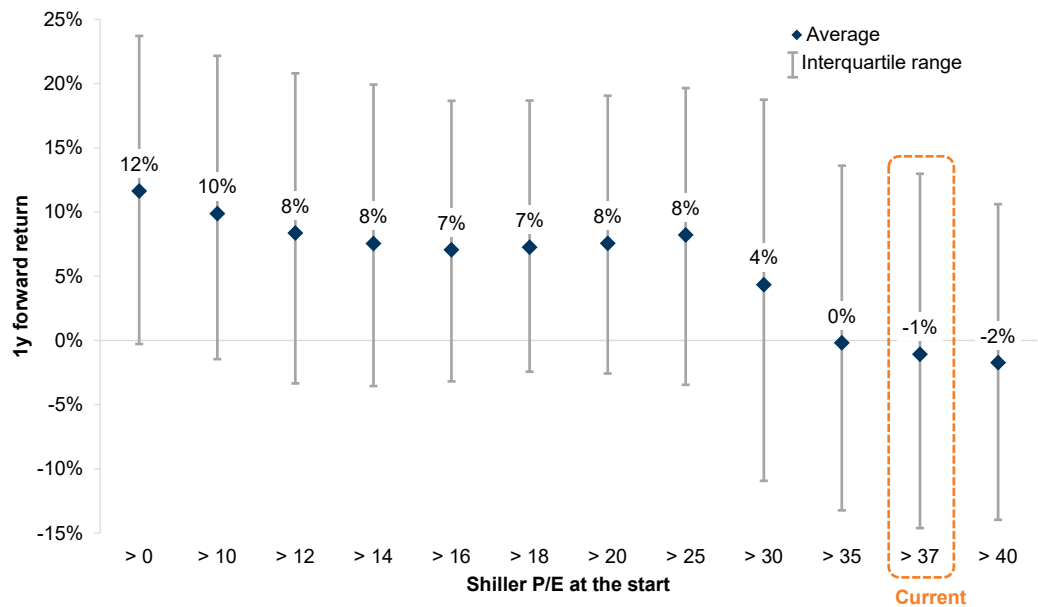


Source: Bloomberg, Datastream, Goldman Sachs Global Investment Research

The current valuation of the equity markets, particularly the US on a ‘Shiller’, or cyclically adjusted earnings basis, is particularly high (Exhibit 9). There have been few historical precedents over the period since 1929; those few that exist suggest poor future returns on a one-year basis.

Exhibit 9: Current valuation of the equity markets on a ‘Shiller’, or cyclically adjusted earnings basis, is particularly high

1-year forward S&P 500 returns conditional on Shiller P/E; history since 1929



Source: Bloomberg, Datastream, Robert Shiller, Goldman Sachs Global Investment Research

Given the high starting point in valuations, the index progress from here will depend to a

great extent on the pace of profit growth. As [Exhibit 10](#) shows, when global equities have a high valuation (currently around 18x), the next 12-month returns are generally only good if earnings revisions are positive. Periods of high valuation and earnings downgrades are typically associated with relatively flat market returns.

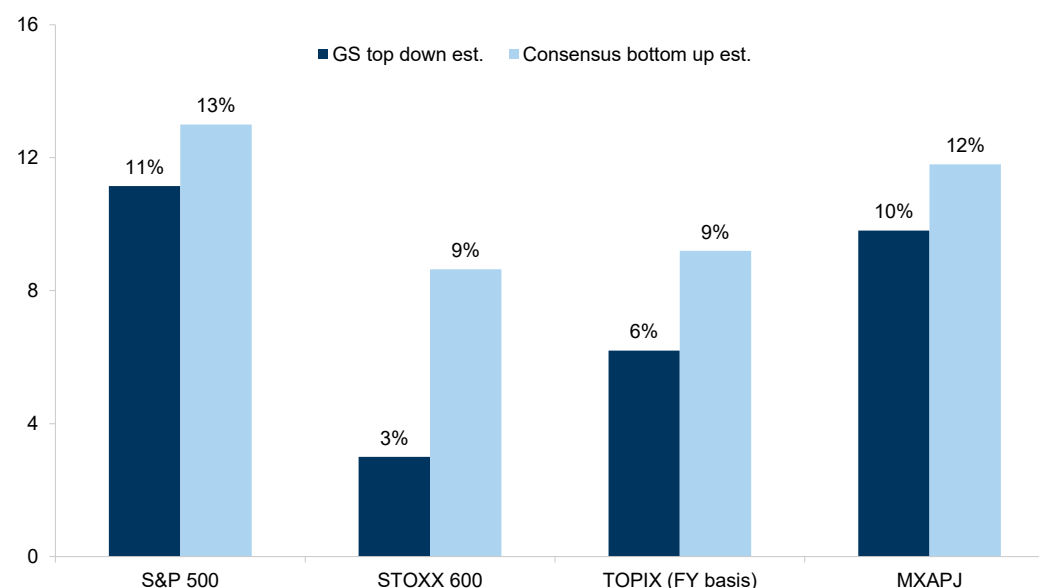
Exhibit 10: When global equities have a high valuation (currently around 18x), the next 12-month returns are generally only good if earnings revisions are positive

MSCI ACWI Forward Return by Starting PE and Forward Earnings (past 20 years)							
Starting PE	# obs	With Upgrades in Earnings			With Downgrades in Earnings		
		3-mo	6-mo	12-mo	3-mo	6-mo	12-mo
Less than 13x	51	6 %	13 %	26 %	(1)%	(0)%	4 %
13x to 14x	32	4 %	9 %	19 %	3 %	3 %	3 %
14x to 15x	64	4 %	6 %	11 %	1 %	2 %	2 %
15x to 16x	46	4 %	9 %	15 %	0 %	1 %	6 %
Greater than 16x	48	3 %	5 %	10 %	(1)%	2 %	(2)%
Aggregate	241	4 %	7 %	14 %	0 %	1 %	3 %

Source: MSCI, FactSet, IBES, Goldman Sachs Global Investment Research

In general, our forecasts point to positive earnings growth but lower than forecast by consensus, largely reflecting our view that margins have peaked in most regions ([Exhibit 11](#)).

Exhibit 11: Our forecasts point to positive earnings growth but lower than forecast by consensus
GS top-down vs. consensus bottom-up estimates of 2025 EPS growth



Source: I/B/E/S, Toyo Keizai, STOXX, MSCI, Goldman Sachs Global Investment Research

With these positive but moderate earnings growth rates, we expect slower index returns than have been experienced in recent months ([Exhibit 12](#)). Over the course of 2025 ([Exhibit 13](#)), for the asset class overall we forecast total US\$ returns of c.10%.

Exhibit 12: Key market forecasts

Data as of November 14, 2024

	Index Level		Price Return		Total Return**	
	Current	12m	Local	USD*	Local	USD*
S&P 500	5949	6500	9%	9%	11%	11%
STOXX Europe 600	507	530	5%	2%	8%	6%
TOPIX	2701	3100	15%	13%	17%	15%
MSCI Asia-Pacific ex Jp (\$)	574	630	10%	10%	12%	12%
Global Equities***	-	-	9%	9%	11%	11%

* GS FX Strategy forecast

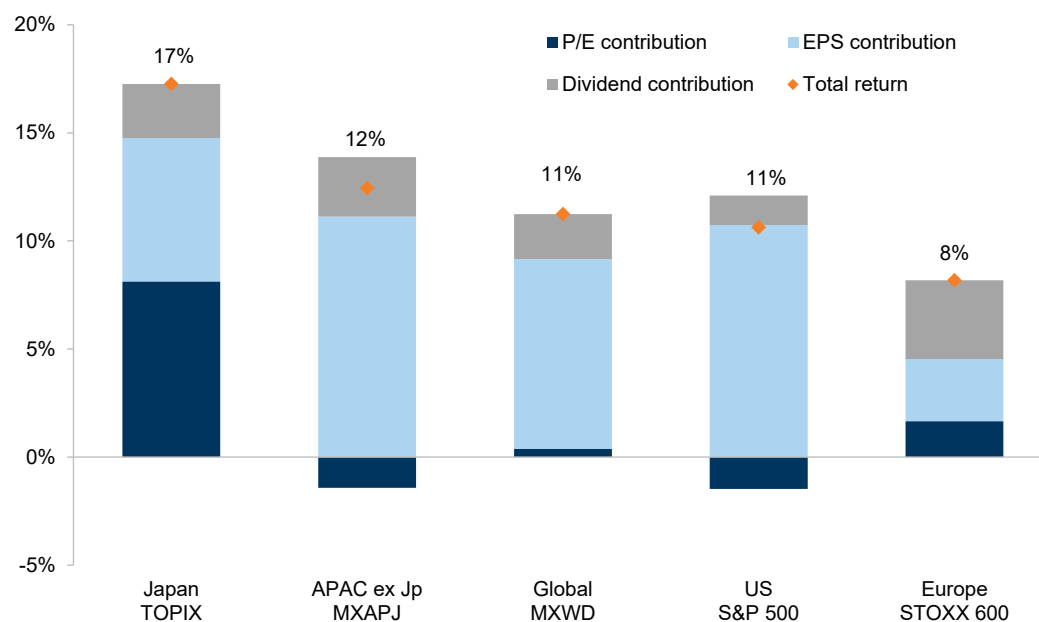
** Consensus 12m fwd Dividend

*** Mkt cap weighted avg of our regional forecasts

Source: Bloomberg, Datastream, FactSet, STOXX, Goldman Sachs Global Investment Research

Exhibit 13: Our expectation is that in most regions, earnings will become the key driver of index returns over the course of 2025

GS 12-month total return forecast (in local currency)



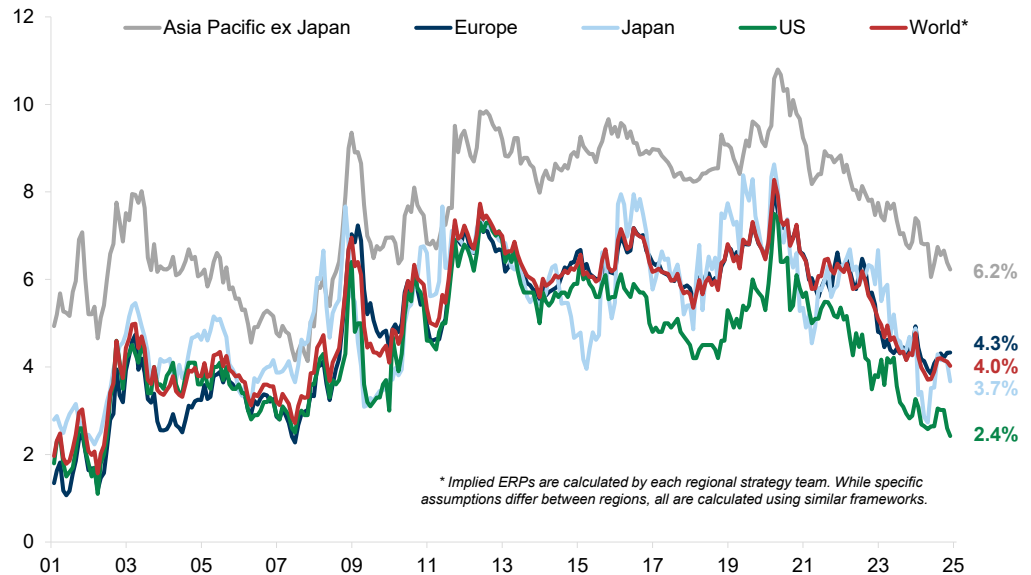
Source: Goldman Sachs Global Investment Research

Navigating the risks

There are two risks in particular that investors face as we approach 2025. The first is that the recent wave of optimism has front loaded returns, leaving them vulnerable to a correction. There are still many unknowns around tariff risks, for example, and the impact on global growth and inflation. While we expect a modest decline in bond yields in 2025, any further rise in bond yields - driven by fiscal pressures - would likely tip the balance for equities given the relatively low ERP ([Exhibit 14](#)).

Exhibit 14: Any further rise in bond yield would likely tip the balance for equities given the relatively low ERP

Global market implied ERP (%)

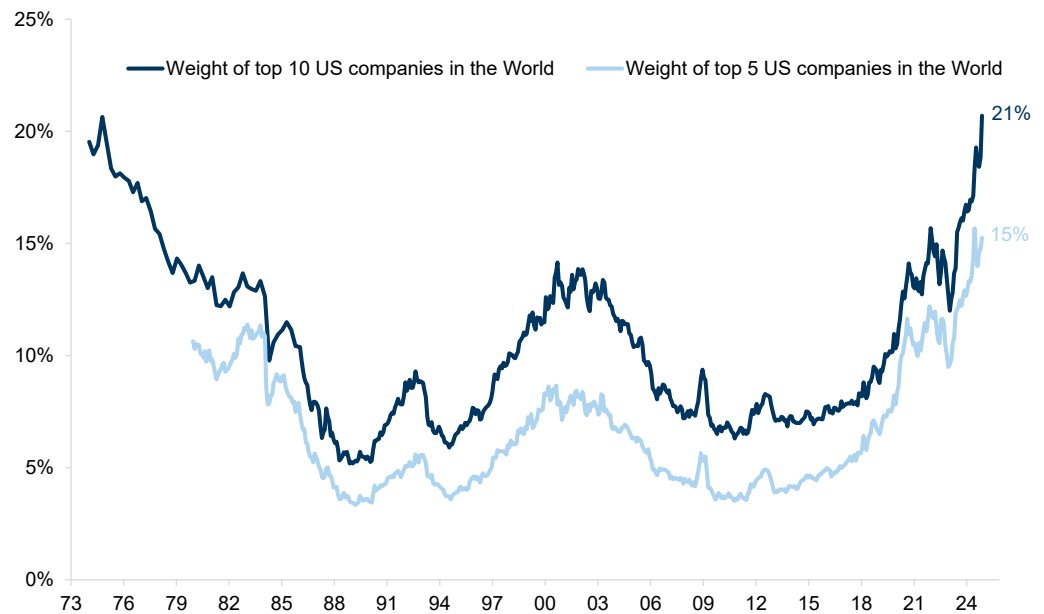


Source: Goldman Sachs Global Investment Research

The second relates to the unusual degree of market concentration. The US equity market is around 70% of the MSCI AC World Index and the biggest 10 US stocks account for over 20% of the entire value of the global index (Exhibit 15).

Exhibit 15: The biggest 10 US stocks account for over 20% of the entire value of the global index

Weight of biggest US companies in global market cap



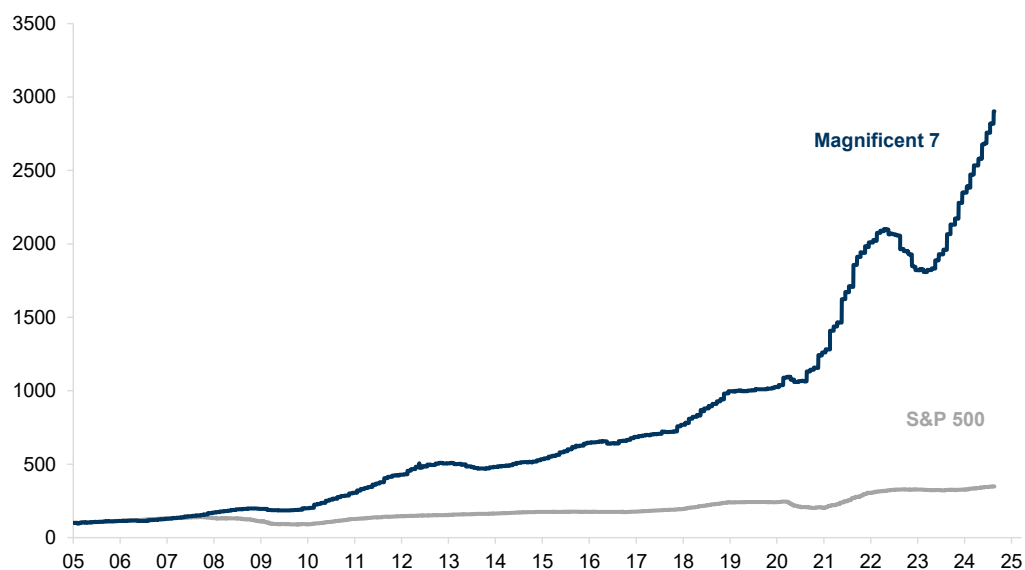
Source: Datastream, Goldman Sachs Global Investment Research

The good news is that the biggest US companies have outperformed the index for good

reason – they have generated much stronger profit growth ([Exhibit 16](#)).

Exhibit 16: The biggest US companies have outperformed the index for good reason – they have generated much stronger profit growth

Magnificent Seven and S&P 500, 12m trailing EPS

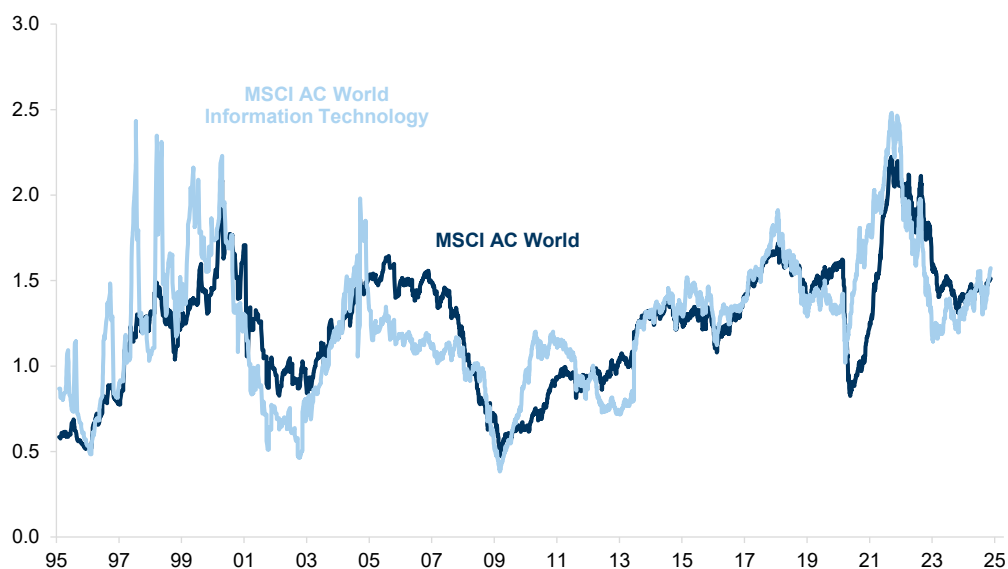


Magnificent 7 is a list of companies including: Meta, Amazon, Apple, Microsoft, Alphabet, Tesla, NVIDIA

Source: Datastream, Goldman Sachs Global Investment Research

This means that their prominence has reflected their premium fundamentals, and has not been driven by excessive valuation. The technology sector, for example, has a PEG ratio (valuation relative to expected growth) which is in line with the rest of the equity complex ([Exhibit 17](#)).

Exhibit 17: The technology sector has a PEG ratio which is in line with the rest of the equity complex
 PEG ratio (12m fwd P/E divided by second 12m EPS growth)



Source: Datastream, Goldman Sachs Global Investment Research

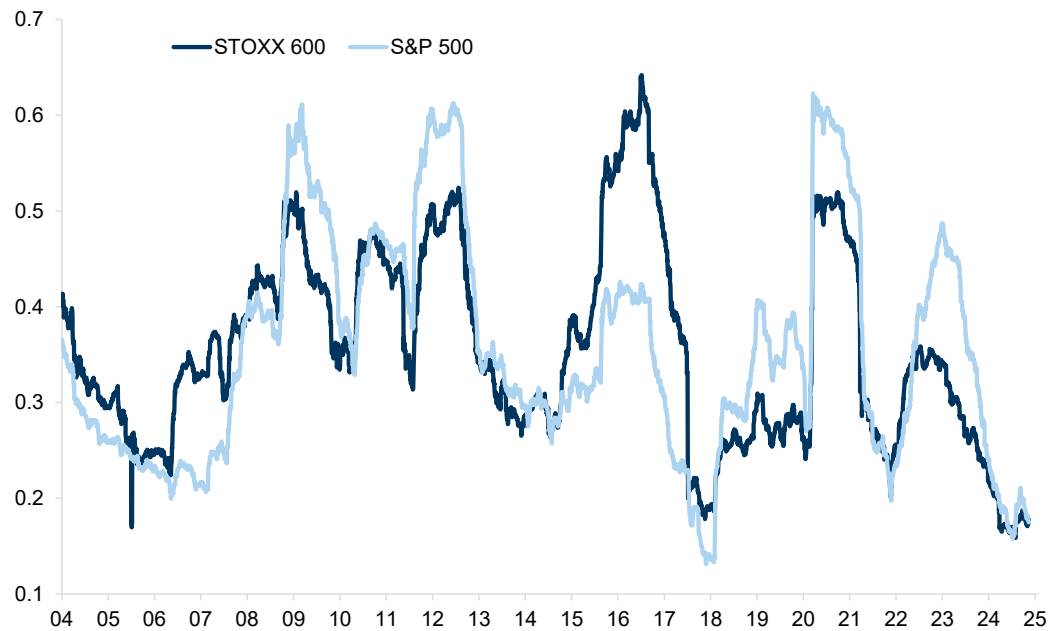
Nonetheless, there are risks when markets become highly concentrated. One risk is reflected in the shift in mega cap technology from being relatively capital-light to capital-intensive. The prospective return on this capital invested is likely to fade. Historically, it has been difficult for any firm to maintain high sales growth and profit margins over sustained periods of time. During the past 40 years, the share of companies that have been able to grow sales at a rate of 20% faded sharply over a decade and only 3% of firms maintained this pace of growth for 10 years. Our US strategists have also emphasized that fewer than 1% of firms maintained EBIT margins of >50% for 10 consecutive years. Despite this historical context, consensus long-term growth expectations for the 10 largest stocks in the S&P 500 are currently in the 99th percentile relative to the past two decades. This is not a reason to underweight large cap technology - we do not think that these companies are in a valuation bubble, but we do think this provides an opportunity for investors to diversify exposure to a greater extent in 2025 in order to enhance risk adjusted returns.

Diversify to amplify

Given that broad equity valuations are full, profit growth is likely to be moderate and markets are highly concentrated, we continue to focus on **diversification and alpha generation**. Pairwise correlations on a 12-month rolling basis have fallen ([Exhibit 18](#)), suggesting a more attractive opportunity set for alpha generation. **What strategies might investors look at?**

Exhibit 18: Pairwise correlations on a 12-month rolling basis have fallen, suggesting a more attractive opportunity set for alpha generation

12m Average Pairwise Correlation



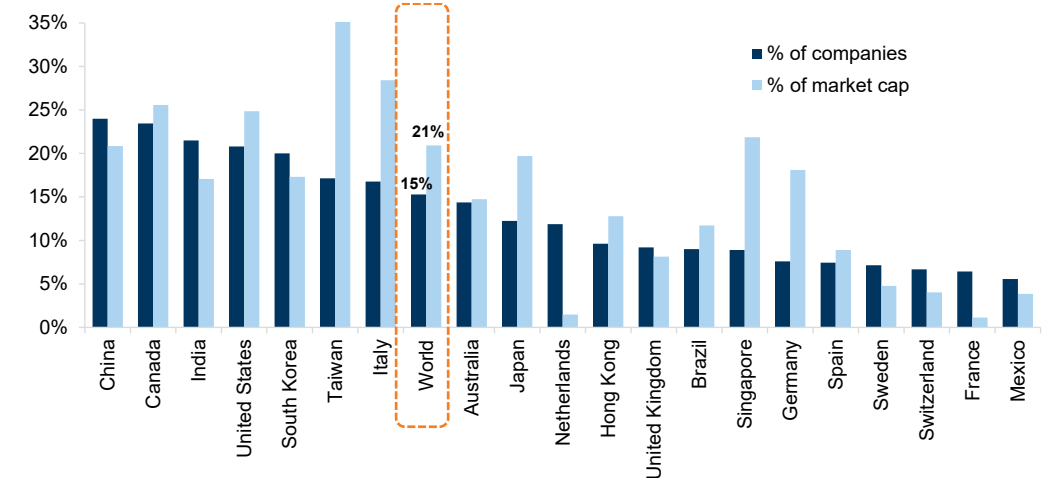
Source: Bloomberg, Goldman Sachs Global Investment Research

1) Broader participation

The reality for portfolio managers is that it has been particularly difficult to outperform mega cap US technology stocks through 2024 with only 15% of companies globally having outperformed the Mag7 in 2024 (Exhibit 19).

Exhibit 19: Only 15% of companies globally have outperformed the Mag7 in 2024

% of companies that did better than the Magnificent 7 in 2024 - World and US exclude the MAG7



Magnificent 7 is a list of companies including: Meta's Facebook, Amazon, Apple, Microsoft, Alphabet's Google, Tesla, NVIDIA

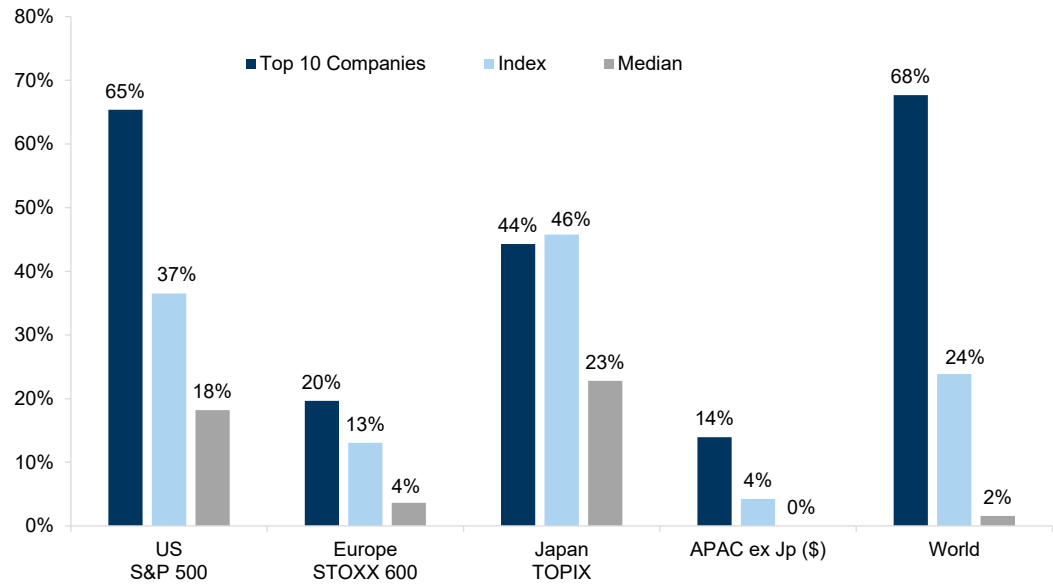
Source: Datastream, Goldman Sachs Global Investment Research

While these companies remain attractive, we believe that investors should broaden their investment universe more than they have been used to in recent years.

During the period of rising interest rates, the largest companies (often with very strong balance sheets) disproportionately boosted returns (Exhibit 20). With the growing trend of lower interest rates, the contribution of index returns should widen out.

Exhibit 20: During the period of rising interest rates, the largest companies (often with very strong balance sheets) disproportionately boosted returns

Total return performance since first Fed hike – March 16, 2022. Local currency, except for Asia Pacific ex. Japan in USD

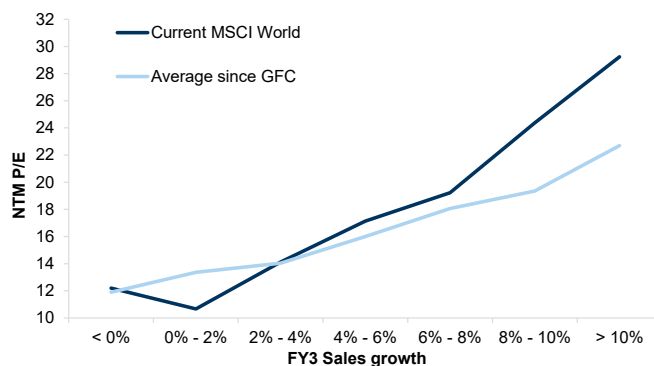


2) Selective Value opportunities

While we like broadening exposure to growth, we also like a bar-bell which includes selected areas of value. Pure growth remains expensive – as [Exhibit 21](#) shows, the premium paid for each unit of additional expected sales growth is higher now than we have seen on average since the global financial crisis. The market has also rewarded higher versus lower revenue generating companies ([Exhibit 22](#)).

Exhibit 21: Premium paid for each unit of additional expected sales growth is higher now than we have seen on average since the global financial crisis

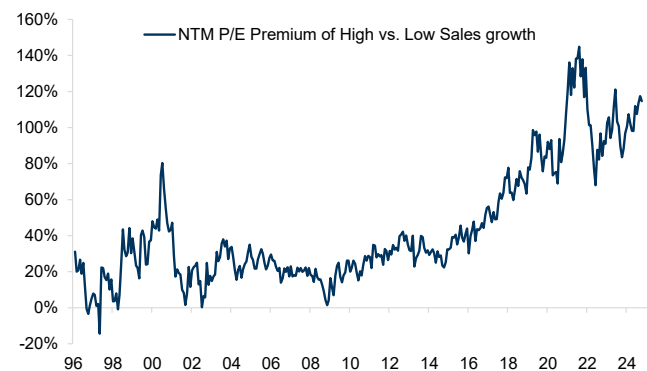
MSCI World: Forecast (FY3) Sales growth and relative NTM PE



Source: Datastream, Goldman Sachs Global Investment Research

Exhibit 22: The market has rewarded higher versus lower revenue generating companies

MSCI World: Premium of High vs. Low Sales growth



MSCI World companies with forecast FY3 Sales growth equal or above 8% (High Sales growth) and equal or below 2% (Low Sales Growth).

Source: Datastream, Goldman Sachs Global Investment Research

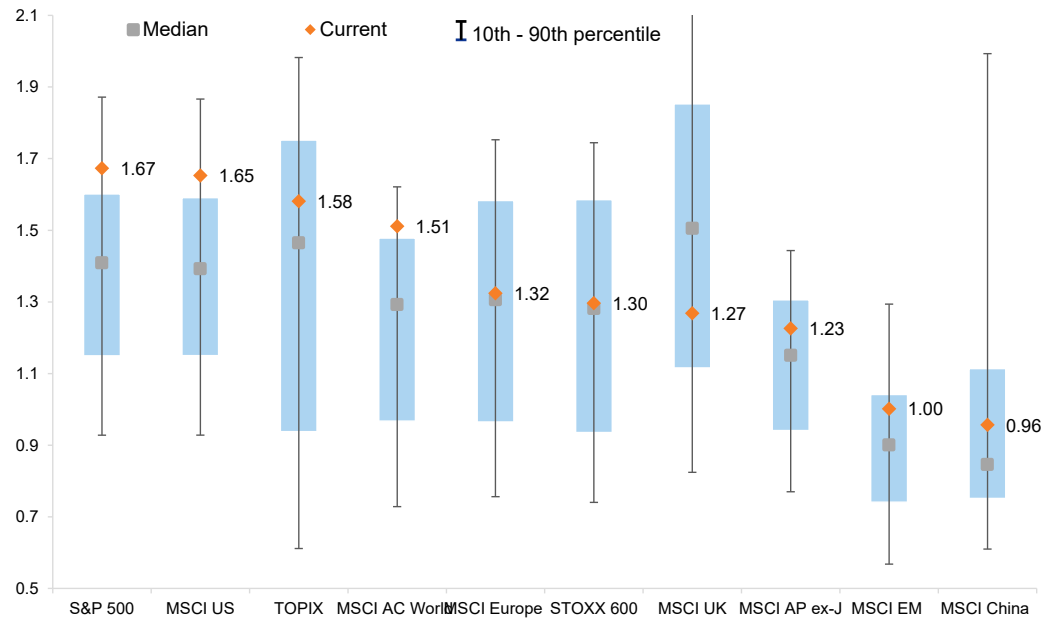
This raises the opportunity to find diversification through selected areas of value where companies are raising shareholder returns.

3) Geographical diversification

To be clear, we are confident about the US economy and like the US equity market. That said, the degree of outperformance and valuation premium leaves selective opportunities for geographical diversification. Most of our equity forecasts are similar from a regional perspective. The highest return forecasts we have is in Japan (where we are overweight), driven by EPS growth rather than multiple expansion, together with the tailwind of a weak yen. Once prospective growth is taken into account, there are pockets of deep value. The UK, selected emerging markets and China all have particularly low PEG ratios ([Exhibit 23](#)). We do not see this, again, as a reason to overweight these markets at the expense of US exposure, but we do see opportunities to find selective undervalued companies in these and other markets.

Exhibit 23: The UK, selected emerging markets and China all have particularly low PEG ratios

PEG ratios (12m fwd P/E divided by second 12m EPS growth), data since 1995 where available

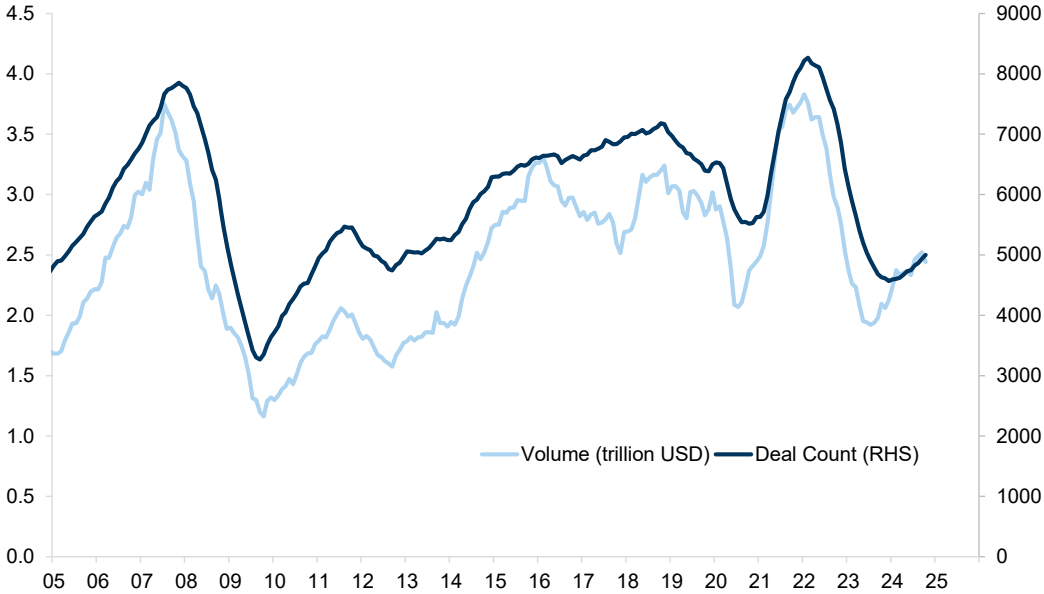


Source: Datastream, FactSet, Goldman Sachs Global Investment Research

4) Capital markets activity

Given the likely push toward de-regulation in the US, and stronger forecast growth, we expect increased capital markets activity. We like to find companies that might be targets of potential M&A.

Exhibit 24: M&A deals globally
Number of deals and volume in USD



Source: Bloomberg, Goldman Sachs Global Investment Research

Disclosure Appendix

Reg AC

We, Peter Oppenheimer, Guillaume Jaisson, Sharon Bell and Lilia Peytavin, 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

MSCI Disclosure

All MSCI data used in this report is the exclusive property of MSCI, Inc. (MSCI). Without prior written permission of MSCI, this information and any other MSCI intellectual property may not be reproduced or disseminated in any form and may not be used to create any financial instruments or products or any indices. This information is provided on an "as is" basis, and the user of this information assumes the entire risk of any use made of this information. Neither MSCI, any of its affiliates nor any third party involved in, or related to, computing or compiling the data makes any express or implied warranties or representations with respect to this information (or the results to be obtained by the use thereof), and MSCI, its affiliates and any such third party hereby expressly disclaim all warranties of originality, accuracy, completeness, merchantability or fitness for a particular purpose with respect to any of this information. Without limiting any of the foregoing, in no event shall MSCI, any of its affiliates or any third party involved in, or related to, computing or compiling the data have any liability for any direct, indirect, special, punitive, consequential or any other damages (including lost profits) even if notified of the possibility of such damages. MSCI and the MSCI indexes are service marks of MSCI and its affiliates. The Global Industry Classification Standard (GICS) were developed by and is the exclusive property of MSCI and Standard & Poor's. GICS is a service mark of MSCI and S&P and has been licensed for use by The Goldman Sachs Group

Equity 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 FICC and Equities. Any Marquee content linked in this report is not necessarily representative of GS Research views. 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 (Sw. 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.

© 2024 Goldman Sachs.

You are permitted to store, display, analyze, modify, reformat, and print the information made available to you via this service only for your own use. You may not resell or reverse engineer this information to calculate or develop any index for disclosure and/or marketing or create any other derivative works or commercial product(s), data or offering(s) without the express written consent of Goldman Sachs. You are not permitted to publish, transmit, or otherwise reproduce this information, in whole or in part, in any format to any third party without the express written consent of Goldman Sachs. This foregoing restriction includes, without limitation, using, extracting, downloading or retrieving this information, in whole or in part, to train or finetune a machine learning or artificial intelligence system, or to provide or reproduce this information, in whole or in part, as a prompt or input to any such system.