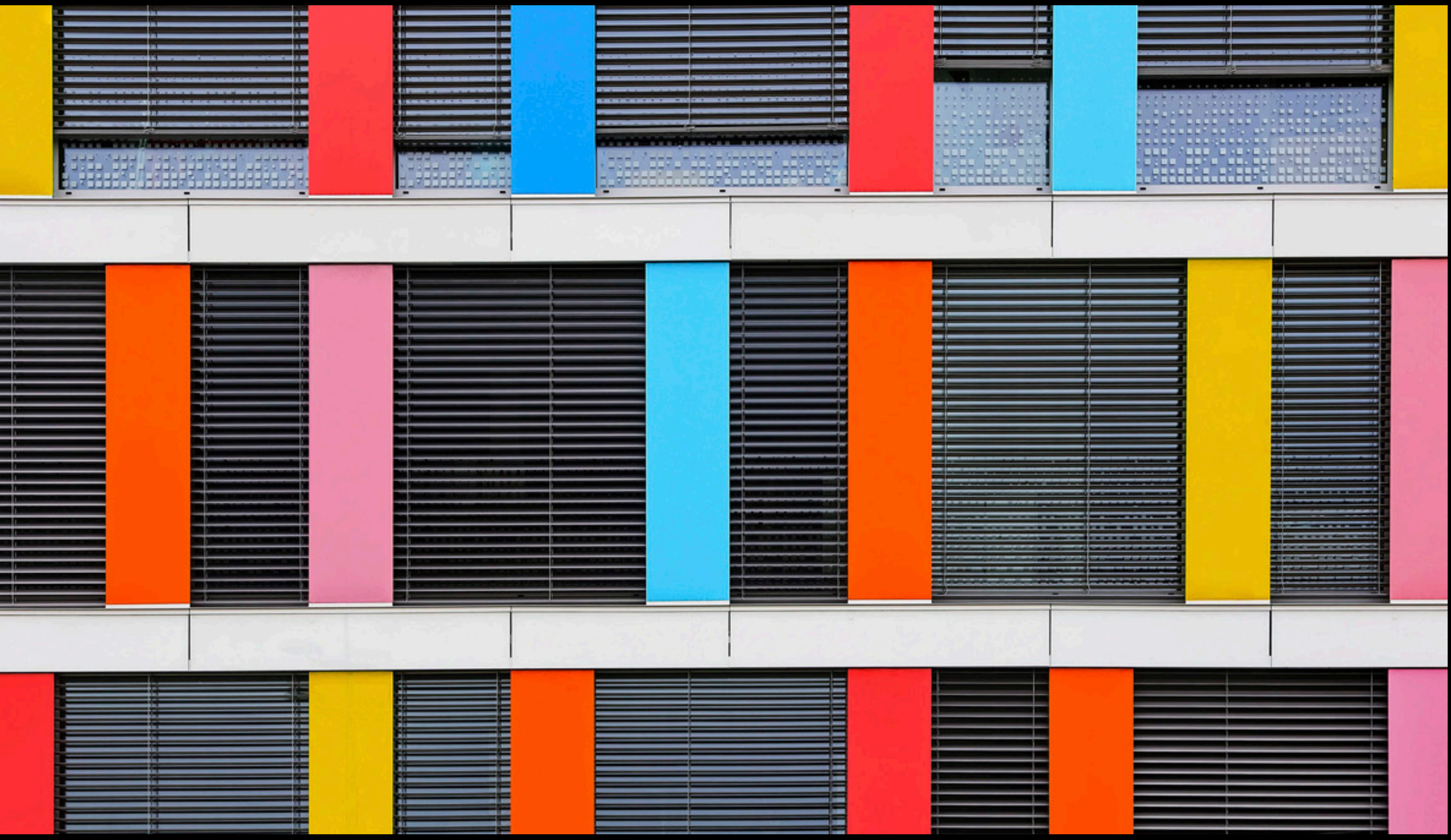
Benchmark concentration and the effects on active portfolios



FOR PROFESSIONAL, INSTITUTIONAL, QUALIFED, WHOLESALE INVESTORS AND PERMITTED, PROFESSIONAL AND QUALIFIED CLIENT USE ONLY – NOT FOR PUBLIC DISTRIBUTION (PLEASE READ IMPORTANT DISCLOSURES)

Authors

Raffaele Savi
Global Head of BlackRock Systematic and Co-CIO of Systematic Active Equities

Jeff Shen, PhD
Co-Head and Co-CIO of Systematic Active Equities

Ronald Kahn, PhD
Global Head of Systematic Active Equities Investment Research

Travis Cooke, CFA
Systematic Active Equities Portfolio Manager and Head of North American Strategies

Alex Montanez
Systematic Active Equities Researcher

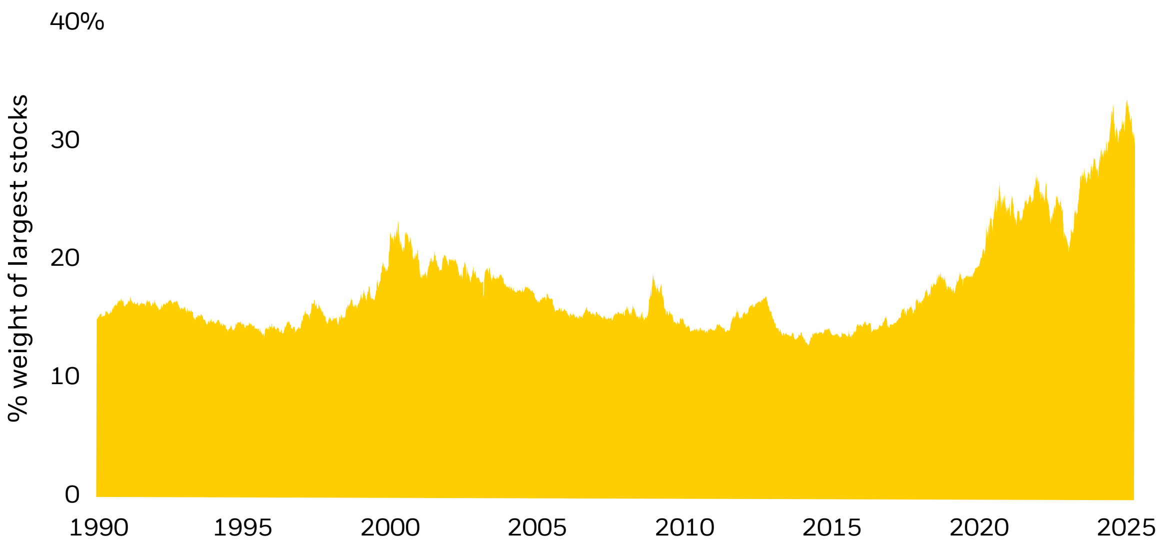
Summary

- Over the last five years, equity market concentration has climbed significantly, meaning a smaller number of stocks have increasingly driven the bulk of the returns within equity markets. For passive investors, increased concentration reduces diversification and increases volatility, leaving major indices more susceptible to the idiosyncratic risks of its largest constituents.
- In this paper, we compare the effect of benchmark concentration across long-only, and partial long-short (i.e., 130/30 and 175/75) portfolios. We simulate hundreds of cross-sectional return forecasts across varying levels of benchmark concentration to measure the effect on forecasted information ratios ("IRs") across various portfolio implementations.
- Overall, we find that partial long-short strategies exhibit a much lower sensitivity to the effects of increased benchmark concentration than long-only strategies.
- Moreover, we find that portable alpha strategies, defined as full long-short equity market neutral with futures overlays, are an attractive way to further insulate portfolios from increased market cap weighted concentration.
- For long-only investors, we find that lower active risk reduces sensitivity to increased market concentration. Furthermore, we find that forecasted IRs can be maintained when benchmark concentration increases.

Introduction

In recent years, the outperformance of the largest firms in equity markets has led to increasingly concentrated market cap weighted benchmarks. In the U.S., for example, the largest seven stocks now make up nearly one-third of the S&P 500 (Figure 1).

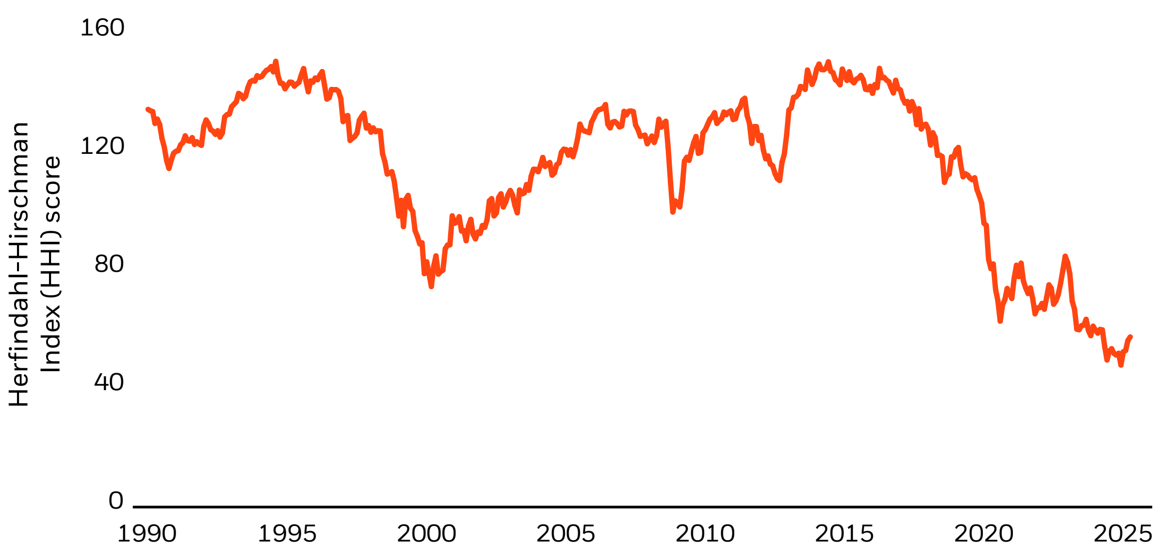
Figure 1: Total weight in the S&P 500 from the seven largest stocks, monthly



Source: BlackRock Systematic, data as of April 2025.

Similarly, the effective breadth of the S&P 500 — a measure which attempts to distill the "effective" number of constituents in an index based on the concentration of the weights — has declined to its lowest point in decades (Figure 2).

Figure 2: Effective breadth of the S&P 500 index



Source: BlackRock Systematic, data as of April 2025.

We define effective breadth as the reciprocal of the sum of the squared benchmark weights (a construct often called the inverse Herfindahl index):

$$EB = \frac{1}{\sum_1^N h_n^2} \quad (1)$$

The term h_n is the benchmark weight and N measures the number of stocks in the benchmark. For an equal-weighted benchmark, $h_n = \frac{1}{N}$, and the effective breadth is N, the maximum possible value for the effective breadth. If the benchmark is extremely concentrated, e.g., $h_1 = 1$ and $h_i = 0$ for $i \neq 1$, then the effective breadth is 1, the minimum possible value. There are many ways to quantify benchmark concentration. For this paper, we will primarily use effective breadth.

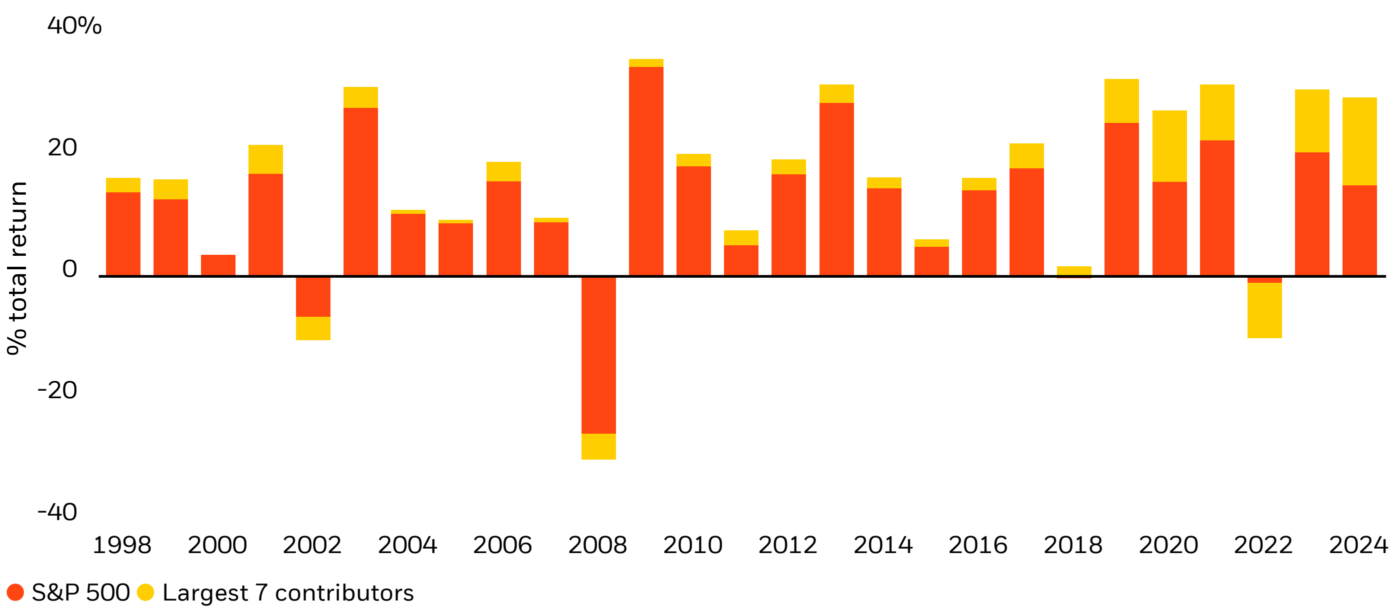
The effect of benchmark concentration on index returns has been similarly dramatic with fewer than 10 stocks frequently driving 25 to 50% of the total return outcome in recent years (Figure 3).

The increasing concentration of cap-weighted equity indices has implications for active managers. This paper examines these effects and evaluates whether certain portfolio construction approaches are more robust to higher concentrated benchmarks. Our goal is to offer insights on how investment managers can adapt their investment processes to maximize the likelihood of index relative outperformance.

We investigate the relationship between active risk and benchmark concentration across three strategies: Long-only, partial long-short, and full long-short implementations. Partial long-short strategies are defined by an aggregate net equity position of 100%, and maximum gross leverage of either 160% (130% long and 30% short) or 250% (175% long and 75% short). Full long-short strategies are characterized by an aggregate net equity exposure of 0% and gross leverage of 600% (300% long and 300% short).[1]

Before moving to our analysis, it's important to briefly review the general impact of long-only and partial long-short constraints on portfolios, without focusing specifically on highly concentrated benchmarks.

Figure 3: Annual return contribution from the largest 7 stocks relative the annual total return, S&P 500



The figures shown relate to past performance. Past performance is not a reliable indicator of current or future results and should not be the sole factor of consideration when selecting a product or strategy. Index performance returns do not reflect any management fees, transaction costs or expenses. Indices are unmanaged and one cannot invest directly in an index. Source: BlackRock Systematic, data as of April 2025.

1 Short positions in portfolios provide greater risk, including the potential for significant unlimited losses.

As described in Grinold and Kahn, we begin with a set of alpha forecasts that are independent of benchmark index weights.[2] Specifically, we assume that these alpha forecasts do not include views on size (i.e., whether large-cap stocks will outperform small-cap stocks, or vice versa). Additionally, we assume that optimal portfolios will be constructed using mean-variance optimization:

$$\textbf{2} \qquad Utility = p_A^T \cdot \alpha - \lambda \cdot p_A^T \cdot V \cdot p_A.$$

In Equation (2), p_A are the active portfolio positions (overweights and underweights), V is the covariance matrix, and λ is a risk-aversion parameter. In the absence of constraints, the portfolio that maximizes the utility (Equation (3)) is:

$$\textbf{3} \qquad p_A = \left(\frac{1}{2\lambda}\right) \cdot V^{-1} \cdot \alpha$$

In Equation (4), w represents the active risk of the portfolio. Notice that without constraints, decreasing risk aversion λ leads to larger overweights and underweights (Equation (3)) resulting in higher active risk (Equation (4)).

$$\textbf{4} \qquad w^2 = p_A^T \cdot V \cdot p_A = \frac{\alpha^T \cdot V^{-1} \cdot \alpha}{4\lambda^2}$$

$$w = \frac{\sqrt{\alpha^T \cdot V^{-1} \cdot \alpha}}{2\lambda}$$

When we introduce a long-only constraint to our optimization, we can no longer derive a general analytic solution as in Equation (3). However, intuitively we can see that our optimal underweights are constrained by the benchmark weights. Specifically:

1. It will be more challenging to implement underweights on small-cap stocks compared to large-cap stocks, although almost all stocks may be affected.

2. The difficulty will increase as we lower risk aversion to achieve higher active risk. Higher active risk involves larger overweights and underweights, making the long-only constraint increasingly impactful as active risk rises.

Additionally, the long-only constraint affects overweights because the overweights and underweights need to balance. Limiting our ability to underweight will, therefore, limit our ability to overweight. We can capture the net effect of this through the transfer coefficient ("TC"), which measures the correlation between the portfolio we can build with constraints[3] and the optimal portfolio (Equation (3)), we could build without constraints. Equivalently, it also measures the reduction in ex-ante information ratio, which is expected active return per unit of active risk, or IR, due to the constraints:

$$\textbf{5} \qquad IR_{\text{constrained}} = TC \cdot IR_{\text{unconstrained}}$$

In our view, long-short portfolios most accurately reflect manager views because they are not constrained by the long-only limitation. While these portfolios are not guaranteed to succeed, as manager views can be incorrect, investors may choose managers based on their expertise and desire portfolios that reflect their views.

The appeal of partial short strategies (e.g., 130/30 or 175/75 strategies) follows the same logic. These strategies relax — but do not eliminate — the constraint on shorting. For instance, 130/30 strategies allow some shorting, but it's limited to 30% of portfolio value. At low levels of active risk, the constraint is not binding, but as active risk increases, the constraint eventually becomes binding.

However, partial short strategies are not directly comparable to long-short strategies, as partial short strategies typically will have market betas close to one and long-short strategies will have market betas close to zero. A closer comparison is between partial short strategies and portable alpha strategies (long-short plus market index). This distinction is important for fund allocators, though it does not impact the analysis in this paper.

Note that partial short strategies enable portfolios to better reflect manager views, even though they are not as flexible as pure long-short strategies. These strategies have been around for more than 15 years, but, in our opinion, their reputation has suffered to unfortunate timing. They gained popularity, particularly among U.S. quantitative investment strategies, just before the financial crisis, when standard quantitative strategies underperformed significantly. During that period, investors would have benefitted from choosing more constrained portfolios. Outside the U.S., these strategies became more popular after the financial crisis. Recently, interest in partial short strategies has been growing in the U.S.[4]

2 Grinold, Richard C., and Ronald N. Kahn. Active Portfolio Management: A Quantitative Approach for Producing Superior Returns and Controlling Risk. 2nd ed. New York: McGraw-Hill, 2000. **3** The transfer coefficient captures the total impact of constraints and costs. We are ignoring costs in this analysis. **4** Duffin, S. "A More Appealing Environment for Equity Long/Short Strategies." Cambridge Associates. February 2025.

Data and methodology

In this analysis, we focus on the expected risk-adjusted return, specifically the forecast information ratio, to compare and draw conclusions from simulated data. To evaluate the effects of benchmark concentration, we create permutations of the current S&P 500 Index weightings by adjusting concentration levels. Starting with the S&P 500 benchmark weights as of April 2024, we compute new asset weights using the following function:

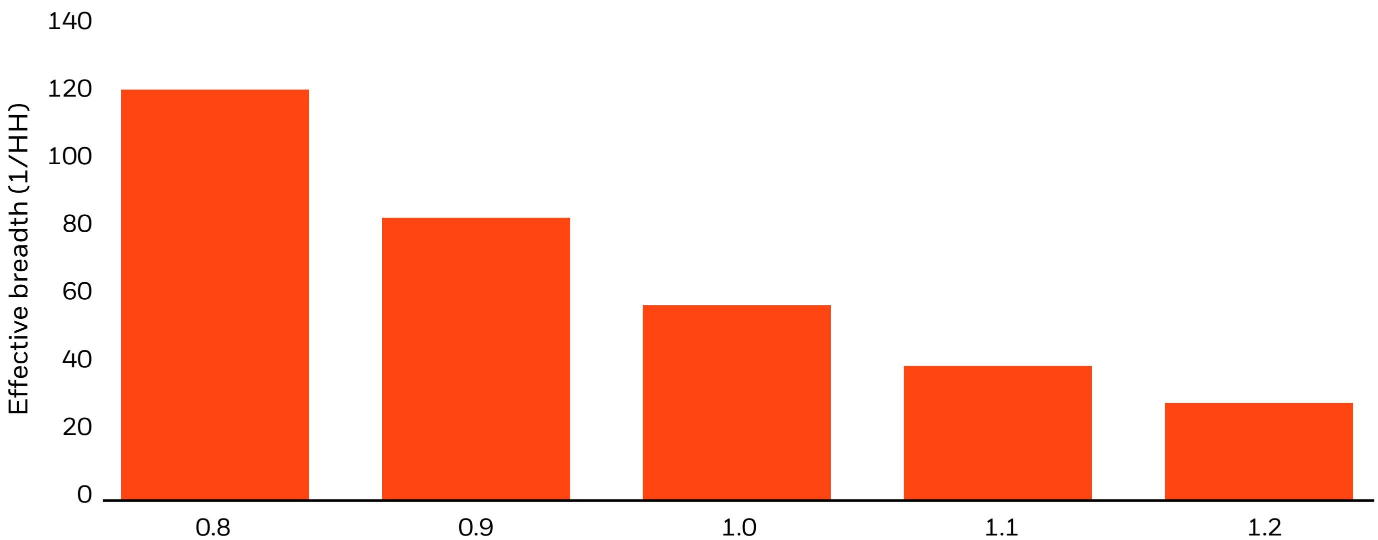
$$h_{n,adjusted} = \frac{h_n^m}{\sum_n h_n^m} \tag{6}$$

In Equation (6), ***m*** is the concentration factor which we vary from 0.8 to 1.2. Values of ***m*** greater than one increase benchmark concentration, while values less than one decrease concentration. This formulation preserves the rank order of the benchmark constituents across the permutations. Figure 4 shows the resulting effective breadth for the S&P 500 at varying values of ***n***.

We conduct single period mean-variance optimizations using simulated return forecasts across various implementations: Long only, partial long/short (130/30 and 175/75), and full long-short market neutral (100% long and 100% short). We measure forecast IRs across different risk and benchmark concentration levels. For these portfolio optimizations, we use the USE4S Barra Risk model, assuming no transaction costs or borrow costs. All portfolios are constructed using data as of April 2024.

The return forecasts are generated using a random distribution of 900 sets of stock-level alphas where each set is normally distributed with a mean of zero and a standard deviation which corresponds to an expected IR of 1.0 in the unconstrained long-short portfolio. Thus, each observation in the proceeding results corresponds to an active risk level, benchmark concentration, and implementation type which are *averaged* over the 900 sampled return forecasts.[5]

Figure 4: Effective breadth of the S&P 500

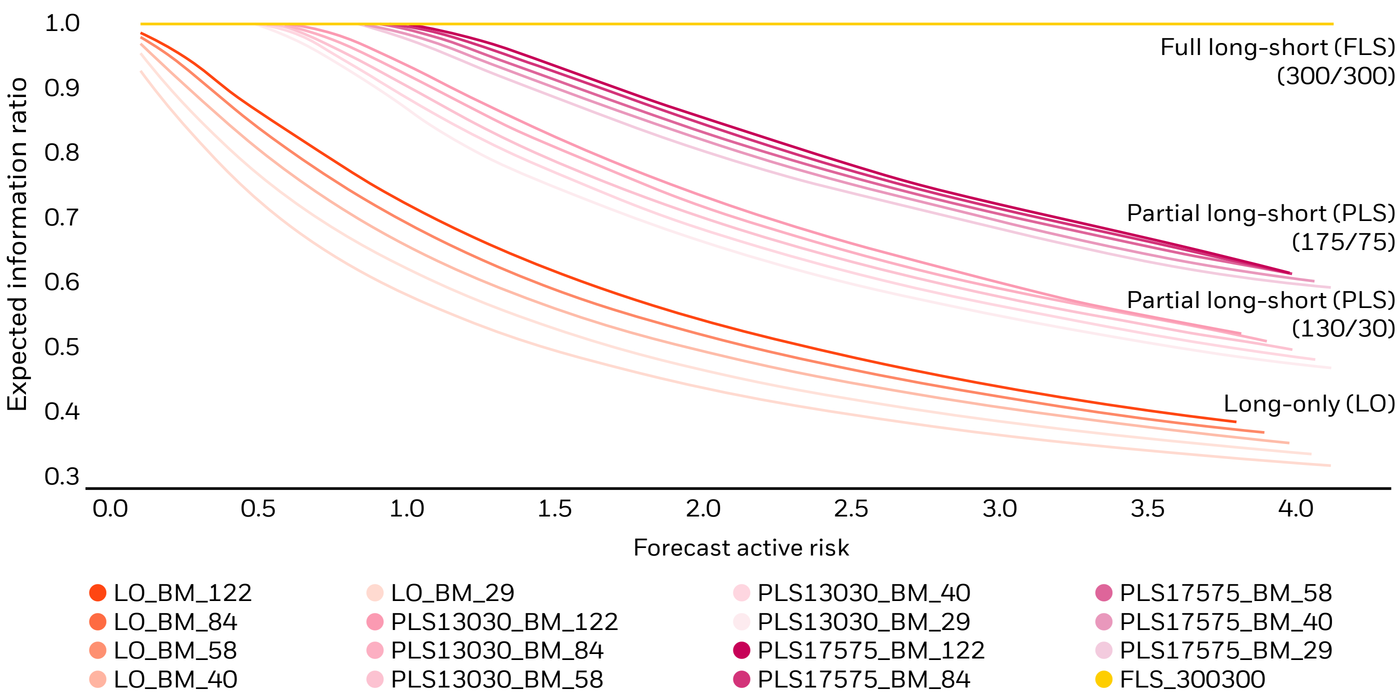


The figures shown relate to past performance. Past performance is not a reliable indicator of current or future results. Index performance returns do not reflect any management fees, transaction costs or expenses. Indices are unmanaged and one cannot invest directly in an index. Source: BlackRock Systematic, data as of April 2024. All analysis as of April 2025.

5 We generate multiple simulations because our random alphas are sometimes easier to implement then other times. For example, in our simulation we may generate negative alphas for the largest stocks. That is easier to implement than if we had positive alphas for the largest stocks. We want to average over all such possibilities.

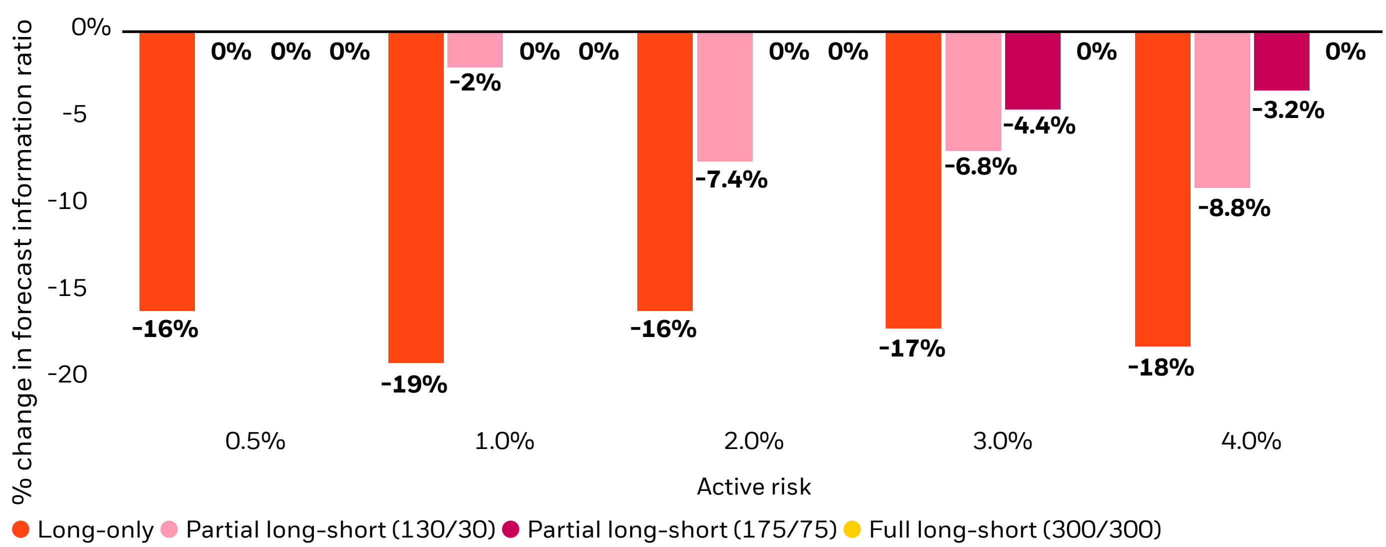
Empirical results and discussion

Figure 5a: Simulation results, model assumed IR = 1.0



BM_## represents benchmark effective breadth level.
Source: BlackRock Systematic, data as of April 2024. All analysis as of April 2025.

Figure 5b: Change in forecast IR when BM effective breadth declines from 122 to 29, assumed model IR = 1.0



Forecasts are based on estimates and assumptions and should not be relied upon as actual results may vary significantly and may not be achieved. The hypothetical performance returns are provided for illustrative purposes only and demonstrated strategy performance and are not meant to be representative of an existing portfolio, product, or actual performance returns of, or to project or predict returns for, any particular investment and does not exist and therefore does not reflect the deduction of any fees or expenses, including advisory, management and performance fees, as well as brokerage fees, commissions and other expenses that might normally apply. There are frequently sharp differences between a hypothetical performance record and the actual record subsequently achieved. In addition, allocation decisions were not made under actual market conditions and cannot completely account for the impact of financial risk. The data was selected with the full benefit of hindsight, after their performance over the period shown was known. Hypothetical performance results are not indicative of future returns. Source: BlackRock Systematic, data as of April 2024. All analysis as of April 2025.

Figure 5a, presents simulation results for an assumed model IR of 1.0 across different implementations (long-only (LO), partial long-short (PLS) at leverage levels of 130/30 and 175/75, and full long-short (FLS) with leverage of 300/300), across various risk levels (from 0.5% to 4.0%), and for a set of benchmark effective breadth levels (ranging 29 to 122). The legend displays the implementation (LO, PLS13030, PLS17575, FLS) and the benchmark effective breadth (from 29 to 122). Thus, each line in the plot represents how the forecast IR evolves with respect to forecast risk for a given level of benchmark effective breadth.

A few things stand out visually from Figure 5a. First, the dispersion of the lines is much wider in the long-only cases and much tighter for the partial long-short cases. This suggests that the sensitivity of the long-only implementation is much higher to benchmark concentration when compared to the partial long-short implementations.

Second, the slope of the long-only lines becomes much steeper as risk falls especially when compared to the partial long-short cases where the slope is relatively constant with respect to risk. The increasing slope of the long-only cases when risk moves from high to low suggests additional returns are earned per unit of risk as forecast risk is decreased.

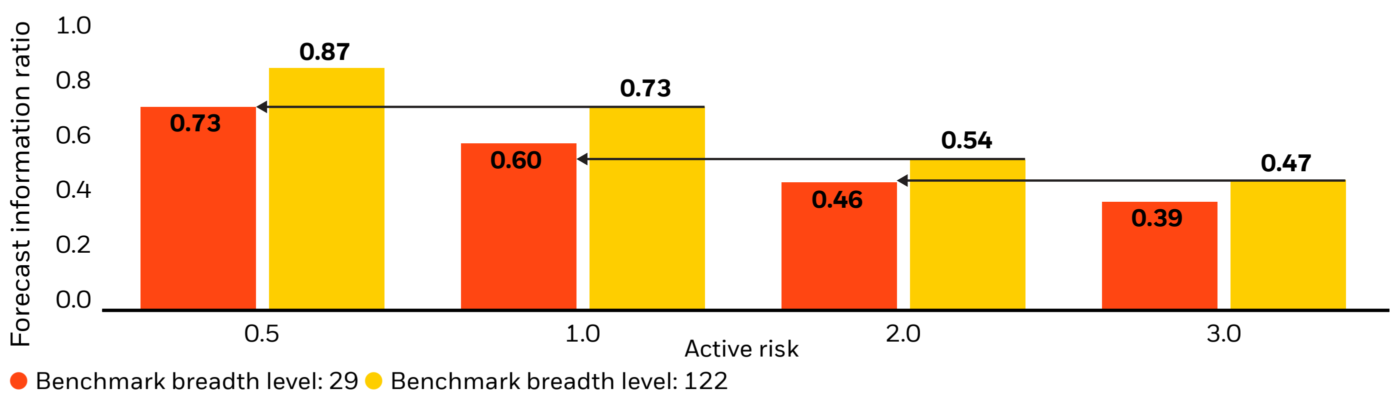
Figure 5b plots the percentage change in IR when benchmark effective breadth drops from 122 to 29 for each of the portfolio implementations. For context, the historical long-run average effective breadth in the SP500 from 1990 to 2020 (shown in Figure 2) is approximately 120, while average effective breadth post-2020 has been roughly 60. Thus, an effective breadth from 122 to 29 a doubling and halving of post-2020 effective breadth levels.

From Figure 5b, at 1.0% active risk, the forecast IR drops by -19% in the long-only implementation when the benchmark breadth drops from 122 to 29. In contrast, the partial long-short 130/130, partial long-short 175/175 and full long-short simulations show declines of -2.0%, 0.0%, and 0.0%, respectively. Therefore, a long-only strategy aiming to generate **100 bps** of excess return above the benchmark at a benchmark breadth is 122 is expected to generate **81 bps** when the benchmark breadth drops to 29. Conversely, at the 1% risk level, the partial long-short and full long-short strategies are expected to generate 98 bps and 100 bps, respectively, demonstrating greater resilience to the decline in effective benchmark breadth.

For long-only investors, reducing active risk may help maintain the portfolio's expected IR when benchmarks become more concentrated. As shown in Figure 6, at a 3% active risk level with a benchmark effective breadth of 122, the expected IR is 0.47. This is roughly equivalent to the expected IR at a 2% risk level when benchmark breadth drops to 29. Conversely, if the risk level remains at 3%, the IR declines to 0.39 when the benchmark breadth drops to 29.

Similarly, if the S&P 500 becomes twice as concentrated compared to 2024 levels, the expected IR in long-only strategies may be maintained by halving active risk.

Figure 6: Forecast IR by active risk and effective benchmark breadth long-only



Forecasts are based on estimates and assumptions and should not be relied upon as actual results may vary significantly and may not be achieved. The hypothetical performance returns are provided for illustrative purposes only and demonstrated strategy performance and are not meant to be representative of an existing portfolio, product, or actual performance returns of, or to project or predict returns for, any particular investment and does not exist and therefore does not reflect the deduction of any fees or expenses, including advisory, management and performance fees, as well as brokerage fees, commissions and other expenses that might normally apply. There are frequently sharp differences between a hypothetical performance record and the actual record subsequently achieved. In addition, allocation decisions were not made under actual market conditions and cannot completely account for the impact of financial risk. The data was selected with the full benefit of hindsight, after their performance over the period shown was known. Hypothetical performance results are not indicative of future returns. Source: BlackRock Systematic, data as of April 2024. All analysis as of April 2025.

Conclusion

This study's findings underscore the significant impact of benchmark concentration on portfolio expectations and the robustness of various investment approaches. As benchmarks become more concentrated, maintaining consistent information ratios ("IRs") becomes more challenging, especially for long-only portfolios. To counteract the effects of rising benchmark concentration, reducing risk levels in long-only portfolios adopting partial long-short strategies can be effective.

Our simulations demonstrate that:

1. **Partial long-short portfolios are more robust**
   Partial long-short (130/30) implementations show greater resilience to increased benchmark concentration compared to long-only portfolios. The sensitivity of forecast IRs to changes in benchmark breadth is significantly lower for partial long-short strategies, making them a preferred choice for investment managers seeking consistent risk-adjusted returns.

2. **Portable alpha strategies are attractive for flexible investors**
   Full long-short market neutral strategies, when combined with index futures, can generate alpha independently of equity benchmark concentration effects.

3. **Active risk adjustments for long-only investors**
   For long-only investors who cannot implement partial long-short strategies, adjusting active risk levels is crucial. Reducing risk levels as benchmark concentration increases helps maintain consistent IR levels. This approach is particularly important as sensitivity to benchmark concentration effects is amplified at lower active risk levels.

These insights provide valuable guidance for investment managers in adapting their portfolio construction approaches in the face of increasingly concentrated benchmarks. By leveraging partial long-short implementations or carefully managing risk levels, managers can better position themselves seeking to achieve consistent outperformance relative to concentrated indices.

BSYSM0625U/M-4595724-10/13

For investors in Italy: This document is marketing material: Before investing please read the Prospectus and the PRIIPs KID available on www.blackrock.com/it, which contain a summary of investors' rights.

Risk warnings

Capital at risk. The value of investments and the income from them can fall as well as rise and are not guaranteed. Investors may not get back the amount originally invested.

Past performance is not a reliable indicator of current or future results and should not be the sole factor of consideration when selecting a product or strategy.

Changes in the rates of exchange between currencies may cause the value of investments to diminish or increase. Fluctuation may be particularly marked in the case of a higher volatility fund and the value of an investment may fall suddenly and substantially. Levels and basis of taxation may change from time to time and depend on personal individual circumstances.

Important information

This material is for distribution to Professional Clients (as defined by the Financial Conduct Authority or MiFID Rules) only and should not be relied upon by any other persons.

This document is marketing material.

In the U.S., this material is For Institutional Use Only. Not For Public Distribution.

In Canada, this material is intended for permitted clients as defined under Canadian securities law, is for educational purposes only, does not constitute investment advice and should not be construed as a solicitation or offering of units of any fund or other security in any jurisdiction.

In the UK and Non-European Economic Area (EEA) countries: This is issued by BlackRock Investment Management (UK) Limited, authorised and regulated by the Financial Conduct Authority. Registered office: 12 Throgmorton Avenue, London, EC2N 2DL. Tel: +44 (0)20 7743 3000. Registered in England and Wales No. 02020394. For your protection telephone calls are usually recorded. Please refer to the Financial Conduct Authority website for a list of authorised activities conducted by BlackRock.

In the European Economic Area (EEA): This is issued by BlackRock (Netherlands) B.V. is authorised and regulated by the Netherlands Authority for the Financial Markets. Registered office Amstelplein 1, 1096 HA, Amsterdam, Tel: 020-549-5200, Tel: 31-20-549-5200. Trade Register No. 17068311. For your protection telephone calls are usually recorded.

In Italy: For information on investor rights and how to raise complaints please go to https://www.blackrock.com/corporate/compliance/investor-right available in Italian.

BlackRock Advisors (UK) Limited-Dubai Branch is a DIFC Foreign Recognised Company registered with the DIFC Registrar of Companies (DIFC Registered Number 546), with its office at Unit L15-01A, ICD Brookfield Place, Dubai International Finullcial Centre, PO Box 506661, Dubai, UAE, and is regulated by the DFSA to engage in the regulated activities of 'Advising on Finullcial Products' and 'Arranging Deals in Investments' in or from the DIFC, both of which are limited to units in a collective investment fund (DFSA Reference Number F000738).

In Bahrain, Dubai (DIFC), Kingdom of Saudi Arabia, Kuwait, Oman, Qatar & United Arab Emirates (UAE) (excluding the Dubai International Financial Centre (DIFC) and the Abu Dhabi Global Market (ADGM)): The information contained in this document, does not constitute and should not be construed as an offer of, invitation or proposal to make an offer for, recommendation to apply for or an opinion or guidance on a financial product, service and/or strategy. Whilst great care has been taken to ensure that the information contained in this document is accurate, no responsibility can be accepted for any errors, mistakes or omissions or for any action taken in reliance thereon. You may only reproduce, circulate and use this document (or any part of it) with the consent of BlackRock.

The information contained in this document is for information purposes only. It is not intended for and should not be distributed to, or relied upon by, members of the public. The information contained in this document, may contain statements that are not purely historical in nature but are "forward-looking statements." These include, amongst other things, projections, forecasts or estimates of income. These forward-looking statements are based upon certain assumptions, some of which are described in other relevant documents or materials. If you do not understand the contents of this document, you should consult an authorised financial adviser.

In DIFC: The information contained in this document is intended strictly for Professional Clients as defined under the Dubai Finullcial Services Authority ("DFSA") Conduct of Business (COB) Rules.

In Bahrain, Oman, & Qatar: The information contained in this document is intended strictly for sophisticated institutions.

In Kuwait: The information contained in this document is intended strictly for sophisticated institutions that are 'Professional Clients' as defined under the Kuwait Capital Markets Law and its Executive Bylaws.

In the Kingdom of Saudi Arabia: This material is for distribution to Institutional and Qualified Clients (as defined by the Implementing Regulations issued by Capital Market Authority) only and should not be relied upon by any other persons.

In United Arab Emirates (UAE) (excluding the Dubai International Financial Centre (DIFC) and the Abu Dhabi Global Market (ADGM)): The information contained in this document is intended strictly for Professional Investors.

In Israel: BlackRock Investment Management (UK) Limited is not licenced under Israel's Regulation of Investment Advice, Investment Marketing and Portfolio Management Law, 5755-1995 (the "Advice Law"), nor does it carry insurance thereunder.

For Qualified Investors in Switzerland: This document shall be exclusively made available to, and directed at, qualified investors as defined in Article 10 (3) of the CISA of 23 June 2006, as amended, at the exclusion of qualified investors with an opting-out pursuant to Art. 5 (1) of the Swiss Federal Act on Financial Services ("FinSA"). For information on Art. 8/9 Financial Services Act (FinSA) and on your client segmentation under Art. 4 FinSA, please see the following website: www.blackrock.com/finsa.

In South Africa: Please be advised that BlackRock Investment Management (UK) Limited is an authorised Financial Services provider with the South African Financial Services Conduct Authority, FSP No. 43288.

In China, this material may not be distributed to individuals resident in the People's Republic of China ("PRC," for such purposes, not applicable to Hong Kong, Macau and Taiwan) or entities registered in the PRC unless such parties have received all the required PRC government approvals to participate in any investment or receive any investment advisory or investment management services.

In South Korea, this information is issued by BlackRock Investment (Korea) Limited. This material is for distribution to the Qualified Professional Investors (as defined in the Financial Investment Services and Capital Market Act and its sub-regulations) and for information or educational purposes only, and does not constitute investment advice or an offer or solicitation to purchase or sells in any securities or any investment strategies.

In Taiwan, independently operated by BlackRock Investment Management (Taiwan) Limited. Address: 28F., No. 100, Songren Rd., Xinyi Dist., Taipei City 110, Taiwan. Tel: (02)23261600.

In Australia & New Zealand, issued by BlackRock Investment Management (Australia) Limited ABN 13 006 165 975, AFSL 230 523 (BIMAL) for the exclusive use of the recipient, who warrants by receipt of this material that they are a wholesale client as defined under the Australian Corporations Act 2001 (Cth) and the New Zealand Financial Advisers Act 2008 respectively.

BlackRock Investment Management (Australia) Limited ("BIMAL") is not licensed by a New Zealand regulator to provide 'Financial Advice Service' or 'Keeping, investing, administering, or managing money, securities, or investment portfolios on behalf of other persons.' BIMAL's registration on the New Zealand register of financial service providers does not mean that BIMAL is subject to active regulation or oversight by a New Zealand regulator.

This material provides general information only and does not take into account your individual objectives, financial situation, needs or circumstances. Before making any investment decision, you should therefore assess whether the material is appropriate for you and obtain financial advice tailored to you having regard to your individual objectives, financial situation, needs and circumstances. Refer to BIMAL's Financial Services Guide on its website for more information. This material is not a financial product recommendation or an offer or solicitation with respect to the purchase or sale of any financial product in any jurisdiction.

This material is not intended for distribution to, or use by, any person or entity in any jurisdiction or country where such distribution or use would be contrary to local law or regulation. BIMAL is a part of the global BlackRock Group which comprises of financial product issuers and investment managers around the world. BIMAL is the issuer of financial products and acts as an investment manager in Australia. BIMAL does not offer financial products to persons in New Zealand who are retail investors (as that term is defined in the Financial Markets Conduct Act 2013 (FMCA)). This material does not constitute or relate to such an offer. To the extent that this material does constitute or relate to such an offer of financial products, the offer is only made to, and capable of acceptance by, persons in New Zealand who are wholesale investors (as that term is defined in the FMCA).

BIMAL, its officers, employees and agents believe that the information in this material and the sources on which it is based (which may be sourced from third parties) are correct as at the date of publication. While every care has been taken in the preparation of this material, no warranty of accuracy or reliability is given and no responsibility for the information is accepted by BIMAL, its officers, employees or agents. Except where contrary to law, BIMAL excludes all liability for this information. No part of this material may be reproduced or distributed in any manner without the prior written permission of BIMAL.

In Singapore, this is issued by BlackRock (Singapore) Limited (Co. registration no. 200010143N) for use only with institutional investors as defined in Section 4A of the Securities and Futures Act, Chapter 289 of Singapore. This advertisement or publication has not been reviewed by the Monetary Authority of Singapore.

In Hong Kong, this material is issued by BlackRock Asset Management North Asia Limited and has not been reviewed by the Securities and Futures Commission of Hong Kong. This material is for distribution to "Professional Investors" (as defined in the Securities and Futures Ordinance (Cap.571 of the laws of Hong Kong) and any rules made under that ordinance.) and should not be relied upon by any other persons or redistributed to retail clients in Hong Kong.

For Southeast Asia: This document is issued by BlackRock and is intended for the exclusive use of any recipient who warrants, by receipt of this material, that such recipient is an institutional investors or professional/sophisticated/qualified/accredited/expert investor as such term may apply under the relevant legislations in Southeast Asia (**for such purposes, includes only Malaysia, the Philippines, Thailand, Brunei and Indonesia**). BlackRock does not hold any regulatory licenses or registrations in Southeast Asia countries listed above, and is therefore not licensed to conduct any regulated business activity under the relevant laws and regulations as they apply to any entity intending to carry on business in Southeast Asia, nor does BlackRock purport to carry on, any regulated activity in any country in Southeast Asia. BlackRock funds, and/or services shall not be offered or sold to any person in any jurisdiction in which such an offer, solicitation, purchase, or sale would be deemed unlawful under the securities laws or any other relevant laws of such jurisdiction(s).

This material is provided to the recipient on a strictly confidential basis and is intended for informational or educational purposes only. Nothing in this document, directly or indirectly, represents to you that BlackRock will provide, or is providing BlackRock products or services to the recipient, or is making available, inviting, or offering for subscription or purchase, or invitation to subscribe for or purchase, or sale, of any BlackRock fund, or interests therein. This material neither constitutes an offer to enter into an investment agreement with the recipient of this document, nor is it an invitation to respond to it by making an offer to enter into an investment agreement.

The distribution of the information contained herein may be restricted by law and any person who accesses it is required to comply with any such restrictions. By reading this information you confirm that you are aware of the laws in your own jurisdiction regarding the provision and sale of funds and related financial services or products, and you warrant and represent that you will not pass on or utilize the information contained herein in a manner that could constitute a breach of such laws by BlackRock, its affiliates or any other person.

For Other Countries in APAC: This material is provided for your informational purposes only and must not be distributed to any other persons or redistributed. This material is issued for Institutional Investors only (or professional/sophisticated/qualified investors as such term may apply in local jurisdictions) and does not constitute investment advice or an offer or solicitation to purchase or sell in any securities, BlackRock funds or any investment strategy nor shall any securities be offered or sold to any person in any jurisdiction in which an offer, solicitation, purchase or sale would be unlawful under the securities laws of such jurisdiction.

Any research in this document has been procured and may have been acted on by BlackRock for its own purpose. The results of such research are being made available only incidentally. The views expressed do not constitute investment or any other advice and are subject to change. They do not necessarily reflect the views of any company in the BlackRock Group or any part thereof and no assurances are made as to their accuracy.

This document is for information purposes only and does not constitute an offer or invitation to anyone to invest in any BlackRock funds and has not been prepared in connection with any such offer.

In Latin America, for institutional investors and financial intermediaries only (not for public distribution). This material is for educational purposes only and does not constitute investment advice or an offer or solicitation to sell or a solicitation of an offer to buy any shares of any fund or security and it is your responsibility to inform yourself of, and to observe, all applicable laws and regulations of your relevant jurisdiction. If any funds are mentioned or inferred in this material, such funds may not been registered with the securities regulators of Argentina, Brazil, Chile, Colombia, Mexico, Panama, Peru, Uruguay or any other securities regulator in any Latin American country and thus, may not be publicly offered in any such countries. The securities regulators of any country within Latin America have not confirmed the accuracy of any information contained herein. No information discussed herein can be provided to the general public in Latin America. The contents of this material are strictly confidential and must not be passed to any third party.

In Argentina, only for use with qualified investors under the definition as set by the Comisión Nacional de Valores (CNV).

In Brazil, this private offer does not constitute a public offer, and is not registered with the Brazilian Securities and Exchange Commission, for use only with professional investors as such term is defined by the *Comissão de Valores Mobiliários*.

In Chile, the securities if any described in this document are foreign securities, therefore: i) their rights and obligations will be subject to the legal framework of the issuer's country of origin, and therefore, investors must inform themselves regarding the form and means through which they may exercise their rights; and that ii) the supervision of the Commission for the Financial Market (Comisión para el Mercado Financiero or "CMF") will be concentrated exclusively on compliance with the information obligations established in General Standard No. 352 of the CMF and that, therefore, the supervision of the security and its issuer will be mainly made by the foreign regulator.

In the case of a fund not registered with the CMF is subject to General Rule No. 336 issued by the SVS (now the CMF). The subject matter of this sale may include securities not registered with the CMF; therefore, such securities are not subject to the supervision of the CMF. Since the securities are not registered in Chile, there is no obligation of the issuer to make publicly available information about the securities in Chile. The securities shall not be subject to public offering in Chile unless registered with the relevant registry of the CMF.

In Colombia, the promotion of each product discussed herein is carried out through the Representative Office of BlackRock Fund Advisors, authorized by the Colombian Financial Superintendence. The transmission of this information does not constitute a securities public offering in Colombia. The products discussed herein may not be promoted or marketed in Colombia or to Colombian residents unless such promotion and marketing is made in compliance with Decree 2555 of 2010 and other applicable rules and regulations related to the promotion of foreign financial and/or securities related products or services in Colombia. With the receipt of these materials, and unless the Client contacts BlackRock with additional requests for information, the Client agrees to have been provided the information for due advisory required by the marketing and promotion regulatory regime applicable in Colombia.

IN MEXICO, FOR INSTITUTIONAL AND QUALIFIED INVESTORS USE ONLY. INVESTING INVOLVES RISK, INCLUDING POSSIBLE LOSS OF PRINCIPAL. THIS MATERIAL IS PROVIDED FOR EDUCATIONAL AND INFORMATIONAL PURPOSES ONLY AND DOES NOT CONSTITUTE AN OFFER OR SOLICITATION TO SELL OR A SOLICITATION OF AN OFFER TO BUY ANY SHARES OF ANY FUND OR SECURITY. This information does not consider the investment objectives, risk tolerance or the financial circumstances of any specific investor. This information does not replace the obligation of financial advisor to apply his/her best judgment in making investment decisions or investment recommendations. It is your responsibility to inform yourself of, and to observe, all applicable laws and regulations of Mexico. If any funds, securities or investment strategies are mentioned or inferred in this material, such funds, securities or strategies have not been registered with the Mexican National Banking and Securities Commission (Comisión Nacional Bancaria y de Valores, the "CNBV") and thus, may not be publicly offered in Mexico. The CNBV has not confirmed the accuracy of any information contained herein. The provision of investment management and investment advisory services ("Investment Services") is a regulated activity in Mexico, subject to strict rules, and performed under the supervision of the CNBV. These materials (*Ley del Mercado de Valores*). Each potential investor shall make its own investment decision based on their own analysis of the available information. Please note that by receiving these materials, it shall be construed as a representation by the receiver that it is an Institutional or Qualified investor as defined under Mexican law. BlackRock México Operadora, S.A. de C.V., Sociedad Operadora de Fondos de Inversión ("BlackRock México Operadora") is a Mexican subsidiary of BlackRock, Inc., authorized by the CNBV as a Mutual Fund Manager (Operadora de Fondos), and as such, authorized to manage Mexican mutual funds, ETFs and provide Investment Advisory Services. For more information on the Investment Services offered by BlackRock Mexico, please review our Investment Services Guide available in **www.blackrock.com/mx**. This material represents an assessment at a specific time and its information should not be relied upon by the you as research or investment advice regarding the funds, any security or investment strategy in particular. Reliance upon information in this material is at your sole discretion. BlackRock México is not authorized to receive deposits, carry out intermediation activities, or act as a broker dealer, or bank in Mexico. For more information on BlackRock México, please visit: **www.blackrock.com/mx**. BlackRock receives revenue in the form of advisory fees for our advisory services and management fees for our mutual funds, exchange traded funds and collective investment trusts. Any modification, change, distribution or inadequate use of information of this document is not responsibility of BlackRock or any of its affiliates. Pursuant to the Mexican Data Privacy Law (Ley Federal de Protección de Datos Personales en Posesión de Particulares), to register your personal data you must confirm that you have read and understood the Privacy Notice of BlackRock México Operadora. For the full disclosure, please visit **www.blackrock.com/mx** and accept that your personal information will be managed according with the terms and conditions set forth therein.

In Peru, this private offer does not constitute a public offer, and is not registered with the Securities Market Public Registry of the Peruvian Securities Market Commission, for use only with institutional investors as such term is defined by the *Superintendencia de Banca, Seguros y AFP*.

In Uruguay, the securities are not and will not be registered with the Central Bank of Uruguay. The Securities are not and will not be offered publicly in or from Uruguay and are not and will not be traded on any Uruguayan stock exchange. This offer has not been and will not be announced to the public and offering materials will not be made available to the general public except in circumstances which do not constitute a public offering of securities in Uruguay, in compliance with the requirements of the Uruguayan Securities Market Law (Law Nº 18.627 and Decree 322/011).

For investors in Central America, these securities have not been registered before the Securities Superintendence of the Republic of Panama, nor did the offer, sale or their trading procedures. The registration exemption has made according to numeral 3 of Article 129 of the Consolidated Text containing of the Decree-Law No. 1 of July 8, 1999 (institutional investors). Consequently, the tax treatment set forth in Articles 334 to 336 of the Unified Text containing Decree-Law No. 1 of July 8, 1999, does not apply to them. These securities are not under the supervision of the Securities Superintendence of the Republic of Panama. The information contained herein does not describe any product that is supervised or regulated by the National Banking and Insurance Commission (CNBS) in Honduras. Therefore any investment described herein is done at the investor's own risk. In Costa Rica, any securities or services mentioned herein constitute an individual and private offer made through reverse solicitation upon reliance on an exemption from registration before the General Superintendence of Securities ("SUGEVAL"), pursuant to articles 7 and 8 of the Regulations on the Public Offering of Securities ("Reglamento sobre Oferta Pública de Valores"). This information is confidential, and is not to be reproduced or distributed to third parties as this is NOT a public offering of securities in Costa Rica. The product being offered is not intended for the Costa Rican public or market and neither is registered or will be registered before the SUGEVAL, nor can be traded in the secondary market. If any recipient of this documentation receives this document in El Salvador, such recipient acknowledges that the same has been delivered upon their request and instructions, and on a private placement basis. In Guatemala, this communication and any accompanying information (the "Materials") are intended solely for informational purposes and do not constitute (and should not be interpreted to constitute) the offering, selling, or conducting of business with respect to such securities, products or services in the jurisdiction of the addressee (this "Jurisdiction"), or the conducting of any brokerage, banking or other similarly regulated activities ("Financial Activities") in the Jurisdiction. Neither BlackRock, nor the securities, products and services described herein, are registered (or intended to be registered) in the Jurisdiction. Furthermore, neither BlackRock, nor the securities, products, services or activities described herein, are regulated or supervised by any governmental or similar authority in the Jurisdiction. The Materials are private, confidential and are sent by BlackRock only for the exclusive use of the addressee. The Materials must not be publicly distributed and any use of the Materials by anyone other than the addressee is not authorized. The addressee is required to comply with all applicable laws in the Jurisdiction, including, without limitation, tax laws and exchange control regulations, if any.

For investors in the Caribbean, any funds mentioned or inferred in this material have not been registered under the provisions of the Investment Funds Act of 2003 of the Bahamas, nor have they been registered with the securities regulators of Dominica, the Cayman Islands, the British Virgin Islands, Grenada, Trinidad & Tobago or any jurisdiction in the Organisation of Eastern Caribbean States, and thus, may not be publicly offered in any such jurisdiction. Engaging in marketing, offering or selling any fund from within the Cayman Islands to persons or entities in the Cayman Islands may be deemed carrying on business in the Cayman Islands. As a non-Cayman Islands person, BlackRock may not carry on or engage in any trade or business unless it properly registers and obtains a license for such activities in accordance with the applicable Cayman Islands law. In the Dominican Republic, any securities mentioned or inferred in this material may only be offered in a private character according to the laws of the Dominican Republic, falling beyond.

Any research in this document has been procured and may have been acted on by BlackRock for its own purpose. The results of such research are being made available only incidentally. The views expressed do not constitute investment or any other advice and are subject to change. They do not necessarily reflect the views of any company in the BlackRock Group or any part thereof and no assurances are made as to their accuracy.

This document is for information purposes only and does not constitute an offer or invitation to anyone to invest in any BlackRock funds and has not been prepared in connection with any such offer.

250817T-0425

BlackRock.