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Investment & Portfolio Solutions Group

BlackRock.

Implementing AI in portfolios

January 2025

Recent developments in artificial intelligence (AI) have the potential to reshape economies, unlocking new long-term revenue streams, shifting labour and resources, creating new industries and leading to major scientific breakthroughs. We're already seeing a significant amount of capital going into AI data centre buildout, with investment into data centres and their chips potentially topping $700B annually by 2030, or over 2% of annual US GDP.[1]

This is opening near-term investment opportunities, according to the BlackRock Investment Institute (BII) – which have helped supercharge the US equity market over the past year.[2] And this is only the beginning – in the decades to come, AI adoption among consumers and companies is expected to soar.

This may lead to the emergence of 'winners' within industries – firms that successfully integrate AI into their products and operations, becoming more profitable – as well as 'losers' that could struggle to catch up.

At the macro level, the BII cautions that the AI buildout may initially strain energy supplies, creating bottlenecks and pushing up inflation – something that could slow down AI's advance. However, AI may improve efficiency over time, which could be deflationary and counterbalance the inflationary impact of other structural trends or 'mega forces', such as geopolitical fragmentation. AI adoption will likely take time, but the BII expects it to expand faster than previous technological transformations. What does this mean for EMEA investors?

Investors are still underweight AI vs. MSCI ACWI

Our analysis of the largest 200+ moderate risk multi-asset portfolios in EMEA shows that this underweight is linked to a domestic bias towards European equities.[3]

They're asking how to implement AI in portfolios…

The BII currently sees the strongest opportunity set in investments linked to the AI data centre buildout. Opportunities are also emerging in companies adopting AI.

…and incorporate AI in strategic asset allocation (SAA)

When building an optimal SAA, it's important to take uncertainty into account and to reflect AI's impact on inflation projections and corporate earnings forecasts.

We've seen strong investor appetite to position portfolios for AI-related investment opportunities. Our survey of 50+ Wealth and asset managers shows that AI is the most popular mega force that investors have incorporated into their investment process, outpacing other mega forces, such as the low carbon transition, geopolitical fragmentation and demographic divergence.[4] In terms of portfolio positioning, US technology ETPs saw continuous inflows in 2024,[5] while the top five stock names held in the largest 200+ moderate risk multi-asset EMEA portfolios were all tech/AI-related.[6]

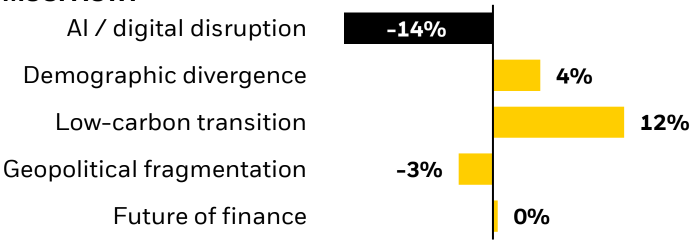
Despite this appetite, our analysis of the largest EMEA multi-asset portfolios shows that their equity sleeves are still underweight the AI mega force on average, relative to the MSCI ACWI, due to a domestic bias towards European stocks – where the AI mega force is underrepresented. We saw the underweight moderate over 2024, thanks to investors increasing allocations to US equities and, in some cases, moving their underlying benchmarks closer to MSCI ACWI. However, it remains pronounced. From a performance perspective, these domestically-biased portfolios have been missing out on the full extent of the AI-fuelled rally.

As more investors look to close their AI underweights relative to MSCI ACWI, we're hearing three common questions:

1) How do you define the investment universe for the AI mega force?
2) How can AI allocations be implemented in portfolios, and what impact should be expected on portfolio characteristics?
3) How can the impact of AI be incorporated when building strategic asset allocations?

We address these questions over the following pages.

Chart 1: mega force load in average EMEA portfolio vs. MSCI ACWI[7]



This information is not intended as a recommendation to invest in any particular asset class or strategy or as a promise - or even estimate - of future performance.

1, 2 Source: BlackRock Investment Institute, "AI's big questions", November 2024. **4** Source: BlackRock, "Portfolio construction in the new regime: key trends", September 2024. **3, 6, 7** Source: BlackRock Portfolio Consulting EMEA, BlackRock Aladdin, Morningstar, November 2024. Portfolio average allocation based on 208 moderate risk multi-asset EMEA domiciled portfolios collected by between 28 June 2024 – 30 September 2024. For Illustrative purposes only, and subject to change. **5** Source: BlackRock Global Business Intelligence, EPFR, January 2025.

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Defining the investment universe for the AI mega force

The BII uses a three-phase framework – buildout, adoption and transformation – to track the progress of AI developments.

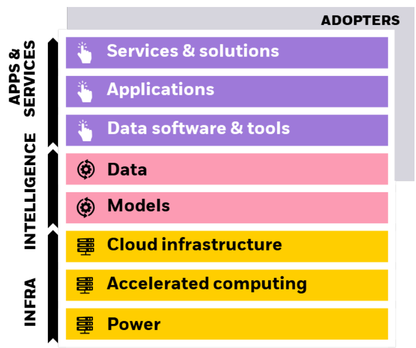
Phase 1 – Buildout: this is the phase we're in right now, according to the BII, and this presents the most immediate AI-related investment opportunities. This phase is focused on building out AI infrastructure, such as data centres, AI models and the power systems that support them.

Phase 2 – Adoption: in this phase, we'll see AI adoption across companies and sectors (such as personal AI assistants for consumers, AI agents performing tasks for companies and AI-powered applications in autonomous vehicles, robotics and healthcare). This phase is just beginning: while it already presents investment opportunities, the BII thinks more will emerge as AI adoption broadens.

Phase 3 – Transformation: this phase may unlock the full value of AI adoption, including productivity gains across the economy, and new industries, business models and jobs. The scale and timing of these developments are hard to assess – for example, the estimates of AI's contribution to GDP range from small to substantial, and this contribution may not materialise if AI adoption turns out to be lower than expected. Identifying the likely winners of this phase is difficult. At the sector level, industries gaining the most AI-driven productivity enhancements may not necessarily be the ones capturing a proportional share of the economic value – so it's important to monitor emerging revenue streams and cross-sector impacts. At the company level, some of the most disruptive companies may be in their infancy – or not even exist yet.

We can visualise the universe of AI-related investment opportunities across the 'AI stack' below, created by our Fundamental Equity team – though we recognise that these opportunities will evolve as AI does. The 'stack' refers to the various layers of technology and infrastructure required to build, operate and deliver AI systems to the end user.

Chart 2: the AI tech stack



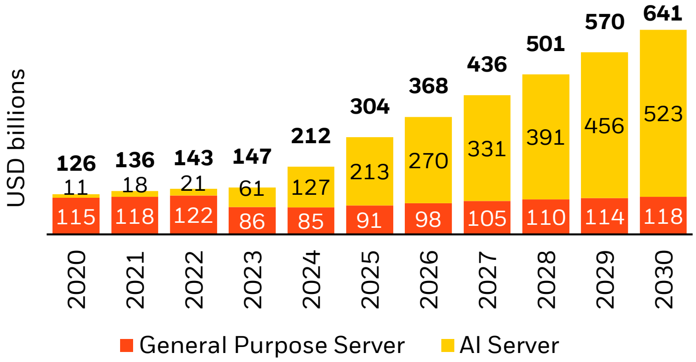
Source: BlackRock Fundamental Equities, October 2024.

Phase 1 – Buildout

In the current phase, we mainly see investment opportunities at **the foundation of the AI stack**, with the surging AI data centre buildout underway. These opportunities include cloud infrastructure, chips and hardware, where capital and expertise are concentrated among a select group of firms. To zoom in on a couple of examples, mega-cap tech firms remain key beneficiaries of the buildout phase, driving vast capex spending into AI infrastructure. We'll likely see differentiation in performance among these companies, and it's still difficult to gauge who will ultimately come out on top.

Chart 3: data centre server spending

General purpose vs. AI servers, 2020-2023 realised. 2024-2030 forecast



Source: BlackRock, 2024. Forecast based on estimates by BlackRock Fundamental Equities.

The BII believes significant AI capex spending by these companies is not excessive just yet, based on metrics like capex-to-sales ratios and free cash flows.[8] They also think AI capex spending should be assessed in aggregate, considering AI's potential to create new revenue streams across the economy. They don't see valuations of these companies as too stretched – and they're far from the extremes seen during the dot-com era[9] – given their strong earnings outlook over the next 12 months.[10]

Semiconductors are seeing growing structural demand – which is expected to support the sector's earnings growth over the long run – with data centres requiring more efficient chips to handle vast computational loads and optimising energy use. This comes on top of semiconductor demand from AI applications beyond the tech sector (such as in healthcare, automotive and consumer electronics), as well as non-AI-driven semiconductor demand linked to increasing application and content requirements.[11] Semiconductor companies that have a technological advantage may be best-positioned to benefit from these trends. Furthermore, companies producing the hardware behind AI models (such as memory, power chips, networking and data storage) could also do well, our Fundamental Equity team thinks.

Sectors that are supporting the buildout of data centres – such as **utilities, energy, materials, industrials** and **real estate** – could also benefit. Some of these sectors are also showing an improving earnings outlook as US earnings growth is broadening out beyond the tech sector.[12]

The BII notes that AI data centres also need reliable, substantial **energy** input – from sources like coal, gas, nuclear or renewables. AI could eventually boost energy efficiency and support decarbonisation, but this can only come after widespread adoption – meaning higher energy demand from AI training and operation in the near term. This may strain energy supplies and create bottlenecks, potentially slowing AI's development.

This additional power generation requires connection to the grid. This means that **utilities** should benefit from the surge in electricity demand driven by AI hardware, according to the BII, particularly from the data centres and servers where AI models are trained and deployed. Specifically, data centre power demand is expected to rise 2x-4x[13] – which comes on top of power demand for the low-carbon transition. Yet not all utilities will benefit equally from AI load growth demand, making the case for selectivity within this space.

8, 9, 13 Source: BlackRock Investment Institute, "AI's big questions", November 2024. **10, 12** Source: LSEG Datastream, MSCI and BlackRock Investment Institute, January 2025. **11** Source: BlackRock Fundamental Equities, November 2024.

The BII also sees opportunities in **materials**. For example, copper inventories are already low, and considerable data centre power demand for the metal will come on top of copper demand linked to the low-carbon transition.[14]

Some opportunities related to the data centre buildout can be accessed via **private markets**, such as infrastructure (for example, data centres and energy infrastructure to create new sources of power for these facilities).

Phase 2 – Adoption

In the second phase, our Fundamental Equity team expects to see more and more companies across industries adopting AI and deriving revenues and efficiencies from this technology. These opportunities are reflected at **the top of the AI stack**. New AI-powered products and tools are emerging for consumers and businesses and will continue to evolve, such as chatbots, AI-powered assistants, automation tools and AI-powered applications within autonomous vehicles. Generally, sectors that more fully adopt AI may see a productivity boost and increase their ability to deliver innovative products and services, according to the BII. The same will likely be true at a company level within industries. We're already seeing investment opportunities among early adopters, including some companies within **financials, healthcare** and **communication services**.

Yet the BII believes there is much more room to run. AI adoption will take time and will likely occur at different speeds across sectors. **Private markets** can provide early exposure to potential future winners before they go public – for example, early-stage growth companies driving AI adoption in non-traditional sectors. Such companies might later become acquisition targets for larger firms as AI applications spread across industries.

Looking ahead, the BII notes that key risks to the buildout and adoption phases relate to power or other supply challenges, AI adoption disappointing expectations, and potential regulatory hurdles. On the latter, geopolitical fragmentation and competition may also play a role in how governments regulate AI – so it's important to watch regulatory developments in the context of this structural trend.

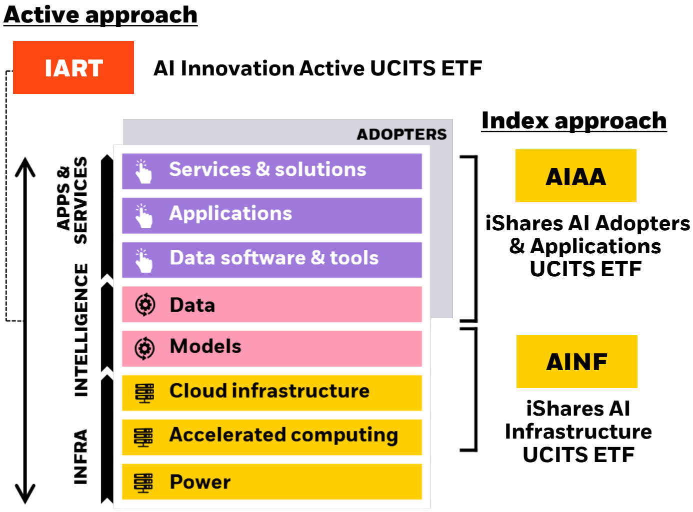
Implementing AI in portfolios – and the expected impact on portfolio characteristics

The results of our wealth and asset manager survey show that when investing in mega forces – including AI – investors are using a wide range of vehicles, including index funds/ETFs, alpha-seeking products, and baskets of single stocks.[15]

We believe both index and alpha-seeking approaches can work to implement AI mega force in portfolios, on a standalone basis and alongside each other in portfolios: an index approach can provide broad beta exposure to specific parts of the stack, while alpha-seeking approaches led by a skilled active manager can help spot and allocate to winners on various time horizons, doubling down on the highest-conviction areas of the universe at a given time.

In the following case study, we explore how adding AI-focused alpha-seeking and index strategies like those in the chart below can affect a portfolio's AI load, ex-ante risk and style factor tilts.

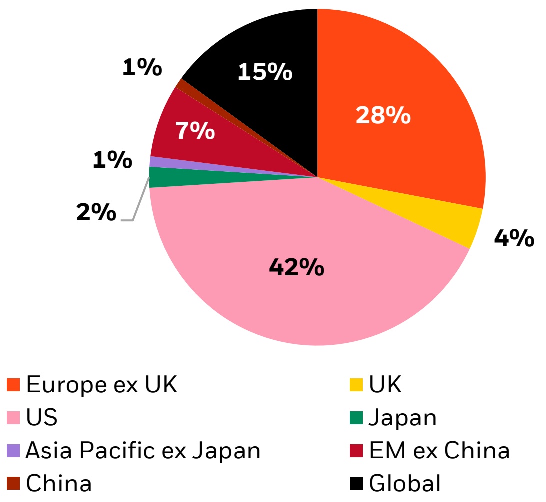
Chart 4: ETF AI strategies mapped to the AI stack



Source: BlackRock, October 2024. For illustrative purposes only.

To achieve this aim, we've taken the average equity allocation of the largest 200+ moderate risk multi-asset portfolios in EMEA and added 15% to the AI-focused alpha-seeking and index strategies above. The allocation is funded from the global sleeve, given the global nature of these strategies.

Chart 5: average equity allocation in EMEA portfolios (rescaled to 100%)



Source: BlackRock Portfolio Consulting EMEA, BlackRock Aladdin, Morningstar, November 2024. Portfolio average allocation based on 208 moderate risk multi-asset EMEA domiciled portfolios collected by between 28 June 2024 – 30 September 2024. For Illustrative purposes only, and subject to change.

We consider four options for integrating AI exposures in portfolios through index and/or alpha-seeking ETF strategies.

14 Source: BlackRock, January 2025. **15** Source: BlackRock, 'Portfolio construction in the new regime: key trends', September 2024.

Option 1: allocating 15% of the portfolio to the iShares AI Innovation Active UCITS ETF – a high-conviction alpha-seeking strategy picking 'best ideas' across all layers of the AI stack. The portfolio is labelled as **'15% AI Inn.'** in the case study.

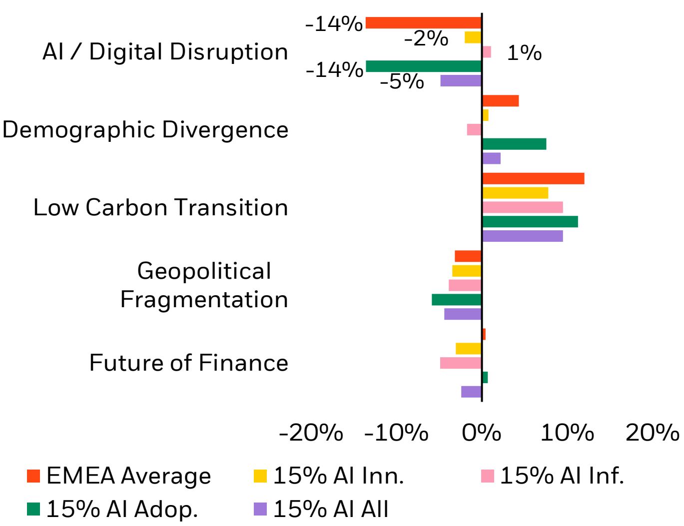
Option 2: allocating 15% to the iShares AI Infrastructure UCITS ETF – an index strategy providing exposure to companies at the bottom of the stack. The strategy has a tilt to the tech sector and captures infrastructure players that are 'AI innovators' (companies with the broadest AI patent portfolios), 'AI specialists' (companies that already generate a majority of their revenues from AI infrastructure products and services), or 'AI market leaders' (companies that are key nodes in the AI chain and have significant scale). The portfolio is labelled as **'15% AI Inf.'** in the case study.

Option 3: allocating 15% to the iShares AI Adopters & Applications UCITS ETF – an index strategy providing exposure to companies at the top of AI stack, capturing those from sectors deriving revenue upside from AI developments, such as financials, healthcare, tech, industrials and telecoms. The companies captured by the strategy are 'AI innovators' or 'AI market leaders'. This means the methodology is set to pick up new AI adopters across industries as they emerge. The portfolio is labelled as **'15% AI Adop.'** in the case study.

Option 4: allocating 15% of the portfolio across all three strategies to achieve a broad beta exposure to the AI theme, with the alpha-seeking strategy doubling down on the highest-conviction areas of the universe at any given time. The portfolio is labelled as **'15% AI All.'** in the case study.

Our analysis shows that options 1, 2 and 4 significantly improve the AI load of the average EMEA portfolio, bringing it closer to the MSCI ACWI Index. The limited impact of the iShares AI Adopters & Applications UCITS ETF on the AI load can be explained by the fact that the AI infrastructure space (captured by the three other options) is better represented within our AI load analytics, given it's a relatively more mature part of the AI stack. We expect that exposure to adopters will be increasingly represented in future AI load analytics as this space grows.

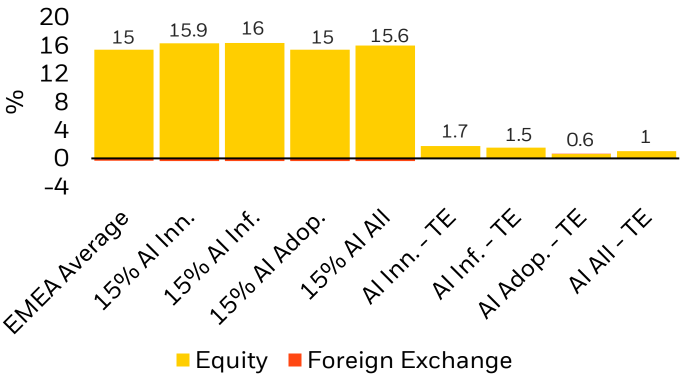
Chart 6: mega force load versus MSCI ACWI (%)



Source: BlackRock Portfolio Consulting EMEA, BlackRock Aladdin, Morningstar, November 2024. Portfolio average allocation based on 208 moderate risk multi-asset EMEA domiciled portfolios collected by between 28 June 2024 – 30 September 2024. For Illustrative purposes only, and subject to change.

Although 15% is a non-negligible allocation, **all of the updated portfolios remain broadly in line with the original portfolio in terms of ex-ante risk.** Adding the iShares AI Adopters & Applications UCITS strategy does not increase ex-ante risk, while adding iShares AI Innovation Active UCITS ETF and iShares AI Infrastructure UCITS ETF leads to a maximum of 1% increase in ex-ante risk vs. the original portfolio. The expected active risk or tracking error (TE) for the updated portfolios vs. the original ranges from 0.6% for the portfolio with iShares AI Adopters & Applications UCITS ETF to 1.7% for the portfolio with iShares AI Innovation Active UCITS ETF.

Chart 7: risk contribution



Source: BlackRock, Aladdin as of 29 November 2024. Currency: EUR.

When zooming into the expected equity active risk, the risk of portfolios containing the iShares AI Innovation Active UCITS ETF and iShares AI Infrastructure UCITS ETF is largely driven by style factor and sector risks – unsurprisingly, given the strategies' higher allocation to tech relative to other sectors, which also correlates with a higher growth style factor tilt. Yet, as noted above, the impact of these tilts on overall portfolio risk remains relatively muted.

Chart 8: expected equity active risk ('TE')

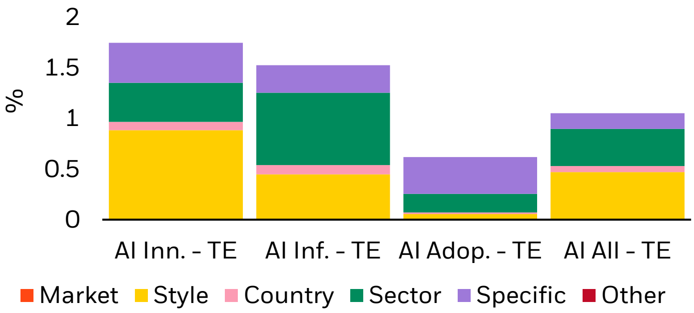
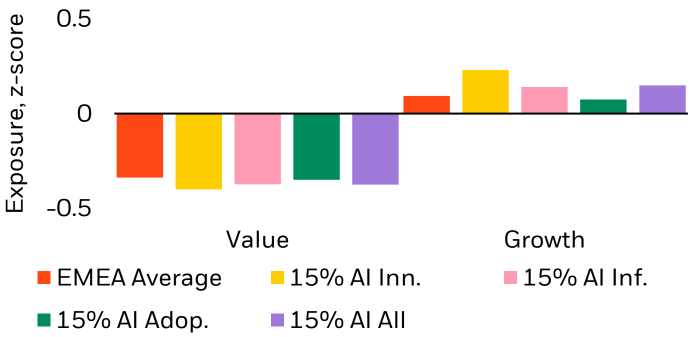


Chart 9: equity style factor exposures



Source: BlackRock, Aladdin as of 29 November 2024. Currency: EUR.

Incorporating the impact of AI when building strategic asset allocations (SAA)

Our Portfolio Consulting team believes AI will have profound implications on how investors build optimal strategic asset allocations. This is because the scale of AI capex investments – which, together with low-carbon transition investments, can be compared to prior industrial revolutions – as well as AI adoption will likely affect inflation, GDP growth and profitability across sectors in the long run, according to the BII. It's important to reflect these considerations in the long-term expected return projections across asset classes that are used to construct SAAs.

BlackRock capital market assumptions (CMAs) do this in the following way:

- **Incorporating expectations that inflation will run higher than central bank targets.** The BII expects mega forces – including AI, the low-carbon transition and geopolitical fragmentation – to be inflationary over the long run. Specifically on AI, the BII expects the buildout phase to be inflationary as the surge in AI data centre capex may face bottlenecks, such as power shortages. Over the long run, however, AI-induced efficiency gains may be disinflationary. They think central banks will have a tightening bias – keeping the policy rate above neutral – in response to these inflationary pressures. Higher interest rates over the strategic horizon, in turn, will impact valuations across fixed income, equities and private markets.
- **Taking uncertainty into account when building SAAs.** The AI buildout comes with considerable uncertainty in the long run, as the resulting productivity gains are difficult to assess, as our colleagues in the BII note. For example, estimates range from adding 0.1% to 1.5% to US GDP annually, depending on adoption levels[16] – which will depend on the scale of efficiency gains for specific tasks, how broadly AI can be applied across industries and how quickly AI adoption happens. When building optimal SAAs, we take the uncertainty around expected returns across asset classes into account by using robust optimisation processes. This allows us to consider a wide range of future scenarios and leads to more diversified strategic asset allocations.
- **Reflecting the future opportunities created by AI in corporate earnings.** While the implications of AI could benefit the broad economy, the benefits won't be uniform, with certain segments likely to be disproportionately impacted. When estimating future profitability of the corporate sector, we reflect the granular opportunities in our capital market assumptions. For example, the BII thinks that margin expansion in the US technology sector has further room to run as the AI buildout continues.
- Importantly, as the BlackRock's AI view evolves in line with developments, our capital market assumptions will also evolve to reflect this.

The BlackRock Portfolio Consulting team can help assess a portfolio's AI load and test strategies, showing the impact on the load and the portfolio's financial characteristics.

The team can also help optimise strategic asset allocation with BlackRock CMAs that incorporate the impact of AI to show the delta between current and optimised allocations.

16 Source: BlackRock Investment Institute, "AI's big questions", November 2024.

Appendix

Modelling Methodology for Ex-Ante Analysis

BPAS leverages Aladdin® portfolio risk modelling process to capture the systematic risk factors that typically drive a fund's risk and return profile. The process utilises a combination of fund holdings disclosures, historical returns and fund summaries such as fact sheets and fund commentaries.
As described in more detail below, the specific modelling process applied to a fund will depend on the asset class as well as the investment style (e.g. active, passive).

Equity Funds:

For all equity index mutual funds, ETFs and European domiciled active equity funds with an AUM > $500mn USD, fund holdings disclosures (where available) are used to model the funds' risk exposures. If unavailable, historical return series, and information found on fact sheets and fund commentaries will be used in order to regress the funds' returns to a series of appropriate factors.

For all other registered investment company products, the holdings of the Morningstar Category benchmark are used to model the funds' risk exposures.

Fixed Income Funds:

For all fixed income index mutual funds and ETFs, fund holdings disclosures are used to model the funds' risk exposures.

European domiciled active fixed income funds with an AUM > $500mn USD have been modelled using a combination of fund holdings disclosures, fund asset allocations and returns-based style analysis. These results are validated with statistical analysis.

For all other fixed income funds, the holdings of the Morningstar Category benchmark are used to model the funds' risk exposures.

Multi-asset Funds:

Multi-asset funds are modelled based on the funds' exposure to major asset classes. A combination of fund holdings disclosures, fund asset allocations and returns-based style analysis is used to derive each fund's asset class exposure. These results are validated with statistical analysis.

Alternatives Funds:

Alternative funds are modelled using Aladdin's alternative asset risk factors based on the fund type and the fund strategy. Alternative funds are mapped to a set of primary, secondary and idiosyncratic risk factors. A combination of fund strategy disclosures, fund asset allocations and returns-based style analysis is used to derive each fund's risk exposures.

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Appendix

Risk Factor Summary

Factors are **fundamental** and **technical** characteristics of asset returns. The BlackRock Aladdin® Risk Factor Models decompose the overall risk/return of a financial asset into the underlying factor drivers. Risk models used are: BlackRock Fundamental Risk for Equities Model (BFRE World), BlackRock Fixed Income Risk Factor Model and BlackRock Alternatives Risk Factor Model. As a default, we measure risk in one standard deviation annualised volatility or 84% confidence annualised analytical VaR, with a one year risk horizon. 72 monthly observations are used, with a half life of 36 months (decay: 0.9809).The risk contribution of any portfolio component is equal to the portfolio exposure to that component multiplied by its volatility, multiplied by the correlation to the portfolio. Portfolio risk is the linear sum of contributions from all components.

Equity Factors:

Equity Market Factor: Contribution to portfolio risk arising from a portfolio's exposure to the returns across the equity market. This factor captures the risk associated with general equity market movements.

Equity Style Factor: Contribution to portfolio risk arising from a portfolio's exposure to the returns of factors such as value, growth, size and momentum. Style factors are constructed from company fundamentals, analyst estimate data and historical market data. These are modelled through the BlackRock Fundamental Risk for Equities Model (BFRE).

Equity Sector Factor: Contribution to portfolio risk arising from a portfolio's exposure to the returns of sector-specific equities, adjusting for market, country and style effects.

Equity Country Factor: Contribution to portfolio risk arising from a portfolio's exposure to returns of country-specific equities, adjusted for market, sector and style effects.

Equity Specific Factor: Contribution to portfolio risk arising from a portfolio's exposure to stock specific idiosyncratic risk not captured by the common risk factors.

Fixed Income Factors:

Rates Factor: Contribution to portfolio risk arising from a portfolio's exposure to the risk associated with changes in yield curves. This can be at a high level (overall exposure) or broken down by different yield curves

Inflation Factor: Contribution to portfolio risk arising from a portfolio's exposure to the risk associated with changes in inflation curves. This can be at a high level (overall exposure) or broken down by different inflation curves.

Spreads Factor: Contribution to portfolio risk arising from a portfolio's exposure to credit spreads factor. Credit spreads factors capture risk associated with investment grade, high yield and distressed debt credit spreads over benchmark interest rates.

FX Factors: Contribution to portfolio risk arising from a portfolio's exposure to the risk associated with changes in foreign exchange rates.

Alternatives Factors: Contribution to portfolio risk arising from a portfolio's exposure to alternative assets and strategies including Private Equity, Infrastructure Equity, Commodities, Hedge Funds and Real Estate.

CMA Disclosure

This information is not intended as a recommendation to invest in any particular asset class or strategy or product or as a promise of future performance. Note that these asset class assumptions are passive, and do not consider the impact of active management. All estimates in this document are in EUR terms unless noted otherwise. Given the complex risk-reward trade-offs involved, we advise clients to rely on their own judgment as well as quantitative optimisation approaches in setting strategic allocations to all the asset classes and strategies. References to future returns are not promises or even estimates of actual returns a client portfolio may achieve. Assumptions, opinions and estimates are provided for illustrative purposes only. They should not be relied upon as recommendations to buy or sell securities. Forecasts of financial market trends that are based on current market conditions constitute our judgment and are subject to change without notice. We believe the information provided here is reliable, but do not warrant its accuracy or completeness. If the reader chooses to rely on the information, it is at its own risk. This material has been prepared for information purposes only and is not intended to provide, and should not be relied on for, accounting, legal, or tax advice. The outputs of the assumptions are provided for illustration purposes only and are subject to significant limitations. “Expected” return estimates are subject to uncertainty and error. Expected returns for each asset class can be conditional on economic scenarios; in the event a particular scenario comes to pass, actual returns could be significantly higher or lower than forecasted. Because of the inherent limitations of all models, potential investors should not rely exclusively on the model when making an investment decision. The model cannot account for the impact that economic, market, and other factors may have on the implementation and ongoing management of an actual investment portfolio. Unlike actual portfolio outcomes, the model outcomes do not reflect actual trading, liquidity constraints, fees, expenses, taxes and other factors that could impact future returns. Asset allocation/diversification does not guarantee investment returns and does not eliminate the risk of loss.

Index Disclosures: Index returns are for illustrative purposes only and do not represent any actual fund performance. Index performance returns do not reflect any management fees, transaction costs or expenses. Indices are unmanaged and one cannot invest directly in an index.

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Methodology

Interest Rates: Our model provides a way to chart the yield curve at multiple time horizons in the future. We base this on our estimates of: (1) the short rate and (2) model implied term premia. We base our estimates of short rates on market data in the near term and on macro-informed data in the long term. We assume investors’ views about long run inflation and real growth, coupled with changing preferences as to savings and risk aversion, will ultimately determine their expectations for short rates (the “long run short rate”). We use an affine term structure model -a type of model that assumes bond yields as a linear function of a small set of parameters (Piazzesi, 2010) –to compute model-implied term premia. In our implementation, we represent the yield curve using the first five principal components of yield, as laid out by Adrian et al. (2013). We then blend the model implied term premia from the affine term structure model with market implied term premia, with the relative weights dependent on the relevant time horizon.

Equities: Expectations of cash flows and discount rates can help explain the variability in equity returns as shown by Campbell (1990). We have used this insight to develop a discounted cash flow (DCF) model, with a few key innovative features. Most academic research focuses on the question of whether stock returns are predictable at all. We are concerned with making the best estimates that we can. We make two additional contributions. First, the baseline DCF model estimates earnings by leveraging analyst earnings estimates in the near term as discussed by Li et al (2013) to derive the implied cost of capital. The common assumption in implied cost of capital (ICC) studies is that earnings growth implied by analyst earnings estimates in the near term should trend towards GDP growth in the long term. This can introduce an unintended assumption of continued expansion of profit margins. We have introduced a modification to account for late economic cycle dynamics. We allow for corporate profit margins to revert to trend (the median over a rolling 10-year history) as margins typically peak late-cycle. The standard ICC approach typically tests for equity returns using linear regression tests. For our DCF model, we take the desired time horizon as an input (number of years) and we estimate the appropriate discount rate for the specific time horizon using our aggregate implied cost of capital. This way, we account for both key sources of variability in equity returns, namely changes in cash flows and changes in the discount rate.

Credit: on two key elements: 1) our estimate of credit spread at a given horizon and 2) our estimated loss due to defaults and downgrades over the horizon. The first component is projected in a consistent manner with our view of real GDP growth and the link between credit spreads and equity volatility. Our approach helps explain the behaviour of credit spreads using a limited number of predictive variables. Yet, as validated by tests against more complex methods, it retains the ability to help explain a high proportion of the variance in credit spreads. The second component is estimated based on our outlook for spreads, the duration of the asset and an assumed transition matrix which captures migrations and defaults across multiple credit cycles. We currently base our transition matrix on Moody’s long-run transition data.

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We aim to further develop our model by directly modelling transitions based on macroeconomic conditions in order to better capture cycle dynamics and the respective variation in losses due to credit events. In addition to making our estimates of credit spreads consistent with our macroeconomic views, our new credit (excess) return model allows greater flexibility of calibrating our expected returns to different credit rating compositions which may prevail over the entire time horizon.

Uncertainty and optimisation: Expected returns and asset price volatility are difficult to predict. We believe any technique that builds portfolios should incorporate this inherent uncertainty (Ceria et al. 2006). We consider both long-and short-term drivers of return. In the long run, we expect a relatively small number of macroeconomic drivers —economic growth, rates, inflation, credit and currencies — to determine an asset's returns. In the short-run, other factors can overpower the structural drivers causing wider fluctuations from an asset's fair value. Valuations can be helpful in estimating short-term returns. We combine contributions from the long-and short-term return drivers to produce a final set of return expectations with a range of uncertainty around each.

The next step is to use this set of return expectations in an optimisation engine that seeks out the best return without breaching an investors' risk limit. Mean variance optimisation would produce a portfolio that maximises expected return under one base scenario with a given level of risk. In contrast, we look to build a "least-worst" portfolio – one that maximises returns for an investors' target risk levels across the worst outcomes, say for the bottom 50% of the distribution, from a set of stochastically generated scenarios (cf. Tütüncü et al. 2004 and Garlappi et al. 2006). This helps ensure the portfolio is not overly reliant on just the median return. This process seeks to produce a portfolio that is robust to small changes in the central return estimates (Scherer, 2006).

Stochastic engine: We use Monte Carlo simulation to create random distributions informed by historical return distributions and centred on our expected returns. The engine simulates thousands of return pathways for each asset, representing the range of possible outcomes over a five-to 20-year time horizon. We leverage BlackRock's risk models to help ensure that assets generate similar returns, to the extent that they have common drivers . The range of scenarios incorporate our work on incorporating uncertainty in return expectations. We use an extension of the Black-Litterman model (1990) –a well-known model for portfolio allocation that combines equilibrium returns and medium-term views in a single-period setting. Our model uses a Kalman filter (1960) –an algorithm that extracts insights about return paths by bringing together a number of uncertain inputs -to extend Black-Litterman into a multi-period setting. This allows us to capture the variation of expected returns over time under various scenarios —from economy-related to market sentiment driven. A large part of these variations is not predictable. Constructing portfolios that are robust to, or can exploit, these variations is a major challenge for investors. The ability to calibrate the engine with asset class views with uncertainty at arbitrary time horizons, and to evolve this uncertainty stochastically, drives the dispersion of return outcomes. Highlighting the uncertainty that investors face when building portfolios helps ensure ostensibly precise return expectations do not lead investors to concentrated portfolios.

Simulated return paths support a broader range of applications, such as asset-liability modelling. We believe stochastically generated return scenarios enable investors to move with ease beyond mean-variance and optimise portfolios against their individual needs. Investors can place more emphasis on the tails of the distribution or focus on the path of returns rather than just the total return. They can incorporate flows in or out of the portfolio over the course of the investor's time horizon or place more emphasis on scenarios that are challenging for the investor's business beyond their portfolio. Investors with complex asset-liability matching requirements, such as insurers, typically rely on stochastic simulations of returns to assess and construct portfolios.

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

Risk Warnings

Investors should refer to the prospectus or offering documentation for the funds full list of risks.

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.

Product Risks

iShares AI Adopters & Applications UCITS ETF USD (Acc)

Artificial Intelligence (AI) Risk, Concentration Risk, Counterparty Risk, Emerging Markets Risk, Equity Risk, ESG Screening Risk (ETF), Liquidity Risk, Investments in technology securities

iShares AI Infrastructure UCITS ETF USD (Acc)

Artificial Intelligence (AI) Risk, Concentration Risk, Counterparty Risk, Emerging Markets Risk, Equity Risk, ESG Screening Risk (ETF), Liquidity Risk, Investments in technology securities

iShares AI Innovation Active UCITS ETF

Artificial Intelligence (AI) Risk, Concentration Risk, Counterparty Risk, Emerging Markets Risk, Equity Risk, Liquidity Risk, Investments in technology securities

Description of Product Risks

Artificial Intelligence (AI) Risk

Companies in AI-related businesses will be subject to risks associated with developing technology and will face intense competition which may have an adverse effect on profit margins. It is likely that these companies will also rely heavily on Patents and other proprietary rights and any loss of, or limitation on their ability to enforce, such proprietary rights in the future could have a material adverse effect on their profitability. Certain AI technology features may also increase the risk of fraud or cyberattack.

Concentration Risk

Investment risk is concentrated in specific sectors, countries, currencies or companies. This means the Fund is more sensitive to any localised economic, market, political or regulatory events.

Counterparty Risk

The insolvency of any institutions providing services such as safekeeping of assets or acting as counterparty to derivatives or other instruments, may expose the Share Class to financial loss.

Emerging Markets Risk

Emerging markets are generally more sensitive to economic and political conditions than developed markets. Other factors include greater 'Liquidity Risk', restrictions on investment or transfer of assets and failed/delayed delivery of securities or payments to the Fund.

Equity Risk

The value of equities and equity-related securities can be affected by daily stock market movements. Other influential factors include political, economic news, company earnings and significant corporate events.

ESG Screening Risk (ETF)

The benchmark index only excludes companies engaging in certain activities inconsistent with ESG criteria if such activities exceed the thresholds determined by the index provider. Investors should therefore make a personal ethical assessment of the benchmark index's ESG screening prior to investing in the Fund. Such ESG screening may adversely affect the value of the Fund's investments compared to a fund without such screening.

Liquidity Risk

The Fund's investments may have low liquidity which often causes the value of these investments to be less predictable. In extreme cases, the Fund may not be able to realise the investment at the latest market price or at a price considered fair.

Investments in Technology Securities

Investments in the technology securities are subject to absence or loss of intellectual property protections, rapid changes in technology, government regulation and competition.

ESG Investment Statements

This information should not be relied upon as research, investment advice, or a recommendation regarding any products, strategies, or any security in particular. This is for illustrative and informational purposes and is subject to change. It has not been approved by any regulatory authority or securities regulator.

The environmental, social, and governance ("ESG") considerations discussed herein may affect an investment team's decision to invest in certain companies or industries from time to time. Results may differ from portfolios that do not apply similar ESG considerations to their investment process.

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.

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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.

iShares Funds: iShares plc, iShares II plc, iShares III plc, iShares IV plc, iShares V plc, iShares VI plc and iShares VII plc (together 'the Companies') are open-ended investment companies with variable capital having segregated liability between their funds organised under the laws of Ireland and authorised by the Central Bank of Ireland.

Further information about the Fund and the Share Class, such as details of the key underlying investments of the Share Class and share prices, is available on the iShares website at www.ishares.com or by calling +44 (0)845 357 7000 or from your broker or financial adviser. The indicative intra-day net asset value of the Share Class is available at http://deutsche-boerse.com and/or http://www.reuters.com. A UCITS ETF's units / shares that have been acquired on the secondary market cannot usually be sold directly back to the UCITS ETF itself. Investors who are not Authorised Participants must buy and sell shares on a secondary market with the assistance of an intermediary (e.g. a stockbroker) and may incur fees and additional taxes in doing so. In addition, as the market price at which the Shares are traded on the secondary market may differ from the Net Asset Value per Share, investors may pay more than the then current Net Asset Value per Share when buying shares and may receive less than the current Net Asset Value per Share when selling them.

For investors in Austria

The funds mentioned in this document are registered for public offer in Austria. The Sales Prospectuses for the Companies, Key Investor Information Document and other documents as well as the annual and semi-annual reports have been published in Austria and are available free of charge from UniCredit Bank AG Vienna Branch, Julius Tandler Platz 3, 1090 Vienna, Austria, the Austrian paying and information agent and are also available on the website www.blackrock.com/at and are available in German and English. Any decision to invest must be based solely on the information contained in the Company's Prospectus, Packaged Retail and Insurance-based Investment Products Key Information Document (PRIIPs KID) and the latest half-yearly report and unaudited accounts and/or annual report and audited accounts. Investors should read the fund specific risks in the Packaged Retail and Insurance-based Investment Products Key Information Document (PRIIPs KID) and the Company's Prospectus. The Companies intend to fulfil the requirements for treatment of all of their sub-funds as reporting funds. Therefore the Companies have an Austrian tax representative who calculates the Austrian Deemed Distributed Income figures once a year and files an electronic tax return with the Austrian Control Bank. However, it cannot be guaranteed that the requirements will be met in the future. The Companies reserve the right to give up the reporting fund status and to not undertake such tax filings. BlackRock may terminate marketing at any time. Investors should understand all characteristics of the funds objective before investing, if applicable this includes sustainable disclosures and sustainable related characteristics of the fund as found in the prospectus, which can be found www.blackrock.com on the relevant product pages. For information on investor rights and how to raise complaints please go to https://www.blackrock.com/corporate/compliance/investor-right available in German.

For investors in Denmark

The funds mentioned are registered for public distribution in Denmark and are authorised by Finanstilsynet, the Danish Financial Supervisory Authority. Any application for shares in the funds is on the terms of the Funds' Prospectus, the Packaged Retail and Insurance-based Investment Products Key Information Document (PRIIPs KID) and the latest half-yearly report and unaudited accounts and/or annual report and audited accounts and the Danish country supplements. Investors should read the fund specific risks in the Packaged Retail and Insurance-based Investment Products Key Information Document (PRIIPs KID) and the Company's Prospectus.

The Danish FSA has introduced rules on risk labelling for investment products pursuant to which various categories of investment product have been assigned a risk label. The shares of the funds mentioned have the yellow risk label pursuant to the Danish FSA's rules on risk labelling. The risk labelling is based on the possibility of losing the invested amount based on the product type and not the actual likelihood of this happening.

The risk labelling system is based on the colours of a traffic light.

• Green: Investment products labelled green refer to those where the risk of losing the invested amount is considered very limited and where the product type is not difficult to understand. Examples include Danish government bonds, EU governments bond and Danish mortgage bonds.

• Yellow: Investment products labelled yellow refer to those where there is considered to be a risk of losing the entire or a part of the invested amount and where the product type is not difficult to understand. Examples include listed shares, corporate bonds and shares of UCITS funds.

• Red: Investment products labelled red refer to those where there is considered to be a risk of losing more than the invested amount or the product type is difficult to understand. Examples include unlisted shares, options, futures, swaps and structured bonds.

Important information on the Funds is contained in the relevant Prospectus and other documents, copies of which can be obtained free of charge from the Fund's Danish representative BlackRock Copenhagen Branch, filial af BlackRock (Netherlands) BV with registered address Harbour House, Sundkrogsgade 21, 2100 København Ø, Denmark. This document is strictly confidential and may not be distributed without authorisation from BlackRock. In line with most other non-Danish funds, the iShares range will not have distributor status under Danish tax law, for which reason investors will generally be subject to tax based on the annual change in value of their investment irrespective of whether iShares are sold or not (mark-to-market taxation). For individuals this may be less tax efficient than upon investment in a comparable Danish investment fund with distributor status. Further information about the Fund and the Share Class, such as details of the key underlying investments of the Share Class and share prices, is available on the website at www.blackrock.com/dk available in English and Danish or by calling +44 (0)845 357 7000 or from your broker or financial adviser. The indicative intra-day net asset value of the Share Class is available at http://deutsche-boerse.com and/or http://www.reuters.com. Investors who are not Authorised

Participants must buy and sell shares on a secondary market with the assistance of an intermediary (e.g. a stockbroker) and may incur fees and additional taxes in doing so. In addition, as the market price at which the Shares are traded on the secondary market may differ from the Net Asset Value per Share, investors may pay more than the then current Net Asset Value per Share when buying shares and may receive less than the current Net Asset Value per Share when selling them. BlackRock may terminate marketing at any time.

For investors in Finland

The funds mentioned are registered for public distribution in Finland and are authorised by the Finanssivalvonta (Fiva), the Financial Supervisory Authority (FIN-FSA), in Finland. Any decision to invest must be based solely on the information contained in the Company's Prospectus, Packaged Retail and Insurance-based Investment Products Key Information Document (PRIIPs KID) and the latest half-yearly report and unaudited accounts and/or annual report and audited accounts which can be found at www.blackrock.com/fi and are available in English and Finnish. Investors should read the fund specific risks in the Packaged Retail and Insurance-based Investment Products Key Information Document (PRIIPs KID) and the Company's Prospectus. This document is strictly confidential and may not be distributed without authorisation from BlackRock. BlackRock may terminate marketing at any time. Investors should understand all characteristics of the funds objective before investing, if applicable this includes sustainable disclosures and sustainable related characteristics of the fund as found in the prospectus, which can be found www.blackrock.com on the relevant product pages. For information on investor rights and how to raise complaints please go to https://www.blackrock.com/corporate/compliance/investor-right available in English.

For investors in Germany

The Sales Prospectus and Packaged Retail and Insurance-based Investment Products Key Information Document (PRIIPs KID), as well as the annual and semi-annual reports are available free of charge from Commerzbank Kaiserplatz, 60311 Frankfurt am Main, Germany. The Companies intend to fulfil the prerequisites for treatment of their sub-funds as so-called "transparent funds" pursuant to §§ 2 and 4 of the German Investment Tax Act (Investmentsteuergesetz – InvStG). However, it cannot be guaranteed that the requirements will be met. The Companies reserve the right to give up the "transparent status" and to not undertake the necessary publications. Any decision to invest must be based solely on the information contained in the Company's Prospectus, Packaged Retail and Insurance-based Investment Products Key Information Document (PRIIPs KID) and the latest half-yearly report and unaudited accounts and/or annual report and audited accounts website at www.blackrock.com/de and are available in German and English. Investors should read the fund specific risks in the Packaged Retail and Insurance-based Investment Products Key Information Document (PRIIPs KID) and the Company's Prospectus. Please note that important information about iShares VII funds is available in the current prospectus and other documents that can be obtained free of charge from the paying agent, Deutsche Bank AG Taunusanlage 12, 60325 Frankfurt am Main, Federal Republic of Germany. BlackRock may terminate marketing at any time. Investors should understand all characteristics of the funds objective before investing, if applicable this includes sustainable disclosures and sustainable related characteristics of the fund as found in the prospectus, which can be found www.blackrock.com on the relevant product pages. For information on investor rights and how to raise complaints please go to https://www.blackrock.com/corporate/compliance/investor-right available in German.

For investors in Ireland

This document is strictly confidential and may not be distributed without authorisation from BlackRock. With respect to funds that are registered for public offer in Ireland, important information on the Companies is contained in the relevant Prospectus, the Packaged Retail and Insurance-based Investment Products Key Information Document (PRIIPs KID), and the most recent financial reports, which are available on our website www.iShares.com in English. Investors should read the fund specific risks in the Packaged Retail and Insurance-based Investment Products Key Information Document (PRIIPs KID) and the Company's Prospectus. BlackRock may terminate marketing at any time. Investors should understand all characteristics of the funds objective before investing, if applicable this includes sustainable disclosures and sustainable related characteristics of the fund as found in the prospectus, which can be found www.blackrock.com on the relevant product pages. For information on investor rights and how to raise complaints please go to https://www.blackrock.com/corporate/compliance/investor-right available in English.

For investors in Israel

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BlackRock could have a direct or indirect benefit from investments made by investors in Israel in the products mentioned in this document, or in other products managed by third parties with whom BlackRock is involved in a business contract. In particular, BlackRock manages the foreign funds mentioned in this document, and therefore derives a benefit from investments of Israeli investors in them (inter alia, by charging a "management fee" as specified in the prospectus and in the Annex to the prospectuses of such funds). Therefore, BlackRock has a "Connection" to such products, might have a personal interest in their sale, and might prefer such products over other products. Accordingly, any advice BlackRock provides, is considered, for the purpose of the Investment Advice Law, as Investment Marketing (and not Investment Advising). The complete and updated information regarding the names of such asset managers to the products of which BlackRock has a "connection" (and the types of products issued by each one) is available upon request**.**

For investors in Italy

Any application for shares in the funds is on the terms of the Prospectus for the Companies. The Shares of certain sub-funds in the Companies have been admitted to listing in Italy and are currently listed on the Mercato Telematico Fondi of Borsa Italiana S.p.A. The list of the sub-funds listed in Italy, the Prospectus, of the Companies, the Documento di quotazione of the iShares funds, the latest annual and semi annual report of the Companies are published (i) on the Companies' internet website at the address www.iShares.com in Italian and English (ii) on Borsa Italiana S.p.A's website at the address www.borsaitalia.it. These documents are available for the public in Italian version with certification that such documents are a faithful translation of the original documents. Investors are entitled to receive free of charge, even at home, a copy of the above documents, upon written request forwarded to the Companies. For comprehensive information on the expenses charged to a fund and fees applicable to investors, see the Documento di quotazione and the Prospectus. Any decision to invest must be based solely on the information contained in the Company’s Prospectus, the Packaged Retail and Insurance-based Investment Products Key Information Document (PRIIPs KID) and the latest half-yearly report and unaudited accounts and/or annual report and audited accounts. Investors should read the fund specific risks in the Packaged Retail and Insurance-based Investment Products Key Information Document (PRIIPs KID) and the Company’s Prospectus. Further information about the Fund and the Share Class, such as details of the key underlying investments of the Share Class and share prices, is available on the iShares website at www.ishares.com or by calling +44 (0)845 357 7000 or from your broker or financial adviser. The indicative intra-day net asset value of the Share Class is available at http://deutsche-boerse.com and/or http://www.reuters.com. Investors who are not Authorised Participants must buy and sell shares on a secondary market with the assistance of an intermediary (e.g. a stockbroker) and may incur fees and additional taxes in doing so. In addition, as the market price at which the Shares are traded on the secondary market may differ from the Net Asset Value per Share, investors may pay more than the then current Net Asset Value per Share when buying shares and may receive less than the current Net Asset Value per Share when selling them. BlackRock may terminate marketing at any time. Investors should understand all characteristics of the funds objective before investing, if applicable this includes sustainable disclosures and sustainable related characteristics of the fund as found in the prospectus, which can be found www.blackrock.com on the relevant product pages. For information on investor rights and how to raise complaints please go to https://www.blackrock.com/corporate/compliance/investor-right available in Italian.

For investors in Luxembourg

The Companies have been notified to the Commission de Surveillance du Secteur Financier in Luxembourg in order to market their shares for sale to the public in Luxembourg and the Companies are notified Undertaking in Collective Investment for Transferable Securities (UCITS). The Companies have not been listed on the Luxembourg Stock Exchange, investors should contact their broker for further information. Investment is subject to the Prospectus, the Packaged Retail and Insurance-based Investment Products Key Information Document (PRIIPs KID) and all documents (the main/umbrella Prospectus, the Supplement[s], the

latest and any previous annual and semi-annual reports of the Companies and the Memorandum and Articles of Association of the Companies) will be available in the Luxembourg, free of charge, from the offices of the Local Agent, BNP Paribas Securities Services, Luxembourg Branch 33, rue de Gasperich Howald – Hesperange L-2085 Luxembourg or by visiting the website on www.iShares.com which are available in English. Investors should read the fund specific risks in the Packaged Retail and Insurance-based Investment Products Key Information Document (PRIIPs KID) and the Company's Prospectus. BlackRock may terminate marketing at any time. Investors should understand all characteristics of the funds objective before investing, if applicable this includes sustainable disclosures and sustainable related characteristics of the fund as found in the prospectus, which can be found www.blackrock.com on the relevant product pages. For information on investor rights and how to raise complaints please go to https://www.blackrock.com/corporate/compliance/investor-right available in English.

For investors in Norway

The funds mentioned are registered for public distribution in Norway and are authorised by Kredittilsynet, the Financial Supervisory Authority of Norway. Any application for shares in the funds is on the terms of the Prospectus, the Packaged Retail and Insurance-based Investment Products Key Information Document (PRIIPs KID) for the Companies. Any decision to invest must be based solely on the information contained in the Company's Prospectus, the Packaged Retail and Insurance-based Investment Products Key Information Document (PRIIPs KID) and the latest half-yearly report and unaudited accounts and/or annual report and audited accounts. Investors should read the fund specific risks in the Packaged Retail and Insurance-based Investment Products Key Information Document (PRIIPs KID) and the Company's Prospectus which can be found at www.blackrock.com/no available in Norwegian and English. This document is strictly confidential and may not be distributed without authorisation from BlackRock. BlackRock may terminate marketing at any time. Investors should understand all characteristics of the funds objective before investing, if applicable this includes sustainable disclosures and sustainable related characteristics of the fund as found in the prospectus, which can be found www.blackrock.com on the relevant product pages. For information on investor rights and how to raise complaints please go to https://www.blackrock.com/corporate/compliance/investor-right available in English.

For investors in Spain

The funds mentioned are registered for public distribution in Spain.The sales Prospectus has been registered with the Spanish Securities Market Commission (Comisión Nacional del Mercado de Valores ('CNMV')). The funds which are registered in the official registry of the Spanish Securities and Exchange Commission (CNMV) are iShares plc (registration number 801), iShares II plc (registration number 802) and iShares III plc (registration number 806), iShares IV plc (registration number 1402), iShares V plc (registration number 977), iShares VI plc (registration number 1091), iShares VII plc (registration number 886) and iShares (Lux) (registration number 905). The official registry, CNMV, must always be checked to see which sub funds of the funds mentioned are registered for public distribution in

Spain. Any decision to invest must be based solely on the information contained in the Company's Prospectus, the Packaged Retail and Insurance-based Investment Products Key Information Document (PRIIPs KID) and the latest half-yearly report and unaudited accounts and/or annual report and audited accounts, copies of which can be obtained free of charge at www.iShares.es available in Spanish and English. Investors should read the fund specific risks in the Packaged Retail and Insurance-based Investment Products Key Information Document (PRIIPs KID) and the Company's Prospectus. This document contains products or services of BlackRock, Inc. (or affiliates thereof) that might be offered directly or indirectly within the Andorran jurisdiction, and it should not be regarded as solicitation of business in any jurisdiction including the Principality of Andorra. BlackRock may terminate marketing at any time. Investors should understand all characteristics of the funds objective before investing, if applicable this includes sustainable disclosures and sustainable related characteristics of the fund as found in the prospectus, which can be found www.blackrock.com on the relevant product pages. For information on investor rights and how to raise complaints please go to https://www.blackrock.com/corporate/compliance/investor-right available in Spanish and Portuguese.

For investors in Sweden

The Funds mentioned herein are registered for public distribution in Sweden and are authorised by Finansinspektionen, the Swedish Financial Supervisory Authority. Any application for shares in the funds is on the terms of the Prospectus, Key Investor Information Document, for the Companies. Important information relating to the Companies is contained in the relevant Prospectus, Packaged Retail and Insurance-based Investment Products Key Information Document (PRIIPs KID) and other documents, copies of which can be obtained free of charge from offices of the paying agent BlackRock (Netherlands) BV, Stockholm branch Regeringsgatan 29, 111 53 Stockholm, Sweden. Any decision to invest must be based solely on the information contained in the Company's Prospectus, Packaged Retail and Insurance-based Investment Products Key Information Document (PRIIPs KID) and the latest half-yearly report and unaudited accounts and/or annual report and audited accounts which can be found at www.blackrock.com/se available in Swedish and English. Investors should read the fund specific risks in the Packaged Retail and Insurance-based Investment Products Key Information Document (PRIIPs KID) and the Company's Prospectus. BlackRock may terminate marketing at any time. Investors should understand all characteristics of the funds objective before investing, if applicable this includes sustainable disclosures and sustainable related characteristics of the fund as found in the prospectus, which can be found www.blackrock.com on the relevant product pages. For information on investor rights and how to raise complaints please go to https://www.blackrock.com/corporate/compliance/investor-right available in English.

For investors in Switzerland

The iShares ETFs are domiciled in Ireland, Switzerland and Germany. BlackRock Asset Management Schweiz AG, Bahnhofstrasse 39, CH-8001 Zurich, is the Swiss Representative and State Street International GmbH, Munich, Zurich Branch, Beethovenstrasse 19, CH-8002 Zürich the Swiss Paying Agent for the foreign iShares ETFs registered in Switzerland. The prospectus with integrated fund contract, the Packaged Retail and Insurance-based Investment Products Key Information Document (PRIIPs KID) or equivalent, the general and particular conditions, the Articles of Incorporation, the latest and any previous annual and semi-annual reports of the iShares ETFs domiciled or registered in Switzerland are available free of charge from BlackRock Asset Management Schweiz AG. Investors should read the fund specific risks in the PRIIPs KID or equivalent and the Prospectus.

For investors in the Netherlands

The Companies have been notified to the Authority Financial Markets in line with the registration process set out in the Dutch Financial Markets Supervision Act (Wet op het financieel toezicht; "FMSA"), regulations enacted pursuant thereto and the supervision thereunder of the Authority Financial Markets. Copies of all documents (the main/umbrella Prospectus, Packaged Retail and Insurance-based Investment Products Key Information Document (PRIIPs KID), the Supplement[s], the latest and any previous annual and semi-annual reports of the Companies and the Memorandum and Articles of Association of the Companies) will be available in the Netherlands, free of charge, from the offices of the representative in the Netherlands, BlackRock (Netherlands) BV, Rembrandt Toren, 17th floor, Amstelplein 1, 1096 HA Amsterdam, Netherlands or by calling the Dutch representative's information request line on 0800 0233 466 and the iShares website www.ishares.nl in Dutch and English. Any decision to invest should be based on the information contained in the Prospectus and the key investor Information Document and the latest half-yearly report and unaudited accounts and/or annual report and audited accounts. Investors should read the fund specific risks in the Packaged Retail and Insurance-based Investment Products Key Information Document (PRIIPs KID) and the Company's Prospectus. The risk indicator shown on this document refers to the relevant share class of the Fund. Higher or lower risk may apply to the other share classes of the Fund. BlackRock may terminate marketing at any time. Investors should understand all characteristics of the funds objective before investing, if applicable this includes sustainable disclosures and sustainable related characteristics of the fund as found in the prospectus, which can be found www.blackrock.com on the relevant product pages. For information on investor rights and how to raise complaints please go to https://www.blackrock.com/corporate/compliance/investor-right available in English and Dutch.

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