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Navigating the AI ecosystem: A guide to the STOXX Thematic Framework

Helen Tesfaldet, Product Development, Associate Director

Co-authors:
Stefano Simone, Product Development, Associate Director
Yang Wang, Product Development, Executive Director
Aneeka Soni, Product Development, Analyst
Rafael Valenzuela Rodriguez, Product Development, Associate

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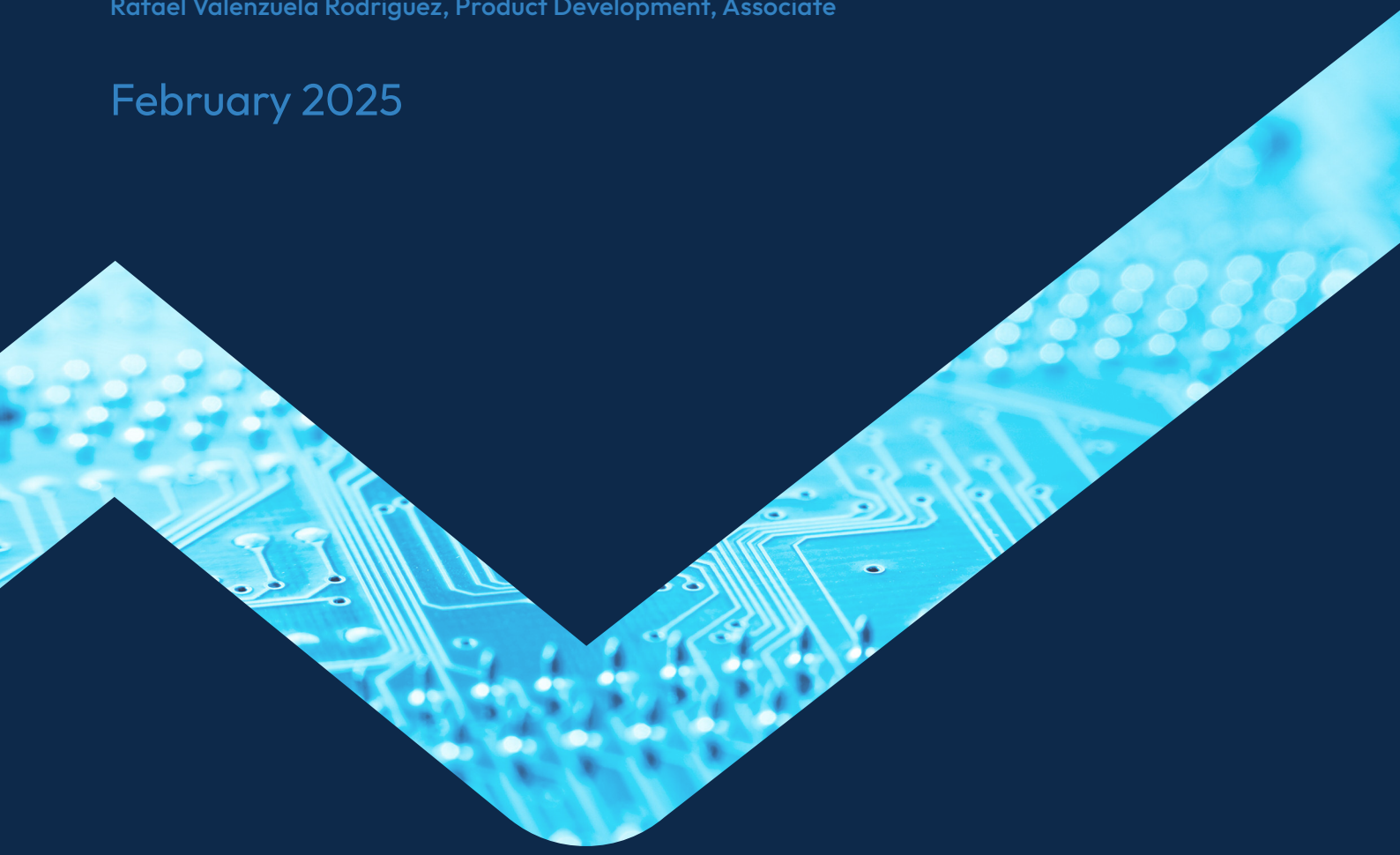

STOXX

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1. Introduction

Artificial Intelligence (AI) has evolved from a niche academic field in the 1950s to a powerful economic force in the 2020s. Initially, it focused mainly on theoretical research, which generated little market interest, and experienced a period of setbacks in the 1970s and 1980s. However, it then saw a resurgence in the 1990s and 2000s, with breakthroughs in machine learning and the commercialization of technologies such as speech recognition and data mining. The 2010s ushered in a deep learning revolution, making AI a core component of industries such as health care, finance and entertainment, and fueling substantial market growth. Today, AI plays a central role in global economic strategies and is projected to contribute trillions to the global economy by 2040.[1] As it advances, it will continue to transform industries, create new job opportunities and spark critical ethical and regulatory discussions, potentially leading to even greater disruption in years ahead.

This paper explores the theme and its growth opportunities. We expect to see a wide range of investment opportunities as developments in AI progress. These opportunities will be in segments at the forefront of AI innovation, those supplying the essential hardware and services supporting this innovation, and those successfully incorporating these advancements in their business models and hence offering both growth and scalability. We will outline systemic strategies for capturing the potential upside as this theme continues to evolve and expand across a wide range of industries.

We begin our discussions by examining the construction of thematic indices, starting with the initial assessment of a theme, its life cycle evolution, and the identification and definition of key subthemes. We emphasize the importance of a multifaceted approach, carefully examining the stages in a theme's development, and incorporating appropriate methodologies and data points to ensure a robust framework.

We then discuss the STOXX Artificial Intelligence index suite to show how the STOXX Thematic Framework is used to construct portfolios that offer targeted exposure to the AI sector. You will see that, while the indices focus on the same theme, they address different aspects of it and different stages of its development. The paper provides a comprehensive overview of the effects of these considerations, covering attributes such as industry and factor exposures, and risk and return profiles.

2. The STOXX Thematic Framework

Historically, investment strategies have focused on traditional assets such as equities and bonds, with diversification typically achieved through exposure to different regions and sectors. However, rapid transformations in consumer behaviors, technological innovations and environmental issues over recent decades have led investors to recognize the potential of aligning portfolios with specific themes that reflect these changes. The increasing availability of relevant data, the growing sophistication of financial products and the rise of exchange-traded products have all made it easier to gain exposure to these themes. Consequently, thematic investing has become increasingly popular in recent years, fueled by new investment opportunities associated with digital transformation and other major structural shifts.

Unlike speculative investments that are driven by short-term market views and activities, we believe that thematic investing seeks to identify enduring trends, with a clear exposure profile, that offer sustainable growth opportunities over time. In other words, to capture market segments that will lead to structural changes in industries and demographics.

[1] Source: McKinsey, The next big arenas of competition.

Thematic strategies are continuing to evolve as investors increasingly seek to align their portfolios with long-term growth prospects, emphasizing themes that go beyond traditional investment metrics to include factors such as sustainability and social impact.

The following sections introduce the STOXX Thematic Framework – a structured approach used to identify investment themes at different stages of their life cycle, tracking their evolution from ideation to maturity. The framework considers the risk and reward profile across these stages, with earlier stages offering higher potential upside but also a higher risk profile. We discuss the importance of assessing the entire ecosystem to define a comprehensive set of building blocks linked to the theme. The insights gained from this research are then used to identify suitable processes and data points for constructing thematic portfolios, i.e. specific market segments that are either expected to drive the revolutions brought about by the themes or that stand to benefit from their evolution. The STOXX Thematic Framework offers a systematic approach to identifying and building thematic indices, ensuring that the thematic strategies reflect the exposure to the desired themes.

2.1 Researching themes

When researching a thematic strategy, it is crucial to take a comprehensive approach to the theme research and to consider the entire ecosystem associated with the theme's evolution. A successful implementation of a thematic strategy goes beyond identifying companies at the forefront of the trend; instead, it requires a deeper understanding of how the theme will evolve and which market segments stand to benefit throughout its life cycle.

The study of a nascent market segment invites multidimensional consideration. The guiding idea behind the STOXX Thematic Framework is to consider three key aspects of a theme:

- Companies directly leading and driving the theme's evolution; these typically provide the end products and services in the theme;
- Key enablers and suppliers, i.e. companies that provide components or services that are essential for the theme's development, and finally;
- Companies that may not be directly involved with the theme but stand to benefit from its evolution.

Using this classification as a basis, the broader theme can be broken down into subthemes, each representing distinct areas and making it easier to identify investment opportunities. This approach provides us with a definition of the theme concerned – i.e. a definition of specific market segments. This encompasses both product and service definitions and technology definitions, which we will elaborate on further in section 3.

Equipped with this market segment definition of a theme, we can adopt a systematic methodology that allows us to consistently select companies in the identified business lines. Accurate theme capturing involves evaluating its evolution and understanding its (and its subthemes') position within its life cycle. This helps to pinpoint potential growth opportunities and risks within the theme, and to select suitable datasets and index construction methodologies.

2.2 Capturing themes

The STOXX Thematic Framework recognizes four stages in the development of a theme:

1. **Ideation**
2. **Innovation**
3. **Commercialization**
4. **Maturity**

In the **ideation** stage, the theme is just emerging, with limited tangible commitments or development. While companies may discuss the theme in earning calls or press releases, it is challenging to assess actual investments or concrete progress made.

The **innovation** stage marks the point at which companies begin investing in the theme, and is often evidenced by patent filings as they start protecting their intellectual property, signaling their intentions and staking out their territory. The STOXX Thematic Framework recognizes that innovation KPIs provide meaningful insights into companies' commitments and initiatives. A company's patent portfolio provides a wealth of information about its innovation and strategic direction, from its technological focus and research commitments down to its competitive position. Building on this, STOXX employs a systematic patent selection approach when identifying innovators and early movers – companies that will lead the innovation and define the theme in coming years. We find patent data to be a highly reliable tool in identifying companies that may not have generated significant revenues from the emerging themes but are actively working in these areas.

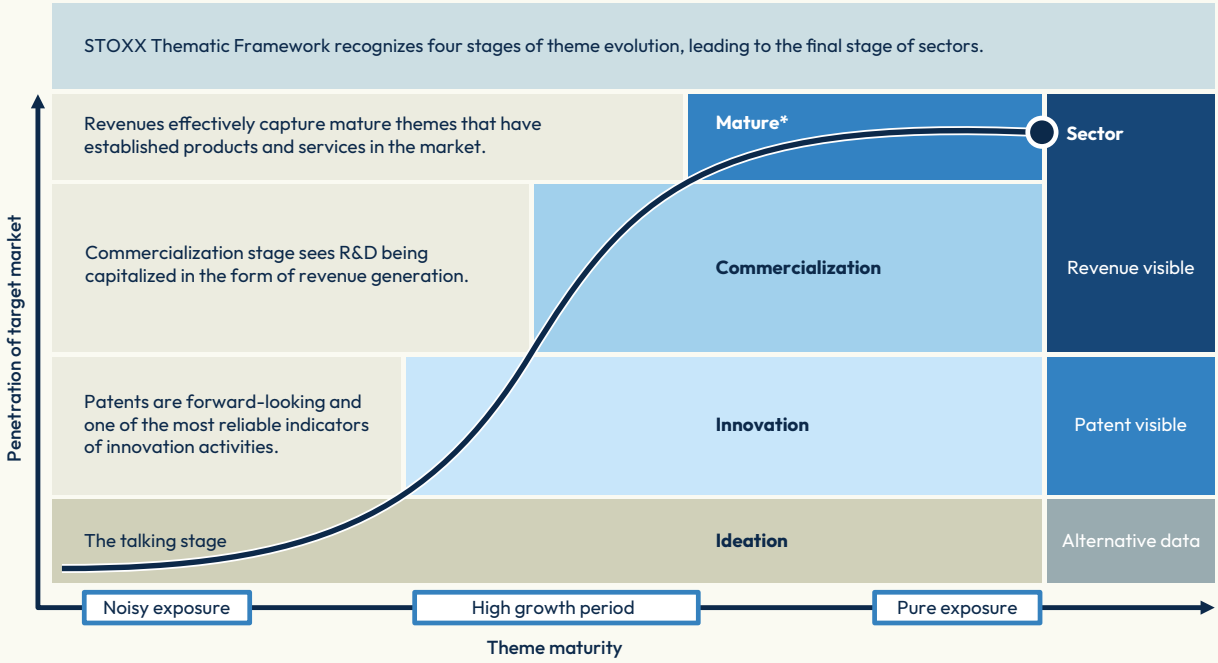
In the **commercialization** stage, companies start generating significant revenues from the theme as products and services begin to materialize. A company's revenue exposure provides a clear picture of its activities and economic output, its focus and realized efforts related to the theme, making it a key metric in understanding the company's links to the theme. Revenue exposure, therefore, serves as an effective indicator for identifying companies at this stage, and is a widely recognized metric used in thematic portfolio construction. After this, the theme becomes well established, with widespread recognition, adoption and market integration. At **maturity**, the theme reaches market saturation and, if significant enough, may evolve into a conventional industrial sector or sectors. Revenue is still effective in selecting companies at this stage as well.

The diffusion of innovations is a theory that seeks to explain how, why, and at what rate new ideas and technology spread. The rate of adoption is defined as the relative speed at which the target market adopts an innovation. In the earlier stages of an innovation, the percentage of the target market that is captured is still very small. As the ideas and technologies mature, they start to have more market penetration and representation. STOXX uses the adoption curve (see Figure 1) to map the life cycle for a given theme and its subthemes' and to evaluate the associated risks and opportunities.

Market penetration is low in the early stages of development, and the availability of reliable datasets for use in capturing relevant companies is limited. The opportunity for growth is significant in the **ideation** stage, but so is the risk of noisier exposure. Market reach and representation then increases as the theme advances, as does the underlying level of conviction.

Thematic exposure becomes more measurable as more observable data points emerge. In the **innovation** phase, forward-looking indicators such as patents signal innovation activities, and early movers can be identified. As we progress along the curve, products and services begin to emerge and revenue exposure becomes measurable. There is a considerable upside potential as we transition across **innovation** and **commercialization**, which are an optimal time to track the theme's evolution. As the theme nears **maturity**, the potential upside stabilizes, as the associated risks and opportunities are factored in.

Figure 1: Theme evolution in the STOXX Thematic Framework.



Source: STOXX.

It is important to note that a theme may not progress from one stage to another in a linear fashion. Some subthemes may be in the early stages of development, while others may already be more established. It is, therefore, valuable to assess the evolutionary cycles of individual subthemes in order to understand their potential evolutionary path, and to identify the most relevant datasets and methodologies for use in targeted thematic portfolio construction.

The STOXX Thematic Framework provides a chronological perspective on theme development. The multi-stage nature of themes naturally offers a tiered view of all their subsegments. The following tier groups are identified in the STOXX thematic index construction process:

- **Pure Players:** Companies that generate the majority of their revenues from the theme
- **Diversified Players:** Companies that generate significant revenues from the theme
- **Break-through Innovators:** Companies that invest significantly in innovative technology related to the theme, but have yet to generate significant revenues from it
- **Potential Contenders:** Companies that are frequently mentioned in connection with, or have shown strong interest in gaining exposure to the theme. There is a lack of reliable indicators that demonstrate tangible commitments and likely success for these players in the theme. Therefore, they are not considered in the STOXX Thematic Framework

The **innovation** to **maturity** stages present the most attractive time periods for investment. STOXX uses a modular approach to incorporating the tiers in thematic index construction, allowing different types of tiers to be employed in a single index to capture themes consisting of companies or subthemes that are positioned at different stages along the innovation curve. The use of different tiers within the same theme also enables the thematic solution to offer exposure to a broad range of thematic companies, enabling index solutions to strike a flexible balance between purity of exposure and higher growth opportunities.

Within the STOXX Thematic Framework, another useful metric that emerges as a relevant indicator in the construction of thematic indices is company's market share. This indicator measures a company's competitive position through its absolute revenues relative to industry peers in specific market segments. This is a powerful tool for identifying market leaders – i.e. companies with dominant market positions in the space. Market share can also be used to select large, diversified companies with multiple revenue sources and less than 25% exposure to the theme overall, but that still have substantial exposure in absolute terms.

The introduction of the innovation curve in conjunction with the corresponding metric representing the capturable signals in each stage forms the foundation of our tier based construction framework. The construction of the thematic indices follows this effective and flexible structure to capture opportunities along the whole innovation curve.

Figure 2: The STOXX Thematic Framework – A tier-based construction structure.

Tiers	Description	Key indicators	Optional supplementary indicators	Common threshold	Additional indicators
Pure Players	Companies generate most of the revenue from the theme	Revenue exposure		Revenue ≥ 50%	Market leaders: Companies that have a substantial market share in the theme (companies with significant total sales in relation to the sales in the market segment)
Diversified Players	Companies generate significant revenue from the theme	Revenue exposure	Patent exposure filing/other data	Revenue ≥ 25% (top patent exposure) (top filings exposure)	
Break-through Innovators	Companies invest significantly in the innovative technology related to the theme but yet to generate significant revenue	Patent exposure		Top patent exposure - High quality patents - Patent specialization	

Source: STOXX.

3. Definition of the Artificial Intelligence theme

In this section, we highlight our approach to analyzing this complex trend, giving a clear-cut definition that provides a better understanding of the Artificial Intelligence theme. Following the principles discussed above, the research analyzes the nature of AI and examines the market landscape for the technology and its market usage. In line with this, we start by decomposing the theme by identifying its building blocks and real-world applications. We then define the subthemes representing the capturable market segments and outline the structure for index construction using the STOXX Thematic Framework.

3.1 AI theme investment thesis

AI is undeniably one of the most prominent technology trends today and is transforming how we work and live. Within the investment community, we have seen many financial products aiming to capture this emerging theme and to provide investors with vehicles and opportunities to gain exposure to it. However, given all the hype surrounding AI and apparent natural language processing (NLP) dominated media coverage, it is easy to lose sight of what the fundamental drivers and demands of AI technology are.

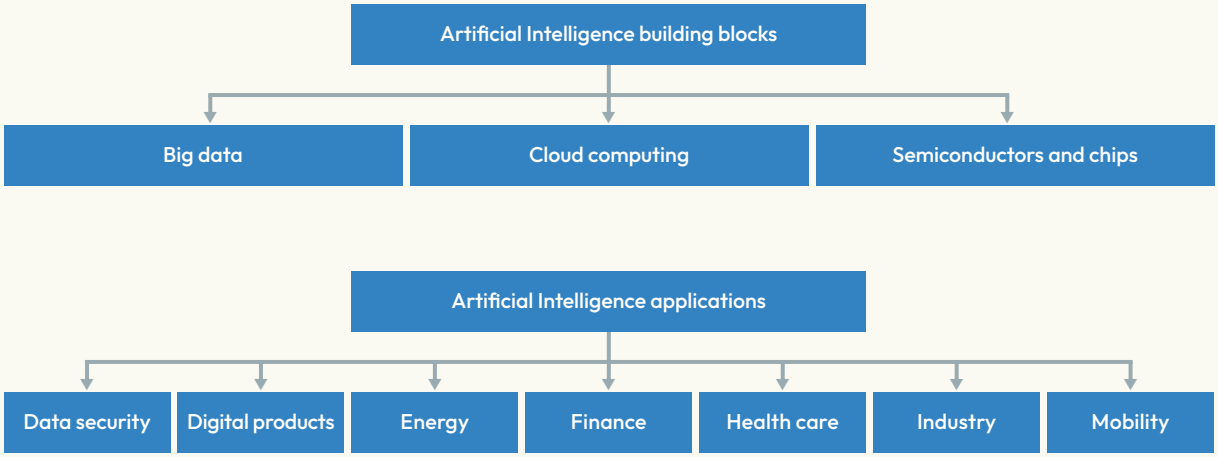
The AI sector is experiencing a rapid growth, fueled by advances in computing power, data availability and machine learning breakthroughs. Transformative applications are being seen across areas such as health care, finance, mobility, energy, industrials, digital products and data security.

- Key high-growth sectors driving AI investment opportunities include AI infrastructure (cloud services, big data and AI chips), which is essential for providing the computing power and hardware needed to scale AI technologies.
- In health care, AI is revolutionizing drug discovery, medical diagnostics and personalized medicine, creating significant potential for both biotech and AI-driven health care platforms.
- The autonomous vehicles sector is also expanding rapidly and advancing self-driving technology, while Mobility as a Service (MaaS) offers additional growth opportunities.
- In financial services, AI is transforming areas such as algorithmic trading, fraud detection and risk assessment, benefiting both fintech start-ups and traditional institutions.
- In the energy sector, AI is enhancing efficiency and supporting the shift to sustainable energy.
- AI is transforming the industrial sector by enabling automation, enhancing predictive maintenance and optimizing supply chain operations.
- Meanwhile, digital products are benefiting from AI in consumer electronics, digital content creation and personalized experiences.
- Finally, data security is increasingly relying on AI for advanced threat detection and data protection, creating investment opportunities in this critical sector.

This list of sectors illustrates the wide range of opportunities in which AI is expected to drive significant innovation and growth.

The investment opportunities identified can be broken down into two key areas: AI building blocks and AI applications.

Figure 3: AI building blocks and AI applications.



Source: STOXX.

3.2 AI building blocks

STOXX identifies the building blocks for AI by examining the technologies that are foundational to its development and effectiveness. These include:

- Semiconductors and chips
- Cloud computing, and
- Big data technologies

Characteristics that distinguish these technologies as AI building blocks include the following:

Semiconductors and chips play a vital role in advancing AI by providing the processing power necessary for complex algorithms, particularly in deep learning. The rapid processing capabilities of modern chips support real-time data handling, which is crucial for tasks such as image recognition and natural language processing.

Big data serves as an essential foundation for AI, offering the extensive, varied and high-quality data that is necessary for training machine learning models. The scalability of big data frameworks also ensures efficient management of large datasets, enriching insights and boosting the effectiveness of AI applications.

Cloud computing is a crucial foundation for AI, providing scalable resources that adapt to diverse computational demands. It offers significant storage capacity for the large datasets essential to AI, allowing seamless access and management. Additionally, cloud computing provides access to advanced AI tools and services, speeding up both development and deployment.

3.3 AI applications

Artificial Intelligence is evolving quickly and is expected to transform a wide range of fields. We anticipate that the following areas will see a significant impact from this technological transformation:

- Health care
- Mobility
- Finance
- Energy
- Industrials
- Digital products
- Data security

These areas have been identified by analyzing the research and development (R&D) efforts by leading companies across various sectors. The focus here is on the domains in which these companies have demonstrated intensive activity, potentially driving significant transformation.[2] Additionally, the areas' characteristics were considered in terms of their potential for transformation through AI.

Characteristics that identify them as the main AI application areas include the following:

Health care is set to be significantly transformed by AI due to the its capability to improve diagnostics, personalize treatment and enable predictive analytics. By leveraging large datasets, AI helps predict health events and resource needs, while streamlining administrative tasks to allow health care professionals to focus on patient care.

Mobility will see significant transformation as a result of AI, particularly in the development of autonomous vehicles that can navigate safely using real-time data. Advanced driver-assistance systems enhance vehicle safety by monitoring surroundings and preventing accidents.

Finance is set to be significantly transformed by AI due to its ability to enhance fraud detection through real-time analysis of transaction patterns, thereby improving security. In algorithmic trading, AI-driven systems can execute trades at high speeds, optimizing investment strategies.

Energy is poised for a significant transformation through AI's ability to optimize smart grids, improving energy distribution and reliability by balancing supply and demand in real time. AI facilitates the integration of renewable energy sources by forecasting production and consumption, and also supports demand response programs that adjust usage during peak periods to balance the grid.

The **industrial sector** will be significantly transformed by AI in the form of enhanced automation and robotics, which improve efficiency and precision while reducing labor costs. AI supports data-driven decision-making, enabling organizations to make informed operational and strategic choices.

Digital products: AI enables enhanced personalization and hence tailored user experiences based on individual preferences and behaviors. AI-driven features such as chatbots and virtual assistants improve user engagement by providing instant support and interactivity. Additionally, AI automates content creation, making it easier for creators to produce high-quality digital products efficiently.

Data security is being significantly affected by AI, which can analyze vast data patterns for unusual behaviors and hence detect threats in real time. AI also enhances fraud prevention by identifying anomalies in transactions. Equally, it can improve encryption methods, making unauthorized access to sensitive data more difficult.

[2] Data Source: EconSight, EconSight - Measuring Technological Progress.

3.4 Definition of AI subthemes

In the previous subsections, we identified the fundamental components of AI and its main areas of application. We can now use this knowledge to divide the AI theme into two categories: AI Infrastructure, which consists of the fundamental components, and AI Applications, which represents the main application areas.

This allows us to differentiate the key aspects of this complex theme and to define related subthemes representing capturable market segments.

Figure 4 shows the AI subthemes for AI Infrastructure and AI Application. Big Data is further classified into two categories, Connectivity, and Storage and Services, which are identified as the two relevant aspects of Big Data technologies.

Figure 4: AI subthemes.

- AI Infrastructure: Semiconductors / chips
- AI Infrastructure: Cloud computing
- AI Infrastructure: Big data
  - Connectivity
  - Storage and Services

- AI Application: Data security
- AI Application: Digital products
- AI Application: Energy
- AI Application: Finance
- AI Application: Health
- AI Application: Industry
- AI Application: Mobility

Source: STOXX.

4. Constructing the STOXX Artificial Intelligence index suite

The growth of any theme follows different stages of evolution, signaling its maturity as a market segment. Commonly, comprehensive themes such as AI encompass a number of segments, each exposed to different stages of maturity. This fact offers a versatile tool for capturing two aspects of a theme: the specific segments within a theme and the different stages of the theme's life cycle. Now that the theme and subthemes for AI have been defined, overlaying the STOXX Thematic Framework naturally leads to the creation of the STOXX Artificial Intelligence index suite, giving index users the flexibility to tailor their thematic exposures.

4.1 AI evolution and the STOXX Thematic Framework

We see themes as market segments that have the potential to mature into market sectors. A market segment is fundamentally defined by its economic function, and the main economic function of a company is typically determined by its primary revenue output. Consequently, revenue data is a strong metric

for identifying companies that are generating significant revenues in the theme and actively participating in the AI market. Companies captured by their overall AI revenue exposure, as a proportion of their overall revenues, are categorized into two groups in the STOXX Thematic Framework:

- Pure Players if their AI revenue exposure accounts for over 50% of their total revenue output
- Diversified Players if their revenue range is 25% – 50%

Market share is another useful element that we consider when assessing market leaders and dominant players in the field. For instance, the STOXX World AC AI Market Leaders index is drawn from a pool of companies with the highest absolute revenue exposures to the AI theme. Combining this with additional fundamental data points, it selects companies with dominant market positions whose pricing power allows them to maintain profitability even in difficult economic conditions. These companies' financial strength allows them to weather downturns better than their competitors, offering a solid combination of growth opportunities and risk management.

Companies with R&D activities and investments are more likely to have a competitive advantage and be better placed to benefit from the growth and future commercialization of growing themes. Patent data serves as a key indicator of innovation, offering valuable insights into a company's R&D activities and strategic direction. AI is a rapidly evolving field, with numerous recent advancements and an exciting trajectory ahead. While revenues are beginning to materialize, we anticipate many new developments that have yet to be reflected in companies' financials. In this case, the use of patent data is instrumental in identifying companies that are heavily investing in and researching AI, as well as in capturing those with significant breakthroughs in this domain.

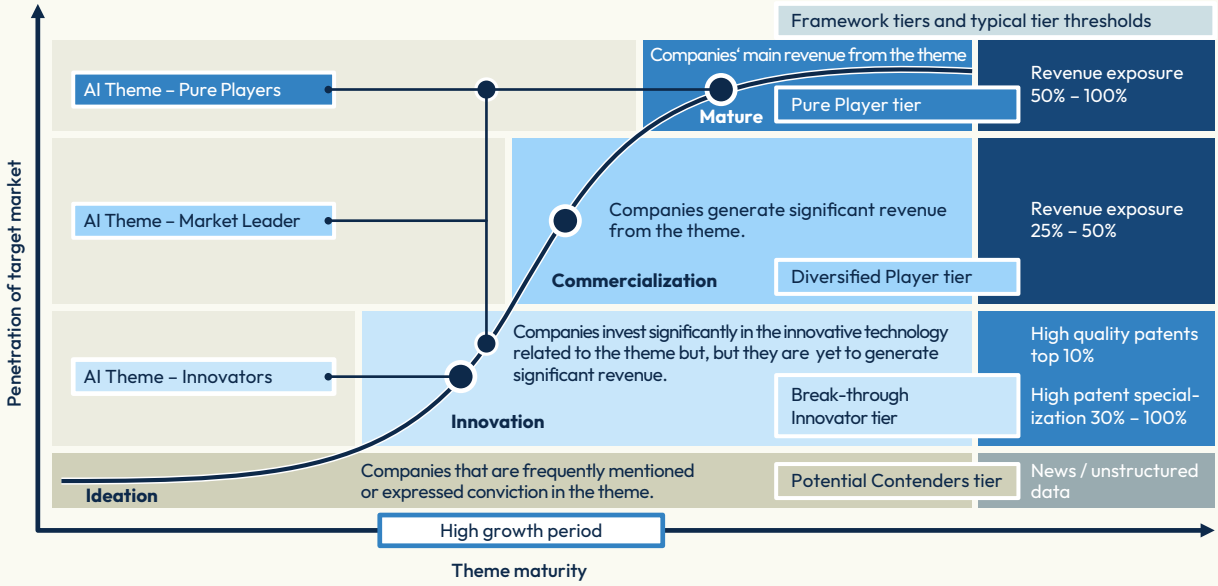
The use of patent data is also very useful in distinguishing companies that, while not primarily focused on AI, are incorporating it into their business models. For example, we can identify companies offering medical imaging and diagnostic services via their revenues. While their use of AI may not be evident from their revenues, it can be inferred from their patent activities. Combining revenue and patent data enables a targeted selection of innovators from within desired industries.

4.2 STOXX Global Artificial Intelligence index solutions

The STOXX Thematic Framework illustrates the growth stages of themes and the associated investment opportunities for investors. It also provides a tiered construction tool comprising three main groups: output-based tiers, innovation-based tiers and market share-based tiers.[3] The STOXX Artificial Intelligence index suite follows this clear tier-based construction process, as can be seen in Figure 5.

[3] STOXX uses the following criteria: Output-based tiers generally rely on revenue exposures (%), innovation-based tiers are typically measured by patents and market share based tiers are determined by the absolute revenues generated within the relevant themes.

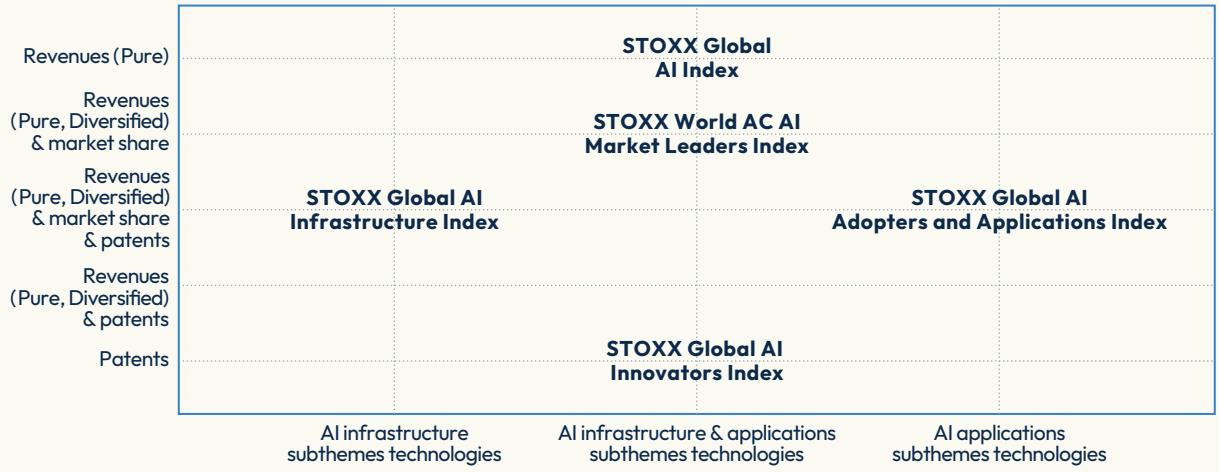
Figure 5: AI theme evolution through the STOXX Thematic Framework lens.



Source: STOXX.

The STOXX Artificial Intelligence index suite contains the portfolio representations of the different growth opportunities and, in some cases, different segments that can be captured by a rules-based passive strategy.[4] Figure 6 shows the indices that are currently part of the suite, how they relate to the STOXX Thematic Framework tier-based construction approach and their exposures to the AI subthemes.

Figure 6: The STOXX Global Artificial Intelligence index suite.



Source: STOXX.

[4] Please see the Appendix for more information on the methodologies used.

The STOXX Global Artificial Intelligence Index represents the more mature portion of the theme, selecting the Pure Players from a revenue perspective. In contrast, the STOXX Global Artificial Intelligence Innovators Index represents the Innovation stage of the theme, capturing companies with superior innovation potential based on their R&D activities (as measured by patents). The STOXX World AC AI Market Leaders Index selects the strongest players in the theme, i.e. those that excel in their AI segment peer group by establishing themselves as the top players, measured in terms of the global listed market output in the defined AI segment.

The STOXX Global AI Infrastructure Index and the STOXX Global AI Adopters and Applications Index aim to capture the more representative segments of the theme in the public listed market across all thematic development stages. Furthermore, the modular approach adopted by the STOXX thematic research enables each of these two indices to focus on a specific segment of the theme. Thus the STOXX Global AI Infrastructure Index focuses on the core foundational technologies that are driving advances in AI technologies and products. Conversely, the STOXX Global AI Adopters and Applications Index captures market segments that have shown great initiative or that are benefiting from market conditions to adopt new AI technologies, enhancing existing products or creating new AI-powered ones.

The STOXX Thematic Framework argues that themes are market segments that can evolve into conventional sectors. Therefore, if we start with a thematic index and weight it by free-float adjusted market capitalization, it will naturally evolve into a sector index once the theme reaches complete maturity. Reflecting this, the indices in the STOXX Artificial Intelligence index suite start with the market capitalization weight. However, this poses potential concentration challenges as themes can be small market segments in their developing stages. Capping is employed to improve the replicability of these indices and reduce concentration risk. Details on the capping methods used in each of the indices can be found in the Appendix.

5. Index analysis

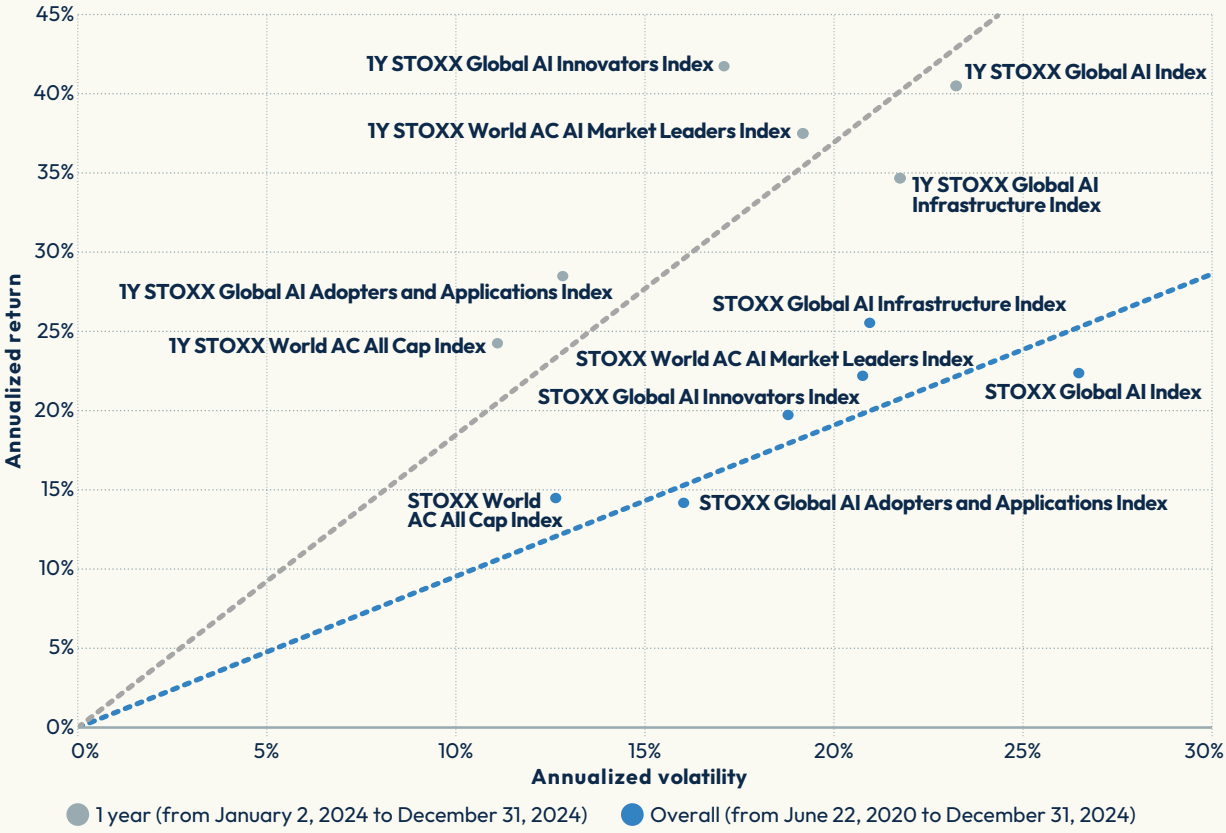
Although all of the indices in the STOXX Artificial Intelligence index suite target the AI theme, they focus on different stages of the AI development or different segments of the AI market. As a result, they exhibit varying risk and return profiles, and different industry and factor exposures. This offers index users a broad range of investment opportunities and the flexibility to tailor their AI exposures.

In this section, we study the performance of the STOXX Artificial Intelligence index suite. The full return and risk statistics can be found in the Appendix.

5.1 Index performance

The performance distribution of the indices over the past four years provides a very valuable picture of how they align in terms of risk and return. The past four years have arguably seen the greatest investment interest in the AI theme and a tech-led market risk. Figure 7 below shows the risk/return plot for the five AI indices' four-year and one-year performance.

Figure 7: Risk and return distribution for the STOXX Artificial Intelligence index suite.



Source: STOXX, data as of December 31, 2024. Annualized return and volatility figures based on the EUR gross return values.

This illustrates efficient risk capturing, which is interesting given that the indices were not designed for risk efficiency optimization. The indices are broadly spread across the risk spectrum, aligning roughly with the market risk/return ratio.

The index placements provide further insights: The STOXX World AC AI Market Leaders Index, STOXX Global Artificial Intelligence Index and STOXX Global AI Infrastructure Index have shown consistently higher volatility. This demonstrates that they capture most of the risk exposure underpinning the theme. Their leading performance also shows that the risk has been efficient. These three indices incorporate the AI Infrastructure subtheme in parts or all of their selection process, capturing companies that are driving the AI revolution.

The STOXX Global Artificial Intelligence Innovators Index is in the midfield when it comes to volatility. It covers the two broad AI subthemes we identified, AI Infrastructure and AI Applications, and selects companies with significant patent exposures in these areas. As a result, it has lower concentration in the building block components such as big data when compared to the three aforementioned indices. This manifests as a more diverse industry composition, which will be explored in the next section. The index targets the innovation phase and, by design, offers higher growth opportunities in the AI theme. The index's leap from fourth place in terms of its four-year return to first place in its one-year return supports the hypothesis regarding the growth that can be expected from innovation. Over the past year, the market's focus on AI innovation has been apparent, which is reflected in the STOXX Global Artificial Intelligence Innovators Index's performance behavior.

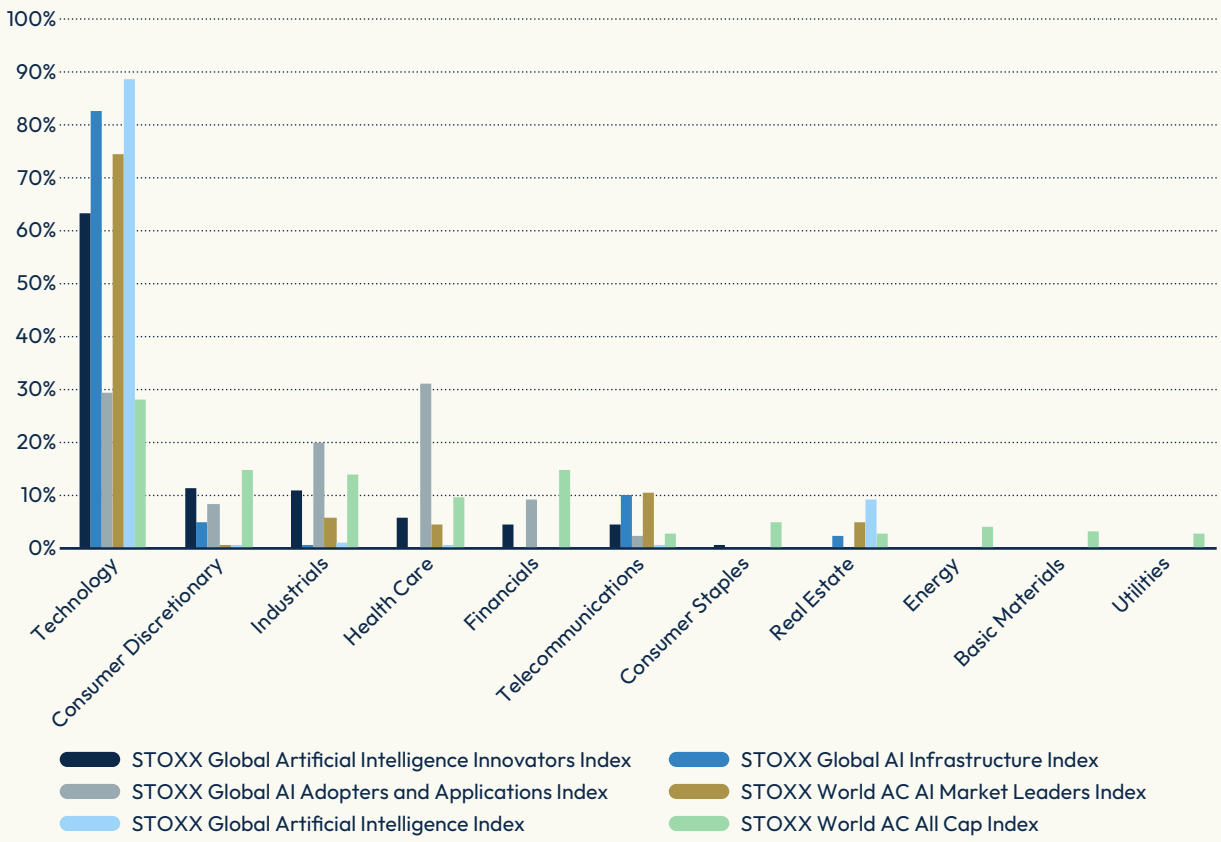
The STOXX Global AI Adopters and Applications Index is the closest to the market, focusing on those segments of the AI theme representing the broader market adoption of AI. By design, it has diverse industry exposures and employs a multitiered construction process. It has the lowest volatility in the whole STOXX Artificial Intelligence index suite. The change in return placement between its four-year and one-year performance demonstrates the theme's selection impact, while it retains an almost similar Technology allocation compared to the market benchmark.

5.2 Industry exposure

Figure 8 shows the industry exposure for the indices discussed above. It provides a very clear picture of the diverse nature of both the STOXX Global AI Adopters and Applications Index and the STOXX Global Artificial Intelligence Innovators Index, which have the broadest industry coverage of all the indices in the suite. The STOXX Global AI Adopters and Applications Index has a similar Technology exposure to the benchmark, whereas the STOXX Global Artificial Intelligence Innovators Index has a significantly higher Technology exposure. Both indices have notable exposure to Financials, Health Care, Industrials and Consumer Discretionary.

Technology exposure dominates the composition of the other three indices, as expected. However, the STOXX World AC AI Market Leaders Index still maintains some diversification, in line with its peer group leaders selection design.

Figure 8: ICB industry allocation in the STOXX Artificial Intelligence index suite.



Source: STOXX, data as of December 31, 2024.

5.3 Factor exposures

Figure 8 presents the style factor exposures for the STOXX Artificial Intelligence index suite. As noted previously, the results display a range of different characteristics for the AI indices.

Figure 9: Active exposures to style factors in the STOXX Artificial Intelligence Index Suite.

Style factors (active exposures)	STOXX Global AI Innovators Index	STOXX Global AI Infra-structure Index	STOXX Global AI Adopters and Applica-tions Index	STOXX World AC AI Market Leaders Index	STOXX Global AI Index	STOXX World AC All Cap Index
Value	−0.16	−0.18	−0.03	−0.18	−0.15	0.00
Earnings yield	−0.04	−0.12	−0.11	−0.11	−0.21	0.00
Leverage	−0.22	−0.13	−0.10	−0.34	−0.16	0.00
Profitability	0.22	0.20	−0.19	0.18	−0.04	0.00
Growth	0.11	0.00	−0.11	0.02	0.11	0.00
Dividend yield	−0.25	−0.14	−0.18	−0.23	−0.36	0.00
Size	0.40	0.27	0.03	0.31	0.08	0.00
Liquidity	0.04	0.29	0.11	−0.01	0.62	0.00
Market sensitivity	0.22	0.36	0.25	0.37	0.55	0.00
Volatility	0.11	0.35	−0.05	0.13	0.56	0.00
Medium-term momentum	0.24	0.30	−0.23	0.22	0.34	0.00

Source: STOXX. The factor model used in the analysis is the Axioma WW4-MH risk model; active style factor exposures as of June 24, 2024. Positive exposures to Size, Leverage and Volatility reflect exposures to large size, high leverage and high price volatility respectively.

Unsurprisingly, value and earnings yield exposures are negative across the board, since the AI market segment is expected to be crowded. Such crowdedness is least apparent in the STOXX Global AI Adopters and Applications index and most obvious in the higher volatility cohorts, i.e. the STOXX Global AI Infra-structure, STOXX Global Artificial Intelligence Index and STOXX World AC AI Market Leaders Index.

Quality measurements add an interesting dimension. The leverage and profitability metrics indicate that the STOXX World AC AI Market Leaders Index has the highest quality, in line with the spirit of selecting leaders in market cohorts. The STOXX Global Artificial Intelligence Innovators Index also demonstrates strong quality, closely followed by the STOXX Global AI Infrastructure Index.

All indices in the suite except for AI Adopters and Applications Index exhibit positive momentum. This is logical given the market appreciation of the topic in the current macro regime. It also highlights the fact that the STOXX Global AI Adopters and Applications Index focuses on different, specific market segments with distinct characteristics.

6. Conclusion

This paper discussed thematic investing, the evolution of themes and their life cycle from ideation to maturity. We introduced the STOXX Thematic Framework and its application in constructing indices, with a particular focus on the AI theme.

The STOXX Thematic Framework provides valuable insights into the development and potential of investment themes. By recognizing these stages, investors can better position their portfolios to capture growth opportunities as themes mature. Categorizing different segments within the theme into subthemes based on their roles and contributions permits a rules-based, transparent, targeted thematic investing process, ensuring that all relevant market segments are considered.

Following the initial outline, we provided guidance on classifying the AI theme into subthemes, exploring the areas that are driving advancements in this field, and other business lines that stand to benefit from its evolution. Guided by the framework, we demonstrated how to target different stages and segments of the AI theme using various tier groups, definitions (subthemes) and datasets.

The STOXX Thematic Framework forms the foundation of the STOXX Artificial Intelligence index suite, and is used to capture the different aspects and stages of the AI theme. The five indices in the suite provide a comprehensive view of the AI investment landscape in the listed market. Analyzing these indices reveals varying risk and return profiles, and industry and factor exposures, highlighting the diverse investment opportunities in the AI segment.

7. Appendix

Figure 10: Comparison of the STOXX Artificial Intelligence index suite methodologies.

Index	STOXX Global AI Innovators	STOXX Global AI Infrastructure[5]	STOXX Global AI Adopters and Applications[5]	STOXX World AC AI Market Leaders	STOXX Global AI
Universe	**STOXX World AC All Cap**				
Screens	**Minimum size:** Free-float market capitalization >= USD 200 million				**Minimum size:** Not applicable
	Minimum liquidity: USD 1 million 3-month median daily trading value (MDTV)				**Minimum liquidity:** EUR 2 million 3-month median daily trading value (MDTV)
	Multiple share lines: If a company has multiple listings and/or DR lines and/or multiple share classes, all lines are eligible, subject to screening and selection criteria			**Multiple share lines:** If a company has multiple listings and/or DR lines and/or multiple share classes, the most liquid share line is selected	
	ESG screening: Not applicable	**ESG screening:** Global Standards Screening, Controversial Weapons Involvement, Controversial Product Involvement, Controversy Ratings		**ESG screening:** Not applicable	
	Patent exposure screen: Not applicable	**Patent exposure screen:** At least one high-quality patent (HQP) in the related technologies		**Patent exposure screen:** Not applicable	
	Revenue exposure screen: Not applicable	**Revenue exposure screen:** Aggregate revenue exposure greater than zero in the relevant RBICS sectors	**Revenue exposure screen:** 25% or more revenue generated in at least one of the identified subthemes	**Revenue exposure screen:** Companies must have an aggregate revenue exposure of 25% or higher to the overall theme	**Revenue exposure screen:** Companies must have an aggregate revenue exposure of 50% or higher to the defined sectors

[5] The indices apply country screen: only stocks from the corresponding eligible country list are eligible for selection.

Index	STOXX Global AI Innovators	STOXX Global AI Infrastructure	STOXX Global AI Adopters and Applications	STOXX World AC AI Market Leaders	STOXX Global AI
Selection	The index components are selected from the following classification:			The index components are selected from the remaining companies that pass all three criteria below:	The index components are selected after the following screen:
	Innovators: For each technology, companies that meet one or more of the following criteria are selected: - The top 5% ranking companies, ranked in descending order of their high-quality patents (HQPs), within the technology - Companies with a patent specialization of greater than or equal to 30% within the technology Companies that have less than 20 high quality patents in the overall AI technology are not eligible for selection	**Innovators:** - Top 20% ranking companies, ranked in descending order of their high-quality patents (HQPs), within each of the AI Infrastructure subthemes **Market Leaders:** - Top 20% ranking companies, ranked in descending order of their market share, within the core AI Infrastructure sectors **Pure Players:** - 50% or more core revenue exposure to AI	**Innovators:** - For each subtheme, companies that have at least 25% revenue exposure to the subtheme are ranked in descending order of their high-quality patents (HQPs). Top 20% ranking companies in each subtheme are selected **Market Leaders:** - For each subtheme, companies that have at least 25% revenue exposure to the subtheme are ranked in descending order of their market share. Top 20% ranking companies in each subtheme are selected	**AI Market Share Leadership:** Companies can be selected from either narrow or broad sectors[6] - Narrow sectors: Sectors with fewer than four companies. Companies must have a market share of 50% or higher - Broad sectors: Sectors with four or more companies. Companies must have a market share of 25% or higher and be at least 1.5 standard deviations above the sector peer average **Competitive Advantage:** Companies must pass one of the following indicators in at least one of the subthemes: - Companies must rank in the top 80% of the company's subtheme group for R&D expenses/book value - Companies must rank in the top 80% of the company's subtheme group for intangible asset value/book value **Profitability:** Companies must pass one of the following indicators in at least one of the subthemes: - Companies must rank in the top 80% of their subtheme group for gross margin - Companies must have a gross margin of greater than or equal to 50%	**Market capitalization screening:** Constituents are ranked in descending order in terms of their free-float market cap; only the top 75%, rounded to the nearest integer, are selected This selection is applied separately to constituents whose RBICS sectors are related to the Cloud Computing subtheme and to constituents whose RBICS sectors are related to all other subthemes

[6] Each company in the starting universe is evaluated across each relevant AI sector in terms of their market share and the size of the sector concerned. Market share and sector size are defined by all companies in the starting universe with revenue from their respective AI sectors of higher than or equal to USD 1 million.

Index	STOXX Global AI Innovators	STOXX Global AI Infrastructure	STOXX Global AI Adopters and Applications	STOXX World AC AI Market Leaders	STOXX Global AI
Review	The index composition is reviewed annually in June				
Weighting scheme	The index is weighted by free-float market capitalization and incorporates concentration capping	The index is weighted by adjusted equal weights with Sustainable Investment (SI) commitment capping and company-level capping		The index is weighted by free-float market capitalization and incorporates concentration capping	The index is weighted proportionally to the free-float market cap of selected stocks, multiplied by the aggregate revenue exposure of each stock to the RBICS sectors
	The index weights are calculated quarterly				

Source: STOXX.

Figure 11: Risk and return characteristics (based on the gross return in EUR).

	STOXX Global AI Innovators Index	STOXX Global AI Infra-structure Index	STOXX Global AI Adopters and Applications Index	STOXX World AC AI Market Leaders Index	STOXX Global AI Index	STOXX World AC All Cap Index
Absolute performance						
Overall return (actual)	128.0%	184.2%	83.5%	150.8%	153.2%	85.2%
1Y return (annualized)	41.5%	34.5%	28.4%	37.4%	40.3%	24.1%
Overall return (annualized)	19.5%	25.4%	14.0%	22.0%	22.3%	14.3%
1Y volatility (annualized)	17.1%	21.8%	12.9%	19.3%	23.3%	11.2%
Overall volatility (annualized)	18.9%	21.1%	16.1%	20.9%	26.6%	12.7%
1Y return/risk ratio	2.42	1.58	2.19	1.94	1.73	2.16
Overall return/risk ratio	1.03	1.20	0.87	1.05	0.84	1.12
1Y maximum drawdown	14.5%	20.3%	8.8%	16.0%	19.6%	9.1%
Overall maximum drawdown	28.3%	29.9%	26.7%	34.8%	39.9%	17.0%
Relative performance						
1Y tracking error (annualized)	8.3%	13.4%	4.6%	11.1%	15.0%	
Overall tracking error (annualized)	8.8%	11.8%	6.1%	11.4%	17.5%	
1Y beta	1.40	1.69	1.09	1.50	1.78	
Overall beta	1.36	1.44	1.18	1.44	1.74	
Concentration						
Maximum weight	8.2%	6.3%	2.0%	8.1%	8.4%	4.3%
Top 10 weight	52.2%	49.5%	19.7%	60.0%	60.1%	21.1%
Effective N	28.43	25.74	60.59	19.47	21.11	146.23
Number of constituents	127	40	85	37	80	14,301

Source: STOXX, data as of December 31, 2024.

8. Offices and contacts

Learn more about STOXX & DAX Indices on STOXX.com

Zug
Theilerstrasse 1A
6300 Zug
Switzerland
P | 41 43 430 71 60

London
1 London Bridge
4th Floor, West Building
London, SE1 9BG
United Kingdom
P | +44 20 7862 7680

Frankfurt
Taunus Tower
Mergenthalerallee 73–75
65760 Eschborn
Germany
P | +49 6196 7719 257

Paris
5 Rue du Renard
75004 Paris
France
P | +33 1 55 27 38 38

Prague
Futurama Business Park Building E
Sokolovska 662/136e
186 00 Prague 8
Czech Republic
P | +420 226 238 419

ISS Inc. (New York)
1177 Avenue of the Americas
14th Floor
New York, NY 10036
USA
P | +1 646 680 6350

Hong Kong
26F, Prosperity Tower
39 Queen's Road Central
Central, Hong Kong
P | +852 3107 8030

ISS Australia Pty. (Sydney)
7F, 55 Clarence St
Sydney, NSW 2000
Australia
P | +61 2 8048 3999

ISS K.K. (Tokyo)
Sumitomo Fudosan Kanda, Building 16F
7 Kanda Mitoshiro-cho, Chiyoda-ku
Tokyo 101-0053
Japan
P | +852 3107 8030

Call a STOXX representative
Customer support
customersupport@stoxx.com
P | +41 43 430 72 72

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