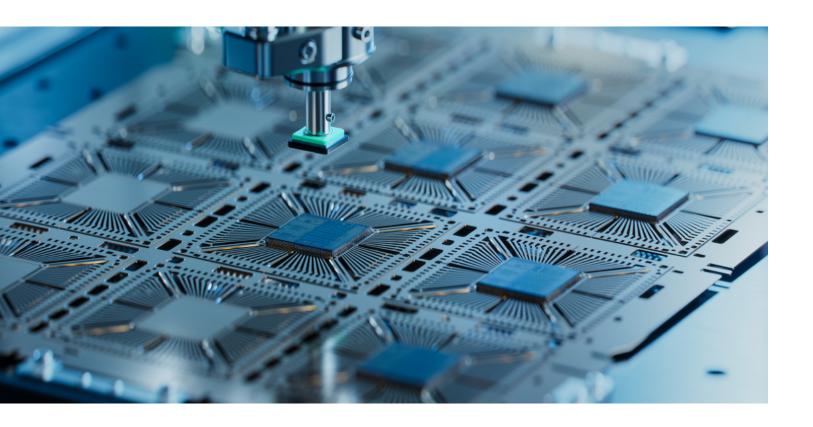
# S&P 500 RavenPack Al Index



The S&P 500 RavenPack AI Index measures exposure to the S&P 500 RavenPack AI Sentiment Index (the underlying index) while applying a rotation process driven by news sentiment that combines U.S. equities and fixed income, complemented by a daily risk control mechanism.

**S&P Dow Jones Indices** 

A Division of S&P Global

# The S&P 500® RavenPack Al Index

The S&P 500 RavenPack AI Index is systematically designed to measure exposure to sectors of the U.S. economy with stronger sentiment based on a news analytics algorithm powered by RavenPack. The rules-based index applies a S&P 500 sector rotation process driven by news sentiment.

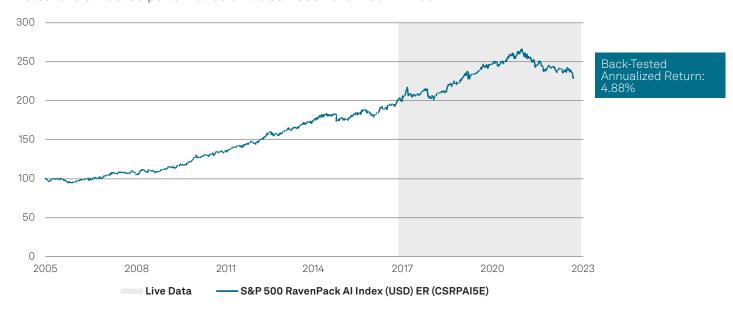
The multi-asset index combines U.S. equities and fixed income, complemented by a daily risk control mechanism that seeks to maintain a target volatility of 5%.

#### The Index at a Glance:

- News Sentiment: An equity component based on sentiment scoring extracted from news data by the RavenPack News Analytics (RPNA) Algorithm, which seeks to anticipate relative price movements and make more informed sector selections
- Balanced: A multi-asset index component weighting diversified across equities and fixed income that seeks to respond to potential opportunities in multiple market environments
- Risk Controlled: An annualized volatility target of 5% seeks to stabilize the overall risk level of the index

#### **Back-Tested Historical Index Performance**

Actual and simulated performance of the S&P 500 RavenPack Al Index



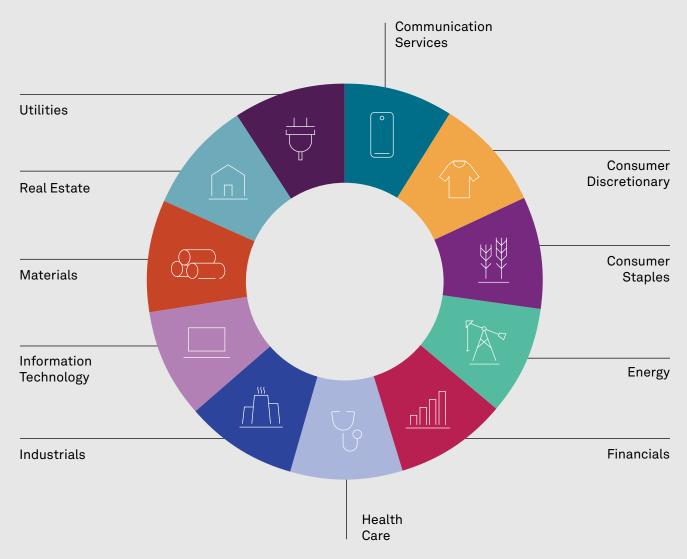
Source: RavenPack News Analytics 4.0, S&P Dow Jones Indices LLC, Bloomberg. Data from Sept. 2, 2005 through Dec. 29, 2023. The S&P 500 RavenPack AI Index (through its predecessor Credit Suisse RavenPack Artificial Intelligence Index) was launched Oct. 6, 2017. All data prior to index launch date is back-tested hypothetical data. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested-performance. Alternative modeling techniques or assumptions might produce significantly different results and may prove to be more appropriate. Actual annualized performance may vary materially from this analysis. The index performance is net of a 0.5% p.a. index calculation fee. The index could underperform relative to other indices, including equity indices. In addition, the index is an excess return index: it reflects the return of the index components net of the cost of funding a hypothetical investment in them, performance of the index does not include fees or costs of any financial instrument referencing the index.

As used herein, the use of the term "Artificial Intelligence" or "AI" in the name of the index does not imply that the S&P 500 RavenPack AI Index is designed to include companies involved in the use, production or commercialization of artificial intelligence. The term is used to indicate that the S&P 500 RavenPack AI Index relies upon data sourced from RavenPack, that is in part created by static rules-based computational methods (with no machine learning capability) to automatically produce a mathematical result that might account for relevance, novelty, or a given sentiment about a company based on algorithmic analysis of news articles.

# Allocation Weight to Large-Cap U.S. Equities

The equity component of the S&P 500 RavenPack AI Index is designed to offer exposure to 4¹ out of 11 GICS® sectors, via total return sub-indices of the S&P 500 (the S&P 500 Sector Indices).

All stocks included in the S&P 500 are split across the 11 GICS sectors, each of them consisting of companies from the same industry or economic segment:



The 11 S&P 500 Sector Indices collectively represent all companies included in the S&P 500.

<sup>&</sup>lt;sup>1</sup> If two sector indices or more have the same Sector Sentiment Scores, the sector index with the highest weight in the S&P 500 as of rebalancing reference date is selected.

The S&P 500 Sector Indices are the property of S&P Dow Jones Indices, its affiliates and/or their third-party licensors.

# Harnessing the Power of Big Data Analytics to Make Rules-Based Index Allocation Decisions in a Systematic Way



### **Uncover Powerful Insights from News Data**

Despite large and continuous flows of information, innovation in data analytics is revolutionizing how fast market participants can process news data and assess their relevance and potential impact.

In recent years, technological advancements such as natural language processing (NLP) have significantly improved the ability to determine positive or negative sentiment in news to help market participants make more informed systematic allocations.

This is why RavenPack developed the RavenPack News Analytics Algorithm (RPNA), which uses NLP models to objectively analyze thousands of company news items published by reputable sources<sup>1</sup> across the globe in milliseconds.

#### About RavenPack

Since 2003, RavenPack has been a leading data analytics provider for financial services. Featuring data on more than 190,000 entities in over 200 countries, the company's data solutions, research and technology seek to help clients enhance returns, reduce risk and increase efficiency by systematically incorporating the effects of public information in their models and workflows.

## What Is the RPNA Algorithm?1



The RPNA Algorithm processes particular words in a given news item on named entities to determine numerical scores for sentiment, relevance and novelty. These scores attempt to provide insights about corporate news and can be used in a variety of applications.

<sup>&</sup>lt;sup>1</sup>Learn more at: www.ravenpack.com/products/rpna

# Calculating the RavenPack Sentiment Scores

In order to identify the sectors attracting the highest sentiment, the equity component of the S&P 500 RavenPack Al Index considers the preceding quarter's **"revenues"** or **"earnings"** news stories (as defined by RavenPack<sup>2</sup>) for stocks of the companies in the S&P 500 and filters them according to three scores:

- The Relevance Score: indicating how strongly related the company is to the news story.
- The Novelty Score:

   attempting to represent how new or novel a news story is relative to other news published on the same topic across all news providers covered by RavenPack in the past 24 hours.
- The Event Score: categorized as sufficiently "positive" or "negative" (i.e., excluding "neutral" scores), and indicating the direction and magnitude of the sentiment contained within a piece of news. This algorithm was built using scores derived from a collection of surveys where finance and economics professionals rated company-specific events as conveying positive or negative sentiment.

# Sophisticated Equity Component Powered by RavenPack Selects the S&P 500 Sectors with the Highest RavenPack Sentiment Scores

The equity component of the index chooses the four S&P 500 sectors with the highest Sentiment Scores relating to earnings and revenues, according to the RPNA Algorithm.<sup>3</sup>

Every quarter, the equity component is rebalanced as follows:

#### **Sentiment Score**

#### **Sector Score**

### **Selection and Weights**

For each S&P 500 stock, all news<sup>2</sup> that passes through the three scores (Relevance, Novelty and Event) are averaged into a Composite Sentiment Score for the stock.

A Sector Score is calculated for all 11 S&P 500 Sector Indices based on the marketcapitalization-weighted average of Sentiment Scores for each index's stocks. Sectors with the four<sup>3</sup> highest Sector Scores are selected. They are assigned weights in proportion to their weights in the S&P 500 and in inverse proportion to their risk (realized volatility).

Because the algorithm does not aim to comprehend news items, it cannot necessarily predict human or the market classification or sentiment of a particular news item. For example, the algorithm might not process enthusiasm, nuance, sarcasm, satire or other types of writing that a human could understand. The algorithm also does not learn from news items it processes or adapt to its environment and, as a static algorithm, will continue to use the same mathematical rules to process news items, even as news develops over time. The algorithm is called "artificial intelligence" only in the limited sense that it applies static algorithmic rules to language to produce a mathematical result that might indicate relevance, novelty or a given sentiment about a company.

<sup>&</sup>lt;sup>2</sup> RavenPack exercised discretion in developing its algorithm, and the scoring and classification of news items may be materially inaccurate.

<sup>&</sup>lt;sup>3</sup> If two sector indices or more have the same Sector Sentiment Scores, the sector index with the highest weight in the S&P 500 as of rebalancing reference date is selected.

# Multi-Asset Allocation and Risk Control Mechanism for a Balanced Index

### **Dynamic Multi-Asset Allocation**

The S&P 500 RavenPack AI Index systematically rotates between the equity component and two fixed income components.

Every day, the allocation to the equity component is scaled to target a 5% volatility level for equities, based on its realized volatility.

The remaining allocation is then dynamically distributed between short-term and medium-term U.S. Treasury indices based on the recent performance of medium-term U.S. Treasury futures contracts, as represented by the S&P 2-Year U.S. Treasury Note Futures Index (SPUST2P) and the S&P 10-Year U.S. Treasury Note Futures Excess Index (SPUSTTP), respectively.<sup>4</sup>

The inclusion of the adaptive fixed income component (providing allocation to 10-year U.S. Treasury note futures contracts or both 10- and 2-year U.S. Treasury note futures contracts) aims to mitigate equity risk and enable more stable index volatility, which may increase potential upside.





## Daily Risk Control Mechanism

The S&P 500 RavenPack AI Index is rebalanced on a daily basis as the index seeks a target volatility of 5%,<sup>5</sup> intended to mitigate the potential risks of market fluctuations and stabilize the performance of the index.

In an effort to attain a consistent level of volatility, the index systematically adjusts its exposure to the multi-asset allocation (up to a leveraged position of 150%) based on its realized volatility.

When the expected volatility of the multi-asset allocation is greater than 5% (signaling "riskier" markets), the index will reduce its exposure to the multi-asset allocation, shifting to theoretical cash component<sup>6</sup> instead.

In certain other circumstances, the index's exposure to the multi-asset allocation may be partially or entirely reduced in favor of a hypothetical cash component. In such instances, the performance of the index will likely deviate from the performance of its selected S&P 500 sector components.

## What Is Volatility?

Volatility refers to the amount of variation in a component's price over time. It is also an indicator of market risk: in most cases, the greater the volatility of a component, the higher the price fluctuations and perceived risk of that component.

<sup>&</sup>lt;sup>4</sup> For history prior to March 2024, the fixed income components of the index were represented by the Credit Suisse 2-Year U.S. Treasury Note Futures Index (Index Code: CSRFTUUE) and Credit Suisse 10-Year U.S. Treasury Note Futures Index (Index Code: CSRFTYUE).

<sup>&</sup>lt;sup>5</sup> Although the index employs a mechanism designed to limit its volatility, no assurance can be given that it will achieve its volatility target. The actual realized volatility may differ from the index's volatility target, which could negatively impact the performance of the index, and the volatility-limiting mechanism may reduce the performance of the index in rising markets.

<sup>&</sup>lt;sup>6</sup> Any index exposure to cash is non-remunerating, meaning it does not earn interest that would be incorporated in the index. The greater the exposure to cash, the smaller the impact on the index from market fluctuations and, consequently, the lower the potential for gains or losses. In addition, the index is an excess return index: it reflects the return of the index components net of the cost of funding a hypothetical investment in them. As such, the index returns could be negatively affected if this cost of funding were to increase. The index also has a 0.5% p.a. index calculation fee deducted on a daily basis.

# About the Index

### **Key Characteristics**

Bloomberg Ticker	CSRPAI5E
Asset Class	Multi-Asset
Geographical Focus	U.S.
Currency	USD
Launch Date	October 6, 2017 (based on the launch of the predecessor Credit Suisse RavenPack Artificial Intelligence Index)
Transition Date	March 2024 (S&P Dow Jones Indices assumes role as index calculation and benchmark administrator)
Type of Return	Excess Return (it reflects the return of the index components net of the hypothetical costs of funding)
Equity Component	The S&P 500 RavenPack AI Sentiment Index is comprised of total return versions of the following S&P 500 Sector Indices:
	- S&P 500 Consumer Discretionary Sector
	- S&P 500 Consumer Staples Sector
	- S&P 500 Energy Sector
	- S&P 500 Financials Sector
	- S&P 500 Health Care Sector
	- S&P 500 Industrials Sector
	- S&P 500 Information Technology Sector
	- S&P 500 Materials Sector
	- S&P 500 Real Estate (Sector)
	- S&P 500 Communication Services Sector
	- S&P 500 Utilities Sector
Fixed Income Components As of December 1, 2023	S&P 2-Year U.S. Treasury Note Futures Index (SPUST2P)
	S&P 10-Year U.S. Treasury Note Futures Excess Index (SPUSTTP)
	Prior to March 2024, the Fixed Income Components of the index were represented by the Credit Suisse 2-Year U.S. Treasury Note Futures Index (CSRFTUUE) and Credit Suisse 10-Year U.S. Treasury Note Futures Index (CSRFTYUE).
Index Sponsor	S&P Dow Jones Indices
Calculation Agent	S&P Dow Jones Indices
Decrement Factor	0.5% p.a. Deducted Daily

### **Key Considerations Related to the Index**

As used herein, the use of the term "Artificial Intelligence" or "Al" in the name of the index does not imply that the S&P 500 RavenPack Al Index is designed to include companies involved in the use, production or commercialization of artificial intelligence. The term is used to indicate that the S&P 500 RavenPack Al Index relies upon data sourced from RavenPack, that is in part created by static rules-based computational methods (with no machine learning capability) to automatically produce a mathematical result that might account for relevance, novelty, or a given sentiment about a company based on algorithmic analysis of news articles.

The rules of the Index may be amended by S&P Dow Jones Indices. An amendment to the rules may result from, without limitation, a change to the construction or calculation rules for the Index or from S&P DJI determining that a change to the rules is required or desirable in order to update them or to address an error, omission or ambiguity. No assurance can be given that any such amendment would not affect parties to this document.

The Index is an excess return index, which means that it reflects the return of the Index components net of the cost of funding a hypothetical investment in them. The Index returns are likely to be negatively affected by such costs of funding. The Index has a 0.5% per annum index calculation fee deducted on a daily basis. The Index fee will negatively affect the performance of the Index, offsetting any appreciation of its value, exacerbating any depreciation of its value and causing the level of the Index to decline steadily if its value remains relatively constant. While volatility controls may result in less fluctuation in rates of return as compared to indices without volatility controls, they may also reduce the overall rate of return as compared to products not subject to volatility controls.

The end-of-day value of the Index is published subject to the provisions in the rules of the Index. Neither S&P DJI nor any of its affiliates is obliged to publish any information regarding the Index other than as stipulated in the rules of the Index.

The index performance provided herein are illustrative only and were derived by means of a retroactive application of a back-casted model designed with the benefit of hindsight. These back casted, hypothetical, historical annualized Index returns have inherent limitations. No representation is made that in the future the Index will have the returns shown. Alternative modelling techniques or assumptions might produce significantly different results and may prove to be more appropriate. Actual annualized returns may vary materially from this analysis. Any effective volatility controls may reduce the overall rate of return.

- The Index is rules-based and cannot be invested in directly.
- There is no assurance that the strategy on which the Index is based will be successful in producing positive returns. The Index may
  not rise in value and may not outperform any alternative portfolio or strategy that tracks the Index components.
- The Index utilizes components that reference futures contracts. The Index may underperform a similar investment linked to the spot prices or current levels of the underlying assets tracked by the futures contracts included in the Index components.
- The Index involves risks associated with equity markets and fixed income investments.
- If the realized volatility of the equity component is sufficiently low (below 5%) as observed daily, the Index may not employ
  any diversification.
- The Index is calculated based on signals scores assigned to news items by the RPNA Algorithm. The RPNA Algorithm is owned and operated by RavenPack, which is not affiliated with S&P DJI. Any loss of S&P DJI's ability to use the scores assigned to news items in calculating the S&P 500 RavenPack Al Index, whether on a temporary or permanent basis, could adversely affect the performance of the Index.
- The S&P 500 RavenPack AI Index is called "Artificial Intelligence" only in the limited sense that it is based on a static algorithm. The RPNA Algorithm does not learn from news items it processes or adapts to its environment and, as a static algorithm, will continue to use the same mathematical rules to process news items, even as news develops over time.
- RavenPack exercised discretion in developing the RPNA Algorithm. The way the RPNA Algorithm processes news items reflects decisions RavenPack made about the RPNA Algorithm's construction.
- Any news items used to calculate the Index and related sector weightings may contain misstatements, inaccuracies or omissions, which may be material to the performance of the relevant issuer.
- The scoring and classification of news items about individual companies (or their affiliates) by the RPNA Algorithm may not accurately
  reflect the impact such news items have on the performance of an S&P 500 sector index as a whole, which may adversely affect the
  performance of the Index.
- The Index will not benefit from any updates to the RPNA Algorithm. Any improvements or refinements to the RPNA Algorithm that are
  published after Version 4.0 will not be reflected in the Index.
- Due to arbitrary methodological rules, the news items considered by the Index may not include all news items that are relevant to the performance of companies in the S&P 500 sector indices.
- Although the Index employs a mechanism designed to limit its volatility, no assurance can be given that it will achieve its volatility target. The actual realized volatility may differ from the Index's volatility target, which could negatively impact the performance of the Index, and the volatility-limiting mechanism may reduce the performance of the Index in rising markets.
- The Index may have greater than 100% exposure (up to 150%) to the multi-asset allocation at any time as a result of the volatility control mechanism, which may exacerbate losses and subsequent deleveraging may increase the time taken to recover from a drawdown event.

- The Index is an excess return index (it reflects the return of the Index components net of the cost of funding a hypothetical investment in them) and has a 0.5% p.a. index calculation fee deducted on a daily basis.

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#### PERFORMANCE DISCLOSURE/BACK-TESTED DATA

The S&P 500 RavenPack AI Index was launched on October 6, 2017 (based on launch of predecessor Credit Suisse RavenPack Artificial Intelligence Index). All information presented prior to an index's Launch Date is hypothetical (backtested), not actual performance, and is based on the index methodology in effect on the index launch date. However, when creating back-tested history for periods of market anomalies or other periods that do not reflect the general current market environment, index methodology rules may be relaxed to capture a large enough universe of securities to simulate the target market the index is designed to measure or strategy the index is designed to capture. For example, market capitalization and liquidity thresholds may be reduced. In addition, forks have not been factored into the back-test data with respect to the S&P Cryptocurrency Indices. For the S&P Cryptocurrency Top 5 & 10 Equal Weight Indices, the custody element of the methodology was not considered; the back-test history is based on the index constituents that meet the custody element as of the Launch Date. Complete index methodology details are available at www.spdji.com. Backtested performance reflects application of an index methodology and selection of index constituents with the benefit of hindsight and knowledge of factors that may have positively affected its performance, cannot account for all financial risk that may affect results and may be considered to reflect survivor/look ahead bias. Actual returns may differ significantly from, and be lower than, back-tested returns. Past performance is not an indication or guarantee of future results.

Please refer to the methodology for the Index for more details about the index, including the manner in which it is rebalanced, the timing of such rebalancing, criteria for additions and deletions, as well as all index calculations. Back-tested performance is for use with institutions only; not for use with retail investors.

S&P Dow Jones Indices defines various dates to assist our clients in providing transparency. The First Value Date is the first day for which there is a calculated value (either live or back-tested) for a given index. The Base Date is the date at which the index is set to a fixed value for calculation purposes. The Launch Date designates the date when the values of an index are first considered live: index values provided for any date or time period prior to the index's Launch Date are considered back-tested. S&P Dow Jones Indices defines the Launch Date as the date by which the values of an index are known to have been released to the public, for example via the company's public website or its data feed to external parties. For Dow Jones-branded indices introduced prior to May 31, 2013, the Launch Date (which prior to May 31, 2013, was termed "Date of introduction") is set at a date upon which no further changes were permitted to be made to the index methodology, but that may have been prior to the Index's public release date.

Typically, when S&P DJI creates back-tested index data, S&P DJI uses actual historical constituent-level data (e.g., historical price, market capitalization, and corporate action data) in its calculations. As ESG investing is still in early stages of development, certain datapoints used to calculate S&P DJI's ESG indices may not be available for the entire desired period of back-tested history. The same data availability issue could be true for other indices as well. In cases when actual data is not available for all relevant historical periods, S&P DJI may employ a process of using "Backward Data Assumption" (or pulling back) of ESG data for the calculation of back-tested historical performance. "Backward Data Assumption" is a process that applies the earliest actual live data point available for an index constituent company to all prior historical instances in the index performance. For example, Backward Data Assumption inherently assumes that companies currently not involved in a specific business activity (also known as "product involvement") were never involved historically and similarly also assumes that companies currently involved in a specific business activity were involved historically too. The Backward Data Assumption allows the hypothetical back-test to be extended over more historical years than would be feasible using only actual data. For more information on "Backward Data Assumption" please refer to the <u>FAQ</u>. The methodology and factsheets of any index that employs backward assumption in the back-tested history will explicitly state so. The methodology will include an Appendix with a table setting forth the specific data points and relevant time period for which backward projected data was used.

Index returns shown do not represent the results of actual trading of investable assets/securities. S&P Dow Jones Indices maintains the index and calculates the index levels and performance shown or discussed but does not manage actual assets. Index returns do not reflect payment of any sales charges or fees an investor may pay to purchase the securities underlying the Index or investment funds that are intended to track the performance of the Index. The imposition of these fees and charges would cause actual and back-tested performance of the securities/fund to be lower than the Index performance shown. As a simple example, if an index returned 10% on a US \$100,000 investment for a 12-month period (or US \$10,000) and an actual asset-based fee of 1.5% was imposed at the end of the period on the investment plus accrued interest (or US \$1,650), the net return would be 8.35% (or US \$8,350) for the year. Over a three-year period, an annual 1.5% fee taken at year end with an assumed 10% return per year would result in a cumulative gross return of 33.10%, a total fee of US \$5,375, and a cumulative net return of 27.2% (or US \$27,200).

#### **About S&P Dow Jones Indices**

At S&P Dow Jones Indices, we provide iconic and innovative index solutions backed by unparalleled expertise across the asset-class spectrum. By bringing transparency to the global capital markets, we empower investors everywhere to make decisions with conviction. We're the largest global resource for index-based concepts, data and research, and home to iconic financial market indicators, such as the S&P 500® and the Dow Jones Industrial Average®. More assets are invested in products based upon our indices than any other index provider in the world. With over USD 8.3 trillion in passively managed assets linked to our indices and over USD 8.4 trillion benchmarked to our indices, our solutions are widely considered essential in tracking market performance, evaluating portfolios and developing investment strategies.

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