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Research

The Liquidity Landscape:
Trading Linked to S&P DJI Indices in 2024

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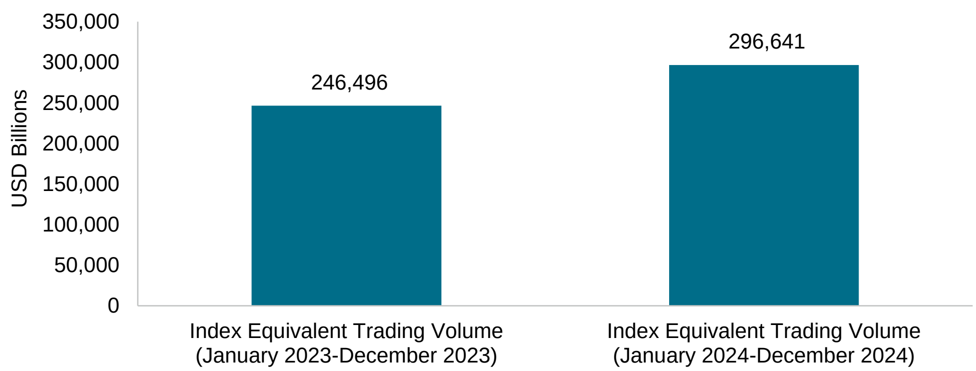
Executive Summary

A healthy trading ecosystem promotes price transparency, market efficiency and confidence for market participants operating at all frequencies, from highly active tactical traders to buy-and-hold passive investors. Updating our analysis from 2023, this paper surveys the volumes for listed products tied to the indices produced by S&P Dow Jones Indices (S&P DJI). Spanning asset classes and product types, the results offer insight into the increased presence of index-linked products within global capital markets.

- The economic value of volumes across products tied to S&P DJI's indices **increased by USD 50 trillion in 2024**.
- The usage of index-linked products is increasingly **active**, with the median holding period across S&P DJI products falling from **222 to 198 days**.
- We spotlight the importance of **sector and industry** products to express market views and note the growing use of exchange-traded futures tied to these indices.

Exhibit 1: S&P DJI-linked Volumes Rose 20% Year-over-Year



Source: S&P Dow Jones Indices LLC. Data as of Dec. 31, 2024. See later sections for more details. Chart is provided for illustrative purposes.

Why Track Trading?

Index funds, which hardly existed 50 years ago, now play a prominent role in global financial markets.[1] The growth in passive investing has coincided with increased availability and usage of tradeable (that is, listed) index-based products,[2] and their combined growth may create benefits for both active and passive users.

One of these benefits is expanded mechanisms facilitating **price discovery**. For example, there are now listed products tracking the S&P 500®—including futures and exchange-traded funds (ETFs) listed across the world—that in combination trade almost 24 hours a day. Consequently, investors no longer have to wait until the underlying equity exchanges are open to assess the impact of overnight events, a fact confirmed by the observation that U.S. equity markets typically open at prices that are in line with where their futures were just recently trading.

Another benefit is improved **market efficiency**. For example, the quoted prices of an ETF tracking The 500™ may be supported by the large and liquid trading ecosystem tied to the same index, which allows arbitrageurs and market makers to minimize mispricing by combining trades in one product with trades in another, often including derivatives such as futures and options tied to the same index.

Meanwhile, motivated by the ability to exploit any discrepancies, highly active users of index-based products add **transparency** by scrutinizing every index change in price, composition or methodology.

All of this may help market participants maintain **confidence** that indices such as the S&P 500 will faithfully replicate their target market and that licensed products will track the index closely.

Thus, as well as indicating the presence of higher-frequency market participants, **volume data** gives us an indication of the potential network effects arising from greater liquidity: a market that is better "policed" by arbitrageurs is potentially one with stronger links reinforced between an index and its objective, and between index-linked products and the indices they seek to track.

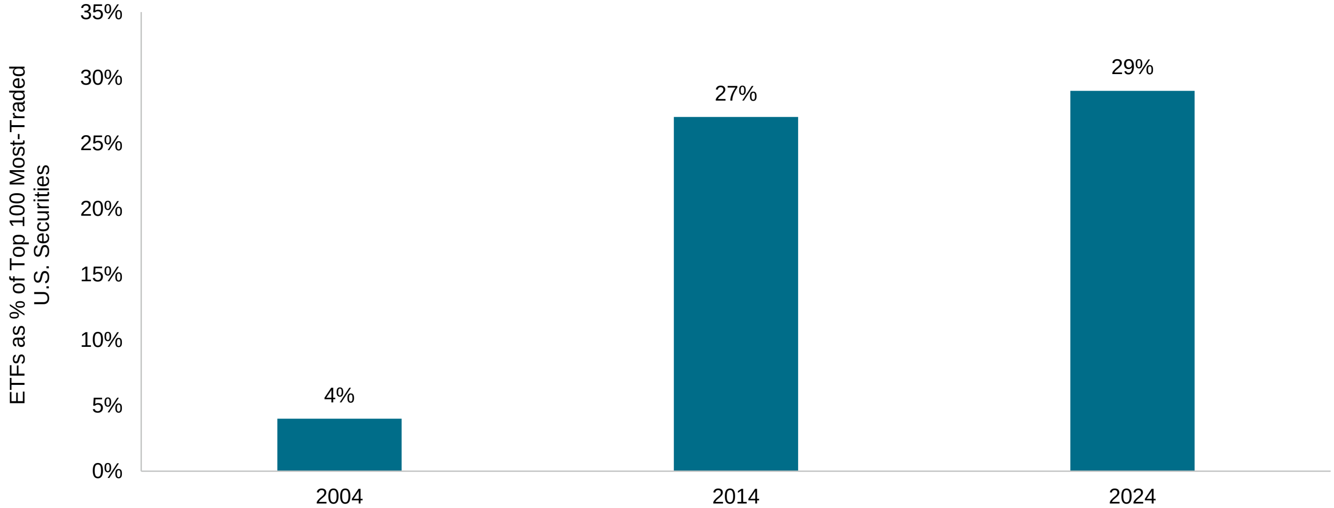
[1] Ganti, Anu and Lazzara, Craig, "Shooting the Messenger," S&P Dow Jones Indices LLC, Nov. 22, 2022.

[2] The first mutual fund tracking the S&P 500 was created in 1976, the first future tracking the same index traded in 1982, the first listed option came in 1983, the first ETF was created in 1993 and a global range of products continues to expand. See also the section, "The S&P 500 Trading Ecosystem," in this paper and Edwards, Tim et al, "Active and Passive Harmonics: Trading Frequencies of Index-Linked Products," Journal of Beta Investment Strategies, Winter 2024.

Index Equivalent Trading Volumes in S&P DJI Indices

The growth of indexing is brightly exemplified in the growth of ETFs, with an increasingly broad range of global products continuing to see rapid growth in assets.[3] Exhibit 2 shows that **ETFs also make up an increasing portion of the most-traded U.S. securities**. In 2024, index-tracking ETFs represented almost one-third (29 of the top 100) of the most-traded U.S.-listed equity securities by U.S. dollar volumes in 2024, a sevenfold increase since 2004.

Exhibit 2: Index-Based Products Make up Almost One-Third of the Most-Traded Securities



Source: S&P Dow Jones Indices LLC, Bloomberg LLC. Data as of Dec. 31, 2024. Chart is provided for illustrative purposes.

Index-based trading also includes instruments such as futures, options and options on ETFs, and the product range has grown beyond traditional ETF vehicles to include offerings such as leveraged and inverse exchange-traded products (ETPs).[4] In order to provide an aggregate statistic for all the relevant trading in products linked to each index, we must specify how trading in different types of products—including options—should be treated.

Index equivalent trading volume (IET)[5] is designed to reflect the economic exposure to the index that is being transacted at the time a trade occurs; it is determined by the instrument's short-term responsiveness to movements in the underlying index.[6]

[3] "ETF Impact Report 2025-2026," State Street Investment Management, May 2025. Although some ETFs are actively managed and thus not tracking an index, the dominant majority of both products and assets are index linked.

[4] The term "ETP" is commonly used to group together ETFs with other related or similar but legally distinct structures, including exchange-traded trusts, leveraged and inverse ETFs and exchange-traded notes.

[5] See Edwards, Tim et al, "The Liquidity Landscape: Trading Linked to S&P DJI Indices," S&P Dow Jones Indices LLC, Sept. 16, 2024.

[6] Details of how the IET is calculated for various product types are provided in the Appendix.

Exhibit 3 provides a breakdown of the IET associated with all of S&P DJI's indices. The data encompass a 12-month period of trading across 1,614 products tracking over 800 indices and listed in almost 30 different countries. We highlight that it spans equities and bonds, reflecting a formidable equities tradable ecosystem and a growing fixed income one.[7]

Exhibit 3: IET of S&P DJI Indices

Index Category	IET (USD Billions)			
	Total	Futures	Options	ETPs
U.S. Broad Equity				
S&P 500	273,454	117,870	143,922	11,662
Dow Jones Industrial Average®	8,486	7,603	150	733
S&P MidCap 400®	1,203	943	2	258
International Equity				
S&P/ASX 200	1,933	1,843	80	10
S&P/TSX 60	1375	1,313	7	56
Equity Sectors				
S&P 500 Sectors	3,591	447	259	2,885
Other Equity Sector	1,920	58	163	1,699
Fixed Income				
iBoxx High Yield	926	12	143	771
iBoxx Investment Grade	817	10	38	769
Other				
VIX®/Option Strategies	1,319	920	134	266
All Other S&P DJI Index-Linked Products	1,615	136	5	1,475

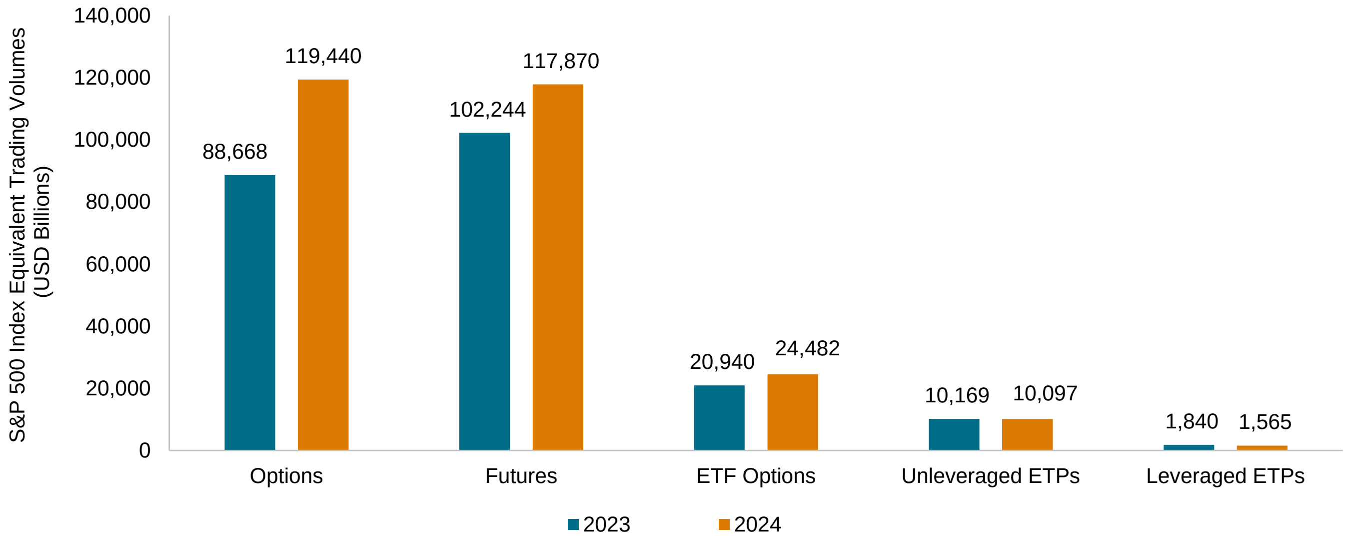
Source: S&P Dow Jones Indices LLC, FIA, Bloomberg. Data as of Dec. 31, 2024. Each product was placed into one of three product categories: futures, options and ETPs, the latter of which includes "vanilla" ETFs and less common structures such as leveraged and inverse ETFs and exchange-traded notes (ETNs). Note that the options column includes both options linked to indices and options on index-linked ETPs. Further details are provided in the Appendix. Table is provided for illustrative purposes.

[7] A survey of listed volumes in the fixed income markets is surveyed in Godec, Nicholas, "2024 Fixed Income Review," S&P Dow Jones Indices LLC, Jan. 17 2025.

The S&P 500 Trading Ecosystem

The 500 alone represents a significant proportion of the total in Exhibit 3, amounting to **USD 273 trillion**, and accounted for much of the increase of more than USD 50 trillion in the annual statistics shown in Exhibit 1. Exhibit 4 provides a breakdown of this growth across product types linked to the S&P 500.

Exhibit 4: Growth in Volume of Products Linked to the S&P 500 Increased by USD 50 Trillion



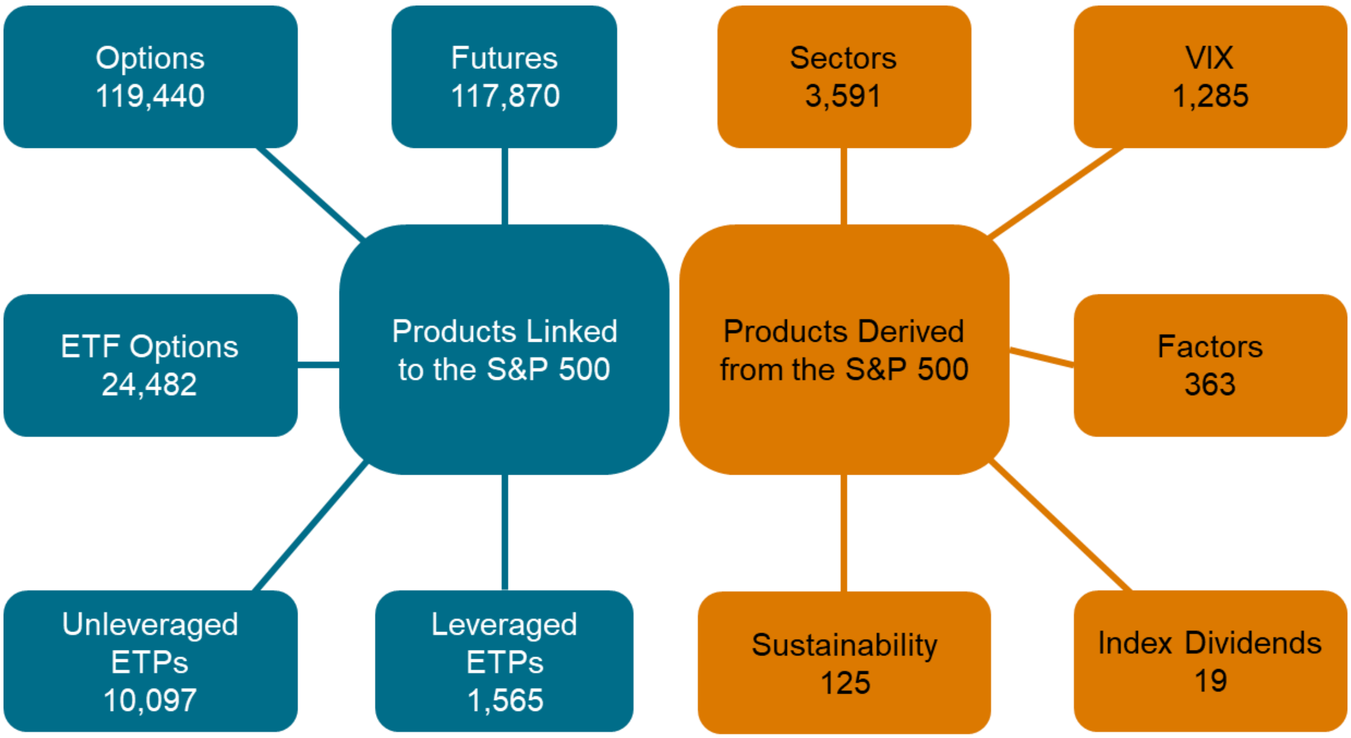
Source: S&P Dow Jones Indices LLC, FIA, Bloomberg. Data from the 12-month-period ending Dec. 31, 2024, and the 12-month period ending Dec. 31, 2023. Chart is provided for illustrative purposes. Multiplier used for options IET in 2024 was .23, consistent with the average in 2024. See Appendix for more details.

Each of these products has its own markets that enable participants to hedge positions or express directional views. Together, **by enabling risk to be transferred from one market to another, they create connections that improve market efficiency**. It is worth emphasizing that this ecosystem encompasses not just different product types but also related indices and products. The simplest form of such connections is demonstrated by the nodes on the left side of Exhibit 5, which illustrate the trading ecosystem associated with the S&P 500 only. On the right side of Exhibit 5, we show the IET in products tied to indices derived from The 500, such as sectors, factors and dividends. These products encompass an additional USD 5 trillion, contributing to a total IET across the S&P 500 ecosystem of **USD 279 trillion**.

Connections in pricing and volumes can occur on the left-hand side of Exhibit 5 through arbitrage links and risk transference, enabling a liquid market in one product to support pricing in another. For example, market makers in S&P 500 options might hedge their delta exposures with futures, a seller of S&P 500 ETFs might use call options to manage the risk of their position, or institutional investors might use ETFs during the day and non-U.S. listed

ETFs or futures after hours to react to macro events that occur after the market close.[8] Connections between elements on the right-hand side of Exhibit 5 rely on their respective connections to the center. For example, arbitrage is possible using S&P 500 sectors to replicate the S&P 500 by weighting them in the appropriate proportions. The resulting benefits in price discovery and market efficiency stemming from the relationships across the ecosystem may be understood as **network effects of liquidity**.

Exhibit 5: The S&P 500 Ecosystem – Aggregate IET in Billions of U.S. Dollars



Source: S&P Dow Jones Indices LLC, FIA, Bloomberg. Data for the 12-month period ending Dec. 31, 2024. Chart is provided for illustrative purposes. See Appendix for more details.

Active Usage of Passive Products

In his famous "The Arithmetic of Active Management," William Sharpe characterized all investors as either passive or active and concluded that in a hypothetically stylized market, the average active investor must underperform after costs. The real market is more complex: there are very few truly passive market participants in the sense of Sharpe's definition, who buy and hold a set of securities over a long horizon without making any adjustments. Meanwhile, there are active investors who hold and trade index-linked products. Exhibit 2

[8] See "The Liquidity Landscape: Trading Linked to S&P DJI Indices," op. cit., where we discuss the growth of the S&P 500 liquidity ecosystem around the world.

showed the increased prevalence of ETFs among the most-traded securities, while Exhibits 3, 4 and 5 showed significant and increasing evidence for **active usage of passive products.**[9]

How active? To gauge the behavior of market participants using index-linked products, we can compare trading volumes with assets invested (or open interest in the case of futures and options) to estimate an average holding period among market participants. For example, consider a fund that has stable assets of USD 100 million and an aggregate trading volume of USD 200 million over a year. We can divide the first number by the second to arrive at an implied average holding period of six months. Of course, any security can and likely will have a mix of investors who trade with different frequencies; **the "average" is unlikely to be typical**.[10]

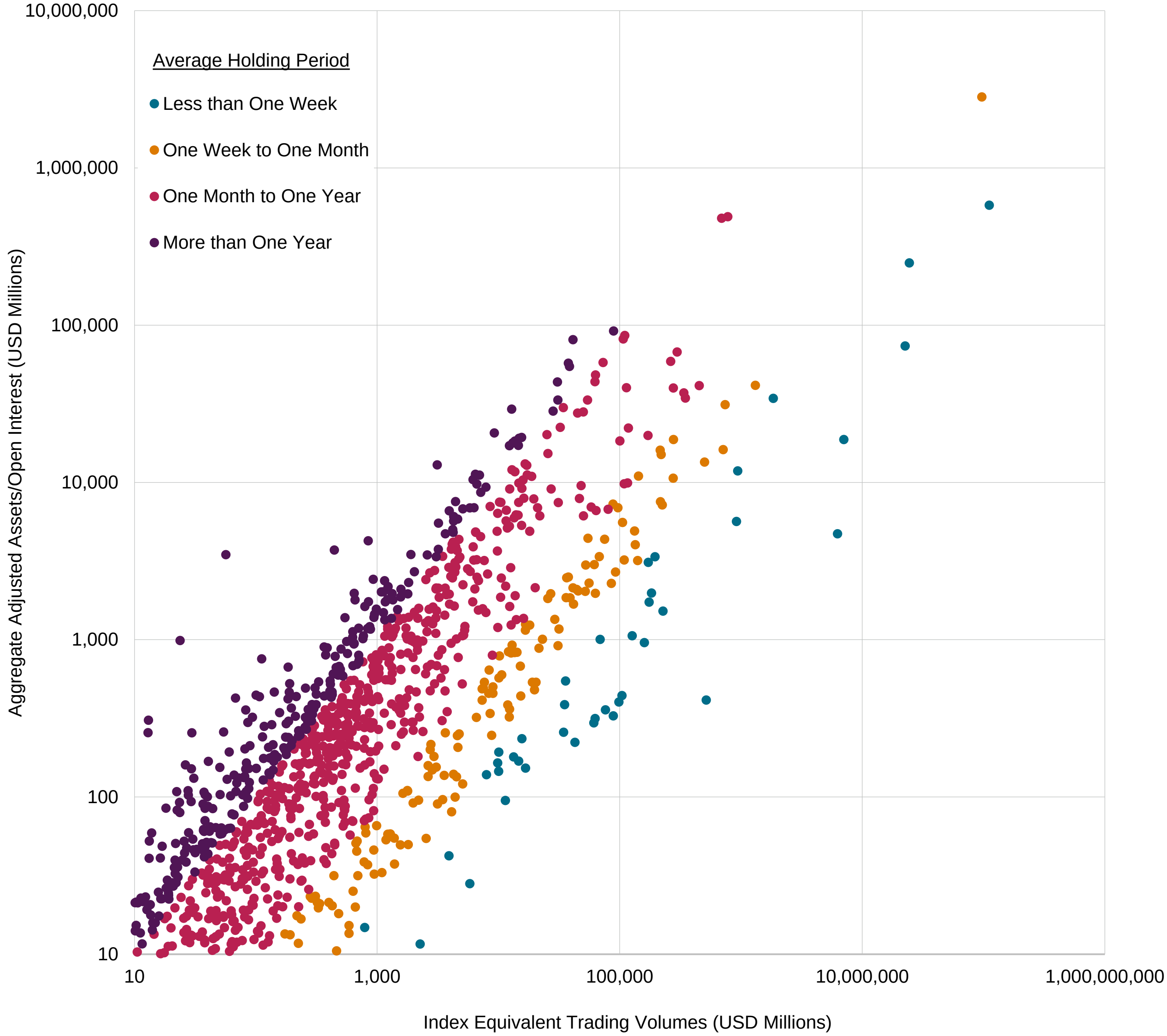
Exhibit 6 visualizes the range of trading volumes and assets across products linked to S&P DJI's indices. Each licensed product is represented by a single data point in the scatter plot, colored according to the ratio of assets to volume in each product (that is, colored according to the implied average holding period). Both assets and volumes were adjusted to estimate the degree of economic exposure in the underlying index that was held or transacted.[11] In order to focus on products with a decent amount of investor and trader interest, our sample was limited to ETPs, futures, ETP options and options with at least USD 10 million in both average assets and annual volumes (once adjusted in the same manner as the IET).

[9] See "Active and Passive Harmonics: Trading Frequencies of Index-Linked Products," op.cit.

[10] If one investor turns over their positions 100 times a day, and another 99 investors hold without ever selling, it is misleading, even if mathematically correct, to observe that, on average, they trade once a day. Due to the presence of market makers and other high-frequency participants, we suspect that many index-based products will have a skewed distribution of holding periods across different owners.

[11] Both volumes and assets were adjusted by the same factor for each product, following the IET methodology as detailed in the Appendix.

Exhibit 6: Assets And Volumes in Products Linked to S&P DJI Indices



Source: S&P Dow Jones Indices LLC, FIA, Bloomberg. Adjusted assets/open interest are averaged and IET volumes were aggregated over the year. Sample truncated at adjusted assets or IET volumes of less than USD 10 million. For each product, the average holding period in days is (assets/IET) x 365. Data as of Dec. 31, 2024. Chart is provided for illustrative purposes. Note: logarithmic scale used for both axes.

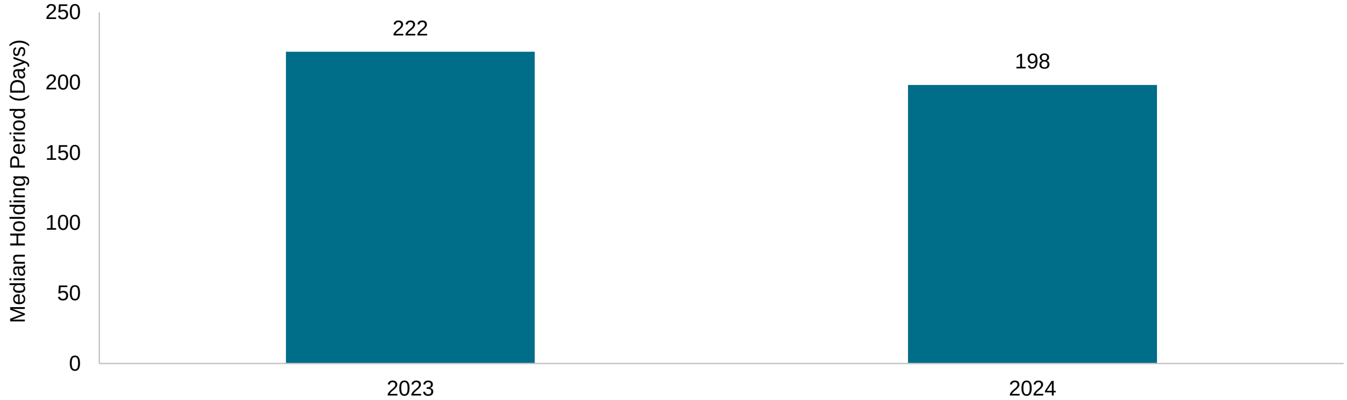
Exhibit 6 confirms that there were several products associated with a relatively high average frequency of trading relative to their outstanding assets, confirming that at least **some index-linked products were associated with some highly active investors.**

Offering a broader and summary statistic, Exhibit 7 shows the unweighted median holding periods for all the products represented in Exhibit 6, and the same for the previous year.[12] The median holding period across all products in 2024 was 198 calendar days, or almost seven

[12] For avoidance of doubt: such median is calculated across the distribution of average holding periods among different products, not across different market participants.

months—a nearly 10% decline from the 222 days reported last year. Taking an average weighted by assets, due to larger interest in the most liquid products, the average holding period was much shorter—only nine days—consistent with what was reported in 2023.[13]

Exhibit 7: Median Holding Period across Products Declined



Source: S&P Dow Jones Indices LLC, FIA, Bloomberg. Sample truncated at adjusted assets or IET volumes of less than USD 10 million. Data as of Dec. 31, 2024, based on 2024 calendar year data. Chart is provided for illustrative purposes.

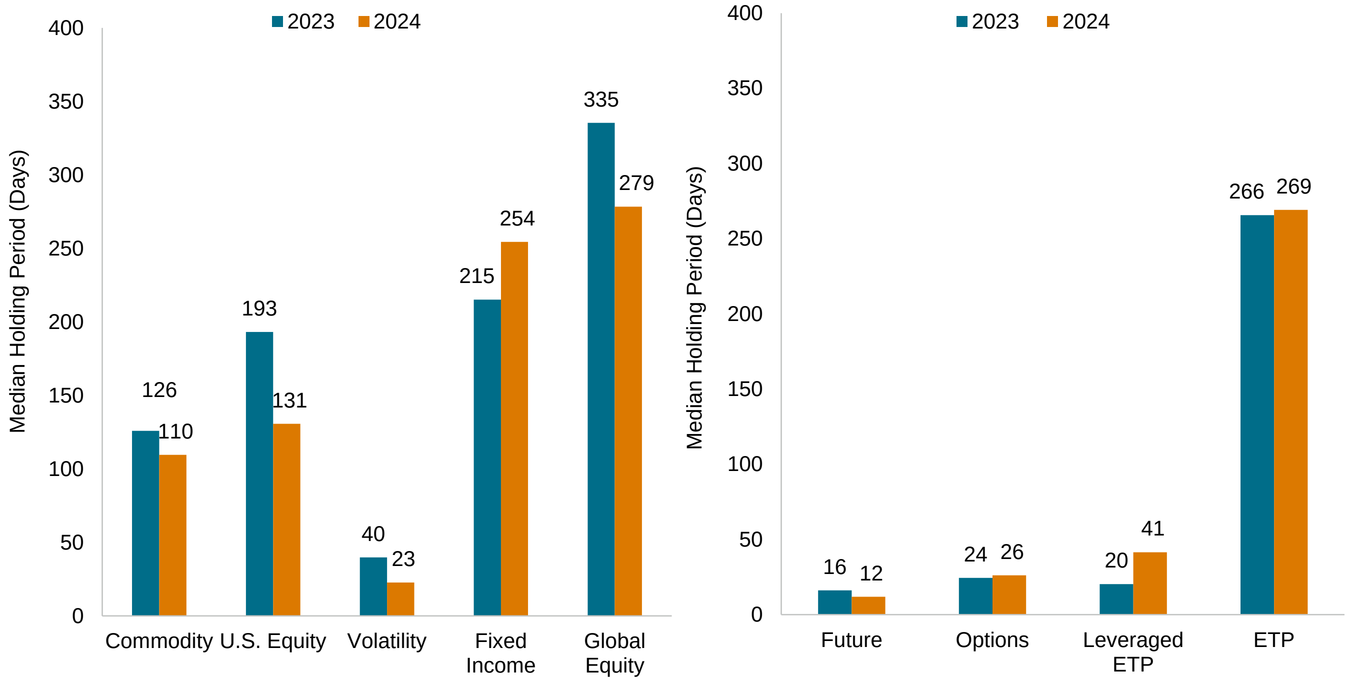
Comparisons between assets (or open interest) and volumes, and the resulting derived average holding periods, allow us to understand the degree of activity across different kinds of products, too. Exhibit 8 aggregates the data across the full sample by asset class and by product type. This allows us to confirm, for example, that futures, leveraged ETPs and options had relatively much shorter median holding periods overall, which is consistent with an expectation for heavier usage of the former by market participants with short-term horizons.

Exhibit 8 also shows the change from the previous year, but it is worth highlighting that such changes can result from shifts in the composition of market participants as well the behavior of existing participants (or a perhaps conflicting, perhaps reinforcing combination of changes in both). For example, an increase in the median holding period for fixed income products could signal investors holding their bond products for longer horizons, or it could reflect increased adoption of fixed income products by passively inclined participants.[14] At any rate, it is interesting to note that Exhibit 8 shows that holding periods for fixed income products increased, while those for U.S. and global equity products decreased overall.

[13] See "The Liquidity Landscape: Trading Linked to S&P DJI Indices," op. cit.

[14] The possibility that passive investing may become more significant within the fixed income markets is explored further in Edwards, Tim; Ganti, Anu R. and Malinowski, Agatha, "The Hare And The Tortoise: Assessing Passive's Potential in Bonds," S&P Dow Jones Indices LLC, February 2024.

Exhibit 8: Median Holding Period across Asset Classes and Products Varied



Source: S&P Dow Jones Indices LLC, FIA, Bloomberg. Data as of Dec. 31, 2024, based on 2024 calendar year data. Charts are provided for illustrative purposes.

Sectors & Industries in Focus

Sector-based investment tools are not new. For example, ETFs based on the main U.S. sectors have been around since the late 1990s,[15] while assets associated with ETFs and futures tied to S&P DJI's range of sector and industry indices nearly tripled in a decade to reach over USD 400 billion by June 2024.[16] S&P DJI sector ETP volumes, meanwhile, have grown to almost 10 times that, to **USD 4 trillion** as of the end of 2024, with roughly three-quarters driven by **S&P 500 sectors**. For context, this is equivalent to five times the average amount traded in 2024 in each one of the top 100 most-traded U.S.-listed securities discussed earlier.

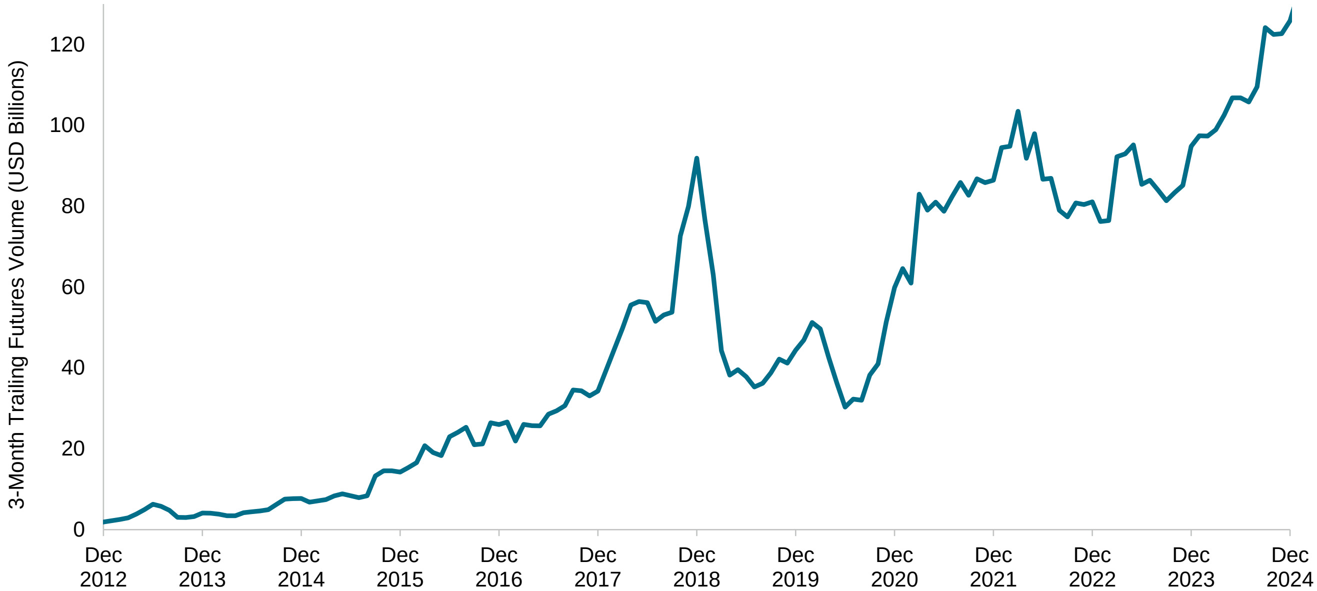
Another notable evolution in the usage of sector-based products in recent years is the increased usage of futures tracking U.S. equity sectors and industries.[17] Although they have long served as an integral part of the S&P 500 liquidity ecosystem, Exhibit 9 shows that three-month trailing cumulative volumes across S&P 500 sector and industry futures surpassed **USD 100 billion** by the end of 2024, almost tripling since five years ago.

[15] Edwards, Tim and Lazzara, Craig J., "Sector Effects in the S&P 500," S&P Dow Jones Indices LLC, March 2019.

[16] Nelesen, Joe and Edwards, Tim, "Natural Selection: Tactics and Strategy with Equity Sectors," S&P Dow Jones Indices LLC, July 2024.

[17] In the main, products tracking S&P DJI's sector and industry indices refer to those classified under the GICS® methodology, in which single equities are categorized into a set of nested, mutually exclusive and collectively comprehensive sub-industries, then industries, then industry groups, and finally sectors.

Exhibit 9: S&P 500 Sector and Industry Futures Volumes Have Grown



Source: S&P Dow Jones Indices LLC, CME, Bloomberg. Data as of Dec. 31, 2024. Chart is provided for illustrative purposes.

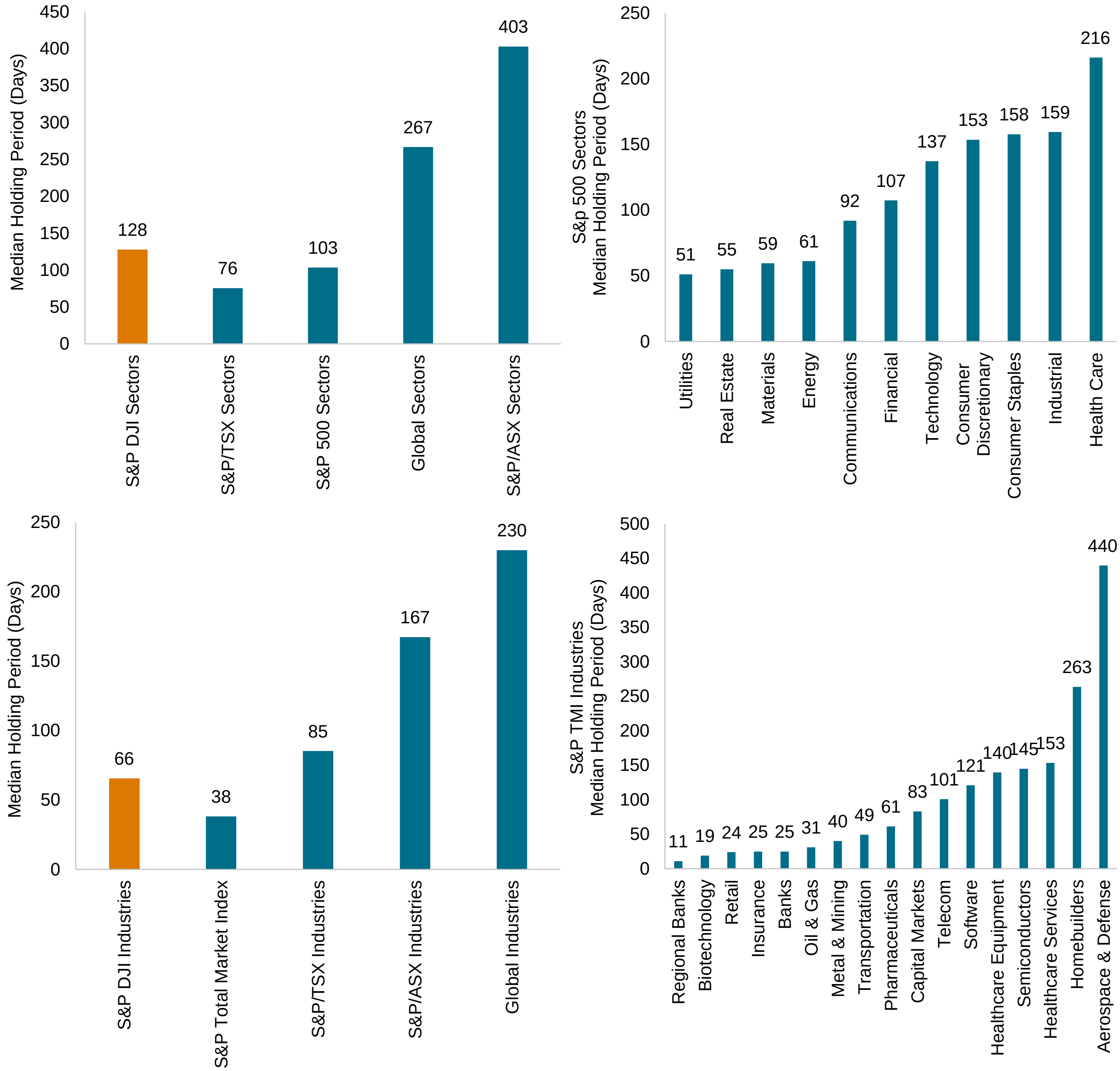
Sector-based trading can allow active investors with a top-down approach to asset allocation to easily express their views and enable those with a bottom-up approach to express views on stocks relative to sectors.[18] The large capitalizations and distinct performances of sectors and industries may also help active participants to optimize their needs to make distinct “bets” in scalable ways, as compared to single securities.[19] Whether for tactical, strategic or diversification purposes, the growth in sector-based index liquidity helps promote market efficiency and price discovery at a more granular level than overall market benchmarks.

Just as was the case for broader market indices, products tracking narrower sector and industry indices may be employed in a wide range of trading frequencies among diverse investor types, ranging from long-term investors tracking sector benchmarks, through sector rotation strategies, to short-term implementations of highly tactical views or hedging. Exhibit 10 provides summary statistics of average holding periods (calculated as before) across the range of S&P DJI index-linked vehicles.

[18] Edwards, Tim and Lazzara, Craig J., “Sector Effects in the S&P 500,” S&P Dow Jones Indices LLC, March 2019.

[19] Edwards, Tim et al, “The Value of Research: Skill, Capacity & Opportunity,” S&P Dow Jones Indices LLC, October 2018.

Exhibit 10: Median Holding Periods Varied across Regions, Sectors and Industries



Source: S&P Dow Jones Indices LLC, FIA, Bloomberg. Data as of Dec. 31, 2024, based on 2024 calendar year data. Ex-U.S. regional sectors and industry products include those offered in Canada and Australia. Charts are provided for illustrative purposes.

The overall median holding period across S&P DJI sector-based products was 128 days, but this varied across regions and was significantly shorter in the U.S. compared to outside the U.S. and globally. This may be a consequence of the fact that a majority of assets and liquidity are concentrated in S&P 500 sectors, instead of indices representing sectors in regions with relatively undeveloped product ecosystems.[20]

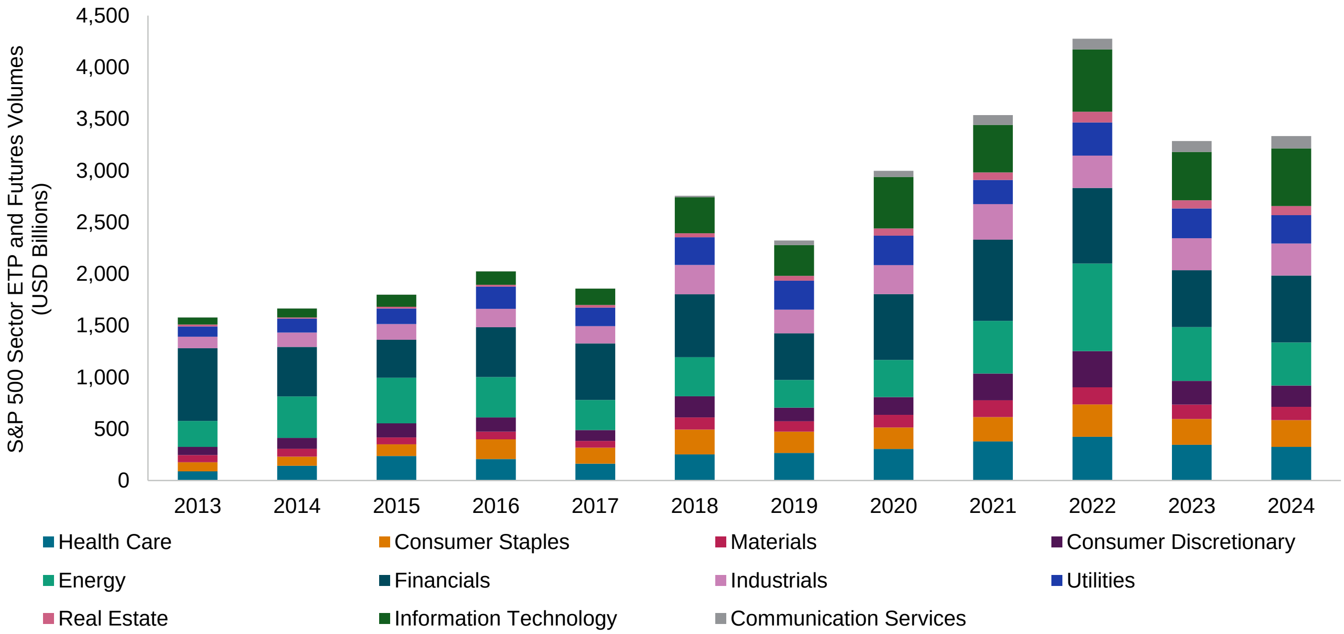
[20] Edwards, Tim et al, "Global Applications of S&P 500 Sectors," S&P Dow Jones Indices LLC, March 2018.

Similar trends were reflected among industries, although the overall median holding period across the narrower S&P DJI industries was 66 days, roughly half that of sectors. These trends might be indicative of more active usage of industries, perhaps by investors using industry products for tactical purposes, to complement their sector allocations or make more granular adjustments based on market or macro conditions.

The median holding period varied across individual S&P 500 sectors, ranging from 51 days for Utilities to 216 days for Health Care. Among industries, Regional Banks and Biotechnology had relatively lower holding periods, evidencing relatively more active trading in these industries compared to Homebuilders and particularly Aerospace & Defense, which were characterized by longer holding periods of 263 and 440 days, respectively.

Including ETPs and ETDs, specifically futures, volumes in S&P 500 sector products had grown to **over USD 3 trillion** as of 2024, an increase of almost USD 1 trillion since 2019.[21] Exhibit 11 provides a sectoral breakdown of this growth. While spanning across sectors, trading in Financials and Technology has experienced a significant increase in recent years.

Exhibit 11: Volumes in S&P 500 Sector ETP and Futures Have Grown



Source: S&P Dow Jones Indices LLC, CME, Bloomberg. Data as of Dec. 31, 2024. Chart is provided for illustrative purposes.

The growing interest in sector and industry derivative products represents a microcosm of the broader story. Increased product choice and liquidity makes it potentially easier to efficiently achieve sector exposures, with an increasingly global range of products enabling market participants around the world to express sectoral and industry views at almost all hours of the day, further serving to promote price discovery.

[21] Edwards, Tim et al, "A Window on Index Liquidity: Volumes Linked to S&P DJI Indices," S&P Dow Jones Indices LLC, August 2019.

Conclusion

The liquidity of the S&P DJI ecosystem continues to expand, with **USD 273 trillion in volumes** associated with S&P 500 products, rising by more than USD 50 trillion since 2023. This is in comparison to an increase of approximately USD 13 trillion of assets under management or open interest in products or portfolios tracking the S&P 500 at the end of 2024.[22] We can draw various conclusions from this.

- The usage of passive products has become **increasingly active**, with the median holding period across all products declining by 24 days to 198 days in 2024.
- Higher index-listed product liquidity supports **price discovery** and **market efficiency**, which is beneficial not just for active traders but also long-term inactive investors to maintain **confidence** in observed prices.
- S&P 500 sectors are an important part of the S&P 500 liquidity ecosystem, with over **USD 3 trillion in volumes** spanning across ETPs and ETDs. The usage of sectors and industries as tools for building strategic or tactical equity allocations is a prominent example of the popularity of index-listed products, especially among the active community.

A broad index-based toolkit comprised of ETPs, futures, options and options on ETPs, across entire markets or more granular segments like sectors or factors, has made it possible for investors trading across a range of frequencies to express their views.[23] The market participants in index-based products compose a broad church, from highly active investors with time horizons in the nanoseconds, to traditional buy-and-hold followers of a passive philosophy. What they increasingly share in common is a contribution to, and the resulting network benefits from, a robust and varied trading ecosystem.

[22] "S&P Dow Jones Indices Annual Survey of Assets," S&P Dow Jones Indices LLC, July 2025.

[23] Ganti, Anu, "Creative Cacophony," S&P Dow Jones Indices LLC, October 2024.

Appendix: Methodology

This appendix details the definition of index equivalent trading volume (IET), outlines the sources used and provides calculation details. We also indicate how products were selected or excluded from the total and note the major sources of potential estimation error. Overall, it is likely that we underestimate the degree of trading in index-linked products, since not all potentially relevant products were included, and not all trading was captured. The focus of this report is secondary market trading; primary market transactions are not included in the total.

Index Equivalent Trading Volume (IET)

IET was designed to measure the economic value of trading in index-linked products traded in aggregate. The key notion is what a market-maker might do to instantaneously hedge exposures on a trade-by-trade basis. We assume—for purposes of calculating the IET—that products track their associated indices "as advertised" and ignore the potential effects of tracking error in index-linked products or their potential hedges.

An illustrative example: if 100 shares of an ETF trade at a price of USD 200 per share, the associated IET is USD 20,000. Similarly, the IET associated with each futures trade is provided by the number of contracts traded, times the futures price, times the contract size.

For leveraged and inverse ETFs, the value traded in the underlying product is multiplied by the absolute value of the appropriate leverage multiple. Thus, 100 shares in a double inverse leveraged ETF traded at USD 200 would correspond to USD 40,000 in IET.

In the case of options, to obtain an estimate of the IET, we multiplied the aggregate monthly traded option notional for each contract by a multiplier designed to estimate the average "delta," or sensitivity, to the underlying index. Although the "correct" delta to use would be expected to vary across different options with different underlying indices, we used a single delta estimate for all options (no matter which index they related to) in each month. That delta was provided by the volume-weighted average delta of S&P 500 index options trades in that month, as provided on a proprietary basis by Cboe according to their own proprietary option pricing models. An average multiplier of 0.23 was used, ranging between 0.22 and 0.24 over the 12 months through 2024. For example, a one-lot trade in an option on an ETF that had a share price of USD 200 and an option notional of 100 shares, during a month in which the average S&P 500 index option delta was 0.23, would have an IET of USD 4,600 = 0.23 x 100 x USD 200.

Sources and Calculation

For each product, we accessed publicly available data on trading volumes and product features from sources including the Futures Industry Association (FIA), Bloomberg LLC and various listing exchanges and product issuer websites to create aggregated volumes in U.S.

dollars for each product over the full year 2024. Where available, volumes in cross-listings in other jurisdictions were also included and aggregated. Additionally, for options and leveraged ETPs (which included funds, trusts and notes), the traded amount was adjusted for the degree of "economic exposure" in the underlying index that was being transacted: for leveraged and inverse ETPs, the dollar amount of observed trading was multiplied by the absolute value of the product's leverage multiple (so that volumes in a triple leveraged inverse ETP were tripled to represent the value of index exposure transacted, for example).

Along with trading volumes, we also obtained full-year averages of the assets under management or open interest in each product in U.S. dollars—with similar adjustments for leverage or delta as before. ETP assets were calculated based on the average of daily datapoints across the year, while futures and index options were calculated via monthly averages.

Product Inclusion and Aggregation by Index

1,614 distinct products were included, many of which were associated with multiple trading lines. The initial universe of products was determined by S&P DJI and represents the range of licensed products as of Dec. 31, 2024.

Although there are only a handful, the list of products includes a select few products that describe themselves as actively managed but are benchmarked under a license to S&P DJI indices, where the active strategy was judged by the authors to represent an equivalent to a combination of elsewhere-included index-linked products. These included, in particular, ETPs such as S&P 500-based call-overwriting and collar strategies. The list excludes derivatives such as (1) flexible exchange options ("flex" options) and listed certificates, (2) over-the-counter transactions such as swaps, even if reported and centrally cleared and (3) products linked to "custom" indices that S&P DJI calculates on behalf of a third party.

For some benchmarks, a wide range of related indices expresses various aspects of the same benchmark return. For example, S&P DJI produces index levels for the S&P 500 expressed in (or hedged into) a range of currencies, potentially including or excluding dividends, or including dividends only net of withholding taxes. For the purposes of producing Exhibit 3, different currency and currency-hedged, and price, net and total return versions of each index are aggregated to the same benchmark index.

Indices that differ in their underlying constituents or weights were counted separately. For example, trades in products linked to the S&P 500 Equal Weight Index were not included in the total associated with the S&P 500 (although they contributed to the right side of Exhibit 5 under "factors").

Biases

The survey is subject to both survivorship and reporting biases. Both are estimated to be of secondary or tertiary importance with respect to the overall total, but could have meaningful impact within individual market segments, and may be more significant when making comparisons to previous years.

Products previously linked to S&P DJI indices that de-listed or switched their benchmark prior to December 2024 were not included in the total. Conversely, products that were linked to S&P DJI indices as of December 2024, but which tracked different indices previously, were included in the total.

As noted in the main text, we emphasize that calculating “average” holding periods in the manner employed herein may result in a potentially misleading figure: there may likely be some market participants who hold their shares for a long time, others who inflate the average by frequently trading, and perhaps few market participants with “average” holding periods.

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