

Underlying supplement no. 5-I
To the prospectus dated April 13, 2023 and
the prospectus supplement dated April 13, 2023

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Rule 424(b)(2)

JPMORGAN CHASE & CO.

Notes Linked to the MerQube Vol Advantage Index Series

JPMORGAN CHASE FINANCIAL COMPANY LLC

Notes, Fully and Unconditionally Guaranteed by JPMorgan Chase & Co., Linked to the MerQube Vol Advantage Index Series

Each of JPMorgan Chase & Co. and JPMorgan Chase Financial Company LLC may, from time to time, offer and sell notes linked in whole or in part to an index in the MerQube Vol Advantage Index Series listed below (each, an “**Index**” and collectively the “**Indices**”):

- MerQube US Tech+ Vol Advantage Index
- MerQube US Large-Cap Vol Advantage Index
- MerQube US Small-Cap Vol Advantage Index

The issuer of the notes, as specified in the relevant terms supplement, is referred to in this underlying supplement as the “**Issuer**.” The Issuer will be either JPMorgan Chase & Co. or JPMorgan Chase Financial Company LLC. For notes issued by JPMorgan Chase Financial Company LLC, JPMorgan Chase & Co., in its capacity as guarantor of those notes, is referred to in this product supplement as the “**Guarantor**.”

Each Index is subject to a 6.0% per annum daily deduction. This daily deduction will offset any appreciation of the futures contracts included in each Index, will heighten any depreciation of those futures contracts and will generally be a drag on the performance of each Index. Each Index will trail the performance of an identical index without a deduction.

This underlying supplement describes each Index, the relationship between JPMorgan Chase & Co., JPMorgan Chase Financial Company LLC and the sponsor of each Index and terms that will apply generally to notes linked in whole or in part to an Index and provides other relevant information. This underlying supplement supplements the terms described in the accompanying product supplement, the prospectus supplement and the prospectus. A separate term sheet or pricing supplement, as the case may be, will describe terms that apply to specific issuances of the notes, including any changes to the terms specified below. These term sheets and pricing supplements are referred to generally in this underlying supplement as terms supplements. The accompanying product supplement, the relevant terms supplement or another accompanying underlying supplement will describe any other index or reference asset to which the notes are linked. If the terms described in the relevant terms supplement are inconsistent with those described in this underlying supplement, any other accompanying underlying supplement, the accompanying product supplement, the prospectus supplement or the prospectus, the terms described in the relevant terms supplement will control. In addition, if this underlying supplement and the accompanying product supplement or another accompanying underlying supplement contain information relating to the same Index to which the notes are linked, the information contained in the document with the most recent date will control.

Investing in the notes involves a number of risks. See “Risk Factors” beginning on page S-2 of the prospectus supplement, “Risk Factors” in the accompanying product supplement and “Risk Factors” beginning on page US-4 of this underlying supplement.

Neither the Securities and Exchange Commission nor any state securities commission has approved or disapproved of the notes or passed upon the accuracy or the adequacy of the relevant terms supplement, this underlying supplement, any other accompanying underlying supplement, the accompanying product supplement, the prospectus supplement or the prospectus. Any representation to the contrary is a criminal offense.

The notes are not bank deposits, are not insured by the Federal Deposit Insurance Corporation or any other governmental agency and are not obligations of, or guaranteed by, a bank.

J.P.Morgan

April 13, 2023

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The Issuer and the Guarantor (if applicable) have not authorized anyone to provide any information other than that contained or incorporated by reference in the relevant terms supplement, this underlying supplement, any other accompanying underlying supplement, the accompanying product supplement, the prospectus supplement or the prospectus with respect to the notes offered by the relevant terms supplement and with respect to the Issuer and the Guarantor (if applicable). The Issuer and the Guarantor (if applicable) take no responsibility for, and can provide no assurance as to the reliability of, any other information that others may give you. The relevant terms supplement, together with this underlying supplement, any other accompanying underlying supplement, the accompanying product supplement, the prospectus supplement and the prospectus, will contain the terms of the notes and will supersede all other prior or contemporaneous oral statements as well as any other written materials, including preliminary or indicative pricing terms, correspondence, trade ideas, structures for implementation, sample structures, fact sheets, brochures or other educational materials of the Issuer. The information in each of the relevant terms supplement, this underlying supplement, any other accompanying underlying supplement, the accompanying product supplement, the prospectus supplement and the prospectus may be accurate only as of the date of that document.

The notes are not appropriate for all investors and involve a number of risks and important legal and tax consequences that should be discussed with your professional advisers. You should be aware that the regulations of Financial Industry Regulatory Authority, Inc., or FINRA, and the laws of certain jurisdictions (including regulations and laws that require brokers to ensure that investments are suitable for their customers) may limit the availability of the notes. The relevant terms supplement, this underlying supplement, any other accompanying underlying supplement, the accompanying product supplement, the prospectus supplement and the prospectus do not constitute an offer to sell or a solicitation of an offer to buy the notes under any circumstances in which that offer or solicitation is unlawful.

The notes are not commodity futures contracts or swaps and are not regulated under the Commodity Exchange Act of 1936, as amended (the “Commodity Exchange Act”). The notes are offered pursuant to an exemption from regulation under the Commodity Exchange Act, commonly known as the hybrid instrument exemption, that is available to securities that have one or more payments indexed to the value, level or rate of one or more commodities, as set out in section 2(f) of that statute. Accordingly, you are not afforded any protection provided by the Commodity Exchange Act or any regulation promulgated by the Commodity Futures Trading Commission.

In this underlying supplement, “we,” “us” and “our” refer to the Issuer, unless the context requires otherwise, and “JPMorgan Financial” refers to JPMorgan Chase Financial Company LLC. To the extent applicable, each index described in this underlying supplement is deemed to be one of the “Indices” referred to in the accompanying product supplement.

SUMMARY

All information contained in this underlying supplement regarding each of the indices in the MerQube Vol Advantage Index Series set forth in the table below (each, an “**Index**” and collectively the “**Indices**”), including, without limitation, their make-up, method of calculation and changes in their components, has been derived from publicly available information and other information provided by MerQube (the “**Index Sponsor**” and “**Index Calculation Agent**”), without independent verification. This information reflects the policies of, and is subject to change by, the Index Sponsor. Each Index was developed by the Index Sponsor, in coordination with J.P. Morgan Securities LLC. Each Index is maintained by the Index Sponsor and is calculated and published by the Index Calculation Agent. The Index Sponsor has no obligation to continue to publish, and may discontinue the publication of, any Index.

Index	Bloomberg Ticker	Futures Contracts	Underlying Index	Underlying ETF	Live Date
MerQube US Tech+ Vol Advantage Index	MQUSTVA	E-mini [®] Nasdaq-100 futures	Nasdaq-100 Index [®]	Invesco QQQ Trust SM , Series 1	June 6, 2021
MerQube US Large-Cap Vol Advantage Index	MQUSLVA	E-mini [®] S&P 500 [®] futures	S&P 500 [®] Index	SPDR [®] S&P 500 [®] ETF Trust	January 7, 2022
MerQube US Small-Cap Vol Advantage Index	MQUSSVA	E-mini [®] Russell 2000 [®] futures	Russell 2000 [®] Index	iShares [®] Russell 2000 ETF	June 21, 2022

An affiliate of ours currently has a 10% equity interest in the Index Sponsor, with a right to appoint an employee of J.P. Morgan Securities LLC, another of our affiliates, as a member of the board of directors of the Index Sponsor.

Each Index was established on the applicable live date set forth in the table above. Each Index is reported by the Bloomberg Professional[®] service (“**Bloomberg**”) under the applicable ticker symbol set forth in the table above.

Each Index attempts to provide a dynamic rules-based exposure to an unfunded rolling position in the applicable futures contracts set forth in the table above (each, a “**Futures Contract**” and collectively the “**Futures Contracts**”), while targeting a level of implied volatility, with a maximum exposure to that Futures Contract of 500% and a minimum exposure to that Futures Contract of 0%. Each Index is subject to a 6.0% per annum daily deduction.

Each Futures Contract references the applicable underlying index set forth in the table above (each, an “**Underlying Index**” and collectively the “**Underlying Indices**”):

- The Nasdaq-100 Index[®] is a modified market capitalization-weighted index that is designed to measure the performance of 100 of the largest non-financial companies listed on The Nasdaq Stock Market.
- The S&P 500[®] Index consists of stocks of 500 companies selected to provide a performance benchmark for the U.S. equity markets.
- The Russell 2000[®] Index consists of the middle 2,000 companies included in the Russell 3000[™] Index and, as a result of the index calculation methodology, consists of the smallest 2,000 companies included in the Russell 3000[®] Index. The Russell 2000[®] Index is designed to track the performance of the small capitalization segment of the U.S. equity market.

For more information about the Futures Contracts and the Underlying Indices, see “Background on the Futures Contracts,” “Background on the Nasdaq-100 Index[®],” “Background on the S&P 500[®] Index” and “Background on the Russell 2000[®] Index,” as applicable, below.

On each weekly Index rebalance day, the exposure of an Index to the applicable Futures Contracts is set equal to (a) the 35% implied volatility target (the “**target volatility**”) *divided by* (b) the one-week implied volatility of the exchange-traded fund that tracks the Underlying Index for that Index (each, an “**Underlying ETF**” and collectively, the “**Underlying ETFs**”), as set forth in the table above, subject to a maximum exposure of 500%. For example, if the implied volatility of an Underlying ETF is equal to 17.5%, the exposure of the applicable Index to the applicable Futures Contracts will equal 200% (or 35% / 17.5%) and if the implied volatility of an Underlying ETF is equal to 40%, the exposure of the applicable Index to the applicable Futures Contracts will equal 87.5% (or 35% / 40%). An Index’s exposure to the applicable Futures Contracts will be greater than 100% when the implied volatility of its Underlying ETF is below 35%, and an Index’s exposure to the applicable Futures Contracts will be less than 100% when the implied volatility of its Underlying ETF is above 35%. In general, the Indices’ target volatility feature is expected to result in the volatility of each Index being more stable over time than if no target volatility feature were employed. No assurance can be provided that the volatility of any Index will be stable at any time.

Each Underlying ETF tracks the applicable Underlying Index:

- The investment objective of the QQQ Fund is to seek to track the investment results, before fees and expenses, of the Nasdaq-100 Index®.
- The SPY Fund seeks to provide investment results that, before expenses, correspond generally to the price and yield performance of the S&P 500® Index.
- The IWM Fund seeks to track the investment results, before fees and expenses, of an index composed of small-capitalization U.S. equities, which is currently the Russell 2000® Index.

For more information about the Underlying ETFs, see “Background on the Invesco QQQ TrustSM, Series 1,” “Background on the SDPR® S&P 500® ETF Trust” and “Background on the iShares Russell® 2000 ETF,” as applicable, below. Each Index uses the implied volatility of its Underlying ETF as a proxy for the volatility of the applicable Futures Contracts.

For each Index, the 6.0% per annum daily deduction will offset any appreciation of the applicable Futures Contracts, will heighten any depreciation of the applicable Futures Contracts and will generally be a drag on the performance of that Index. Each Index will trail the performance of an identical index without a deduction.

Holding the estimated value of the notes and market conditions constant, the economic terms available on the notes linked to an Index are expected to be more favorable to investors than the terms that would be available on a hypothetical note issued by us linked to an identical index without a daily deduction. However, there can be no assurance that any improvement in the terms of the notes derived from the daily deduction will offset the negative effect of the daily deduction on the performance of the applicable Index. The return on the notes may be lower than the return on a hypothetical note issued by us linked to an identical index without a daily deduction.

The daily deduction and the volatility of the applicable Index (as influenced by that Index’s target volatility feature) are two of the primary variables that affect the economic terms of the notes linked to that Index. Additionally, the daily deduction and volatility of the applicable Index are two of the inputs our affiliates’ internal pricing models use to value the derivative or derivatives underlying the economic terms of the notes linked to that Index for purposes of determining the estimated value of the notes set forth in the relevant terms supplement. The daily deduction will effectively reduce the value of the derivative or derivatives underlying the economic terms of the notes. See the discussion and risk factors relating to the estimated value of the notes in the accompanying product supplement and the relevant terms supplement.

For additional information about the Indices, see “The MerQube Vol Advantage Index Series” below.

Each Index is subject to risks associated with the use of significant leverage. In addition, each Index may be significantly uninvested on any given day, and, in that case, will realize only a portion of any gains due to appreciation of the applicable Futures Contracts on that day. The index deduction is deducted daily at a rate of 6.0% per annum from each Index, even when that Index is not fully invested.

No assurance can be given that the investment strategy used to construct the Indices will achieve its intended results or that any Index will be successful or will outperform any alternative index or strategy that might reference the applicable Futures Contracts.

RISK FACTORS

*Your investment in the notes will involve certain risks. Investing in the notes is not equivalent to investing directly in any Index, Futures Contract or Underlying Index, any of the equity securities composing any Underlying Index, any Underlying ETF or exchange-traded or over-the-counter instruments based on, or other instruments linked to any of the foregoing. **You should consider carefully the following discussion of risks as well as the discussion of risks included in the relevant terms supplement, in the accompanying product supplement and in any other accompanying underlying supplement, before you decide that an investment in the notes is suitable for you.***

Risks Relating to the Indices Generally

J.P. Morgan Securities LLC, an affiliate of the Issuer and the Guarantor (if applicable), coordinated with the Index Sponsor in the development of the Indices, and our affiliate owns an equity interest in the Index Sponsor.

J.P. Morgan Securities LLC, which is referred to in this underlying supplement as JPMS, an affiliate of the Issuer and the Guarantor (if applicable), coordinated with the Index Sponsor in its development of the guidelines and policies governing the composition and calculation of the Indices. Although the Index Sponsor, in developing the Indices, coordinated with JPMS, JPMorgan Chase & Co., as the ultimate parent company of JPMS, ultimately controls JPMS.

An affiliate of ours currently has a 10% equity interest in the Index Sponsor, with a right to appoint an employee of JPMS, another of our affiliates, as a member of the board of directors of the Index Sponsor. The Index Sponsor can implement policies, make judgments or enact changes to an Index methodology that could negatively affect the performance of that Index. The Index Sponsor can also alter, discontinue or suspend calculation or dissemination of the Indices. Any of these actions could adversely affect the value of the notes. The Index Sponsor has no obligation to consider your interests in calculating, maintaining or revising an Index, and we, JPMS, our other affiliates and our respective employees are under no obligation to consider your interests as an investor in the notes in connection with the role of our affiliate as an owner of an equity interest in the Index Sponsor or the role of an employee of JPMS as a member of the board of directors of the Index Sponsor.

In addition, the policies and judgments for which JPMS was responsible could have an impact, positive or negative, on the levels of the Indices and the value of your notes. JPMS was under no obligation to consider your interests as an investor in the notes in its role in developing the guidelines and policies governing an Index or making judgments that may affect the level of that Index. Furthermore, the inclusion of the applicable Futures Contracts in an Index is not an investment recommendation by the Issuer, the Guarantor (if applicable) or JPMS of those Futures Contracts.

The level of each Index will reflect a 6.0% per annum daily deduction.

One way in which each Index may differ from a typical index is that its level will include a 6.0% per annum daily deduction. As a result of the daily deduction, the level of each Index will trail the value of a hypothetical identically constituted notional portfolio that is not subject to any such deduction.

The index deduction will place a significant drag on the performance of each Index, potentially offsetting positive returns on that Index's investment strategy, exacerbating negative returns of its investment strategy and causing the level of that Index to decline steadily if the return of its investment strategy is relatively flat. An Index will not appreciate unless the return of its investment strategy is sufficient to offset the negative effects of the index deduction, and then only to the extent that the return of its investment strategy is greater than the index deduction. As a result of the index deduction, the level of each Index may decline even if the return of its investment strategy is positive.

The daily deduction is one of the inputs our affiliates' internal pricing models use to value the derivative or derivatives underlying the economic terms of the notes linked to an Index for purposes of

determining the estimated value of the notes set forth in the relevant terms supplement. The daily deduction will effectively reduce the value of the derivative or derivatives underlying the economic terms of the notes. See the discussion and risk factors relating to the estimated value of the notes in the accompanying product supplement and the relevant terms supplement.

Each Index may not be successful or outperform any alternative strategy that might be employed in respect of the applicable Futures Contracts.

No assurance can be given that the investment strategy on which any Index is based will be successful or that any Index will outperform any alternative strategy that might be employed with respect to the applicable Futures Contracts.

An Index may not approximate its target volatility.

No assurance can be given that an Index will maintain an annualized realized volatility that approximates its target volatility of 35%. An Index's target volatility is a level of implied volatility and therefore the actual realized volatility of an Index may be greater or less than the target volatility. On each weekly Index rebalance day, the exposure of an Index to the applicable Futures Contracts is set equal to (a) the 35% implied volatility target divided by (b) the one-week implied volatility of its Underlying ETF, subject to a maximum exposure of 500%. Each Index uses the implied volatility of an Underlying ETF as a proxy for the volatility of the applicable Futures Contracts. However, there is no guarantee that the methodology used by each Index to determine the implied volatility of its Underlying ETF will be representative of the implied or realized volatility of that applicable Futures Contracts. The performance of an Underlying ETF may not correlate with the performance of the applicable Futures Contract, particularly during periods of market volatility. In addition, the volatility of the applicable Futures Contracts on any day may change quickly and unexpectedly and realized volatility may differ significantly from implied volatility. In general, over time, the realized volatilities of an Underlying ETF and the applicable Futures Contracts have tended to be lower than their respective implied volatilities; however, at any time those realized volatilities may exceed their respective implied volatilities, particularly during periods of market volatility. Accordingly, the actual realized annualized volatility of an Index may be greater than or less than the target volatility, which may adversely affect the level of that Index and the value of the notes.

Each Index is subject to risks associated with the use of significant leverage.

On a weekly Index rebalance day, each Index will employ leverage to increase the exposure of that Index to the applicable Futures Contracts if the implied volatility of its Underlying ETF is below 35%, subject to a maximum exposure of 500%. Under normal market conditions in the past, the Underlying ETF of each Index has tended to exhibit an implied volatility below 35%. Accordingly, each Index has generally employed leverage in the past, except during periods of elevated volatility. When leverage is employed for an Index, any movements in the prices of the applicable Futures Contracts will result in greater changes in the level of that Index than if leverage were not used. In particular, the use of leverage for an Index will magnify any negative performance of the applicable Futures Contracts, which, in turn, would negatively affect the performance of that Index. Because each Index's leverage is adjusted only on a weekly basis, in situations where a significant increase in volatility is accompanied by a significant decline in the value of the applicable Futures Contracts, the level of that Index may decline significantly before the following Index rebalance day when that Index's exposure to the applicable Futures Contracts would be reduced.

Each Index may be significantly uninvested.

On a weekly Index rebalance day, the exposure of each Index to the applicable Futures Contracts will be less than 100% when the implied volatility of its Underlying ETF is above 35%. If an Index's exposure to the applicable Futures Contracts is less than 100%, that Index will not be fully invested, and any uninvested portion will earn no return. Each Index may be significantly uninvested on any given day, and will realize only a portion of any gains due to appreciation of the applicable Futures Contracts on any such day. The 6.0% per annum deduction is deducted daily from each Index, even when that Index is not fully invested.

An Index may be adversely affected if later Futures Contracts have higher prices than an expiring Futures Contract included in that Index.

As the applicable Futures Contracts included in an Index come to expiration, they are replaced by applicable Futures Contracts that expire three months later. This is accomplished by synthetically selling the expiring Futures Contract and synthetically purchasing the Futures Contract that expires three months from that time. This process is referred to as “rolling.” Excluding other considerations, if the market for the applicable Futures Contracts is in “contango,” where the prices are higher in the distant delivery months than in the nearer delivery months, the purchase of the later Futures Contract would take place at a price that is higher than the price of the expiring Futures Contract, thereby creating a negative “roll yield.” In addition, excluding other considerations, if the market for the applicable Futures Contracts is in “backwardation,” where the prices are lower in the distant delivery months than in the nearer delivery months, the purchase of the later Futures Contract would take place at a price that is lower than the price of the expiring Futures Contract, thereby creating a positive “roll yield.” The presence of contango in the market for the applicable Futures Contracts could adversely affect the level of the applicable Index and, accordingly, any payment on the notes.

Each Index is an excess return index that does not reflect “total returns.”

Each Index is an excess return index that does not reflect total returns. The return from investing in futures contracts derives from three sources: (a) changes in the price of the relevant futures contracts (which is known as the “**price return**”); (b) any profit or loss realized when rolling the relevant futures contracts (which is known as the “**roll return**”); and (c) any interest earned on the cash deposited as collateral for the purchase of the relevant futures contracts (which is known as the “**collateral return**”).

Each Index measures the returns accrued from investing in uncollateralized futures contracts (*i.e.*, the sum of the price return and the roll return associated with an investment in the applicable Futures Contracts). By contrast, a total return index, in addition to reflecting those returns, would also reflect interest that could be earned on funds committed to the trading of the applicable Futures Contracts (*i.e.*, the collateral return associated with an investment in the applicable Futures Contracts). Investing in the notes will not generate the same return as would be generated from investing in a total return index related to the applicable Futures Contracts.

Each Index has a limited operating history and may perform in unanticipated ways.

Each Index was established recently and therefore has a limited operating history. Any back-testing or similar analysis performed by any person in respect of the Index must be considered illustrative only and may be based on estimates or assumptions not used by the Index Sponsor when determining the level of the Index. Past performance should not be considered indicative of future performance.

Concentration risks associated with each Index may adversely affect the value of your notes.

Each Index generally provides exposure to a single futures contract based on the applicable Underlying Index that trades on the Chicago Mercantile Exchange. Accordingly, the notes are less diversified than other funds, investment portfolios or indices investing in or tracking a broader range of products and, therefore, could experience greater volatility. You should be aware that other indices may be more diversified than any Index in terms of both the number and variety of futures contracts. You will not benefit, with respect to the notes, from any of the advantages of a diversified investment and will bear the risks of a highly concentrated investment.

Hypothetical back-tested data relating to an Index do not represent actual historical data and are subject to inherent limitations.

Hypothetical back-tested performance measures of an Index are purely theoretical and do not represent the actual historical performance of that Index and have not been verified by an independent third party. Hypothetical back-tested performance measures have inherent limitations. Hypothetical back-tested performance is derived by means of the retroactive application of a back-tested model that

has been designed with the benefit of hindsight. Alternative modeling techniques might produce significantly different results and may prove to be more appropriate. Past performance, and especially hypothetical back-tested performance, is not indicative of future results. This type of information has inherent limitations and you should carefully consider these limitations before placing reliance on such information.

Each Index is subject to significant risks associated with futures contracts, including volatility.

Each Index tracks the returns of futures contracts. The price of a futures contract depends not only on the price of the underlying asset referenced by the futures contract, but also on a range of other factors, including but not limited to changing supply and demand relationships, interest rates, governmental and regulatory policies and the policies of the exchanges on which the futures contract trades. In addition, the futures markets are subject to temporary distortions or other disruptions due to various factors, including the lack of liquidity in the markets, the participation of speculators and government regulation and intervention. These factors and others can cause the prices of futures contracts to be volatile.

Suspension or disruptions of market trading in futures contracts may adversely affect the value of your notes.

Futures markets like the Chicago Mercantile Exchange, the market for the Futures Contracts, are subject to temporary distortions or other disruptions due to various factors, including the lack of liquidity in the markets, the participation of speculators, and government regulation and intervention. In addition, futures exchanges have regulations that limit the amount of fluctuation in some futures contract prices that may occur during a single day. These limits are generally referred to as “daily price fluctuation limits” and the maximum or minimum price of a contract on any given day as a result of these limits is referred to as a “limit price.” Once the limit price has been reached in a particular contract, no trades may be made at a price beyond the limit, or trading may be limited for a set period of time. Limit prices have the effect of precluding trading in a particular contract or forcing the liquidation of contracts at potentially disadvantageous times or prices. These circumstances could affect the level of an Index and therefore could affect adversely the value of your notes.

The official settlement price and intraday trading prices of the applicable Futures Contracts may not be readily available.

The official settlement price and intraday trading prices of the applicable Futures Contracts are calculated and published by the Chicago Mercantile Exchange and are used to calculate the level of each Index. Any disruption in trading of the applicable Futures Contracts could delay the release or availability of the official settlement price and intraday trading prices and may delay or prevent the calculation of an Index.

Changes in the margin requirements for the applicable Futures Contracts included in an Index may adversely affect the value of the notes.

Futures exchanges require market participants to post collateral in order to open and to keep open positions in futures contracts. If an exchange changes the amount of collateral required to be posted to hold positions in the applicable Futures Contracts, market participants may adjust their positions, which may affect the prices of the applicable Futures Contracts. As a result, the level of an Index may be affected, which may adversely affect the value of the notes.

Historical performance of an Index should not be taken as an indication of the future performance of that Index during the term of the notes.

The actual performance of an Index over the term of the notes, as well as the amount payable at maturity, may bear little relation to the historical performance of that Index or its hypothetical, back-tested historical performance. As a result, it is impossible to predict whether the level of an Index will rise or fall.

The notes are not regulated by the Commodity Futures Trading Commission (the “CFTC”).

The net proceeds to be received by the Issuer from the sale of the notes will not be used to purchase or sell any futures contracts or options on futures contracts for your benefit. An investment in the notes thus does not constitute either an investment in futures contracts or options on futures contracts or an investment in a collective investment vehicle that trades in these futures contracts (*i.e.*, the notes will not constitute a direct or indirect investment by you in the futures contracts), and you will not benefit from the regulatory protections of the CFTC. Among other things, this means that the Issuer and the Guarantor (if applicable) are not registered with the CFTC as a futures commission merchant and you will not benefit from the CFTC’s or any other non-U.S. regulatory authority’s regulatory protections afforded to persons who trade in futures contracts on a regulated futures exchange through a registered futures commission merchant. For example, the price you pay to purchase notes will be used by the Issuer for its own purposes and will not be subject to customer funds segregation requirements provided to customers that trade futures on an exchange regulated by the CFTC.

Unlike an investment in the notes, an investment in a collective investment vehicle that invests in futures contracts on behalf of its participants may be subject to regulation as a commodity pool, and its operator may be required to register with and be regulated by the CFTC as a commodity pool operator, or qualify for an exemption from the registration requirement. Because the notes will not be interests in a commodity pool, the notes will not be regulated by the CFTC as a commodity pool, the Issuer and the Guarantor (if applicable) will not be registered with the CFTC as a commodity pool operator and you will not benefit from the CFTC’s or any non-U.S. regulatory authority’s regulatory protections afforded to persons who invest in regulated commodity pools.

Risks Relating to the Specified Indices

An investment in the notes linked to the MerQube US Tech+ Vol Advantage Index will be subject to risks associated with non-U.S. securities.

Some of the equity securities composing the Nasdaq-100 Index[®] are issued by non-U.S. companies. Investments in securities linked to the value of such non-U.S. equity securities involve risks associated with the home countries of the issuers of those non-U.S. equity securities. The prices of securities issued by non-U.S. companies may be affected by political, economic, financial and social factors in the home countries of those issuers, or global regions, including changes in government, economic and fiscal policies and currency exchange laws.

The equity securities of JPMorgan Chase & Co. are currently included in the S&P 500[®] Index, the Underlying Index of the MerQube US Large-Cap Vol Advantage Index.

The equity securities of JPMorgan Chase & Co. are currently included in the S&P 500[®] Index. We have no obligation to consider your interests as a holder of the notes in taking any action that might affect the level of the S&P 500[®] Index, including those that might affect the value of your notes. We will have no ability to control the actions of the other issuers of the equity securities included in the S&P 500[®] Index, including actions that could affect the value of the equity securities included in the S&P 500[®] Index or your notes. None of those issuers will have any obligation to consider your interests as a holder of the notes in taking any actions that might affect the value of your notes.

An investment in notes linked to the MerQube US Small-Cap Vol Advantage Index is subject to risks associated with small capitalization stocks.

The securities held by the Russell 2000[®] Index, the Underlying Index of the MerQube US Small-Cap Vol Advantage Index, are issued by companies with relatively small market capitalization. Small capitalization companies may be less able to withstand adverse economic, market, trade and competitive conditions relative to larger companies. Small capitalization companies are less likely to pay dividends on their stocks, and the presence of a dividend payment could be a factor that limits downward stock price pressure under adverse market conditions.

THE MERQUBE VOL ADVANTAGE INDEX SERIES

All information contained in this underlying supplement regarding each of the indices in the MerQube Vol Advantage Index Series set forth in the table below (each, an “**Index**” and collectively the “**Indices**”), including, without limitation, their make-up, method of calculation and changes in their components, has been derived from publicly available information and other information provided by MerQube (the “**Index Sponsor**” and “**Index Calculation Agent**”), without independent verification. This information reflects the policies of, and is subject to change by, the Index Sponsor. Each Index was developed by the Index Sponsor, in coordination with J.P. Morgan Securities LLC. Each Index is maintained by the Index Sponsor and is calculated and published by the Index Calculation Agent. The Index Sponsor has no obligation to continue to publish, and may discontinue the publication of, any Index.

Index	Bloomberg Ticker	Futures Contracts	Underlying Index	Underlying ETF	Live Date
MerQube US Tech+ Vol Advantage Index	MQUSTVA	E-mini® Nasdaq-100 futures	Nasdaq-100 Index®	Invesco QQQ Trust SM , Series 1	June 6, 2021
MerQube US Large-Cap Vol Advantage Index	MQUSLVA	E-mini® S&P 500® futures	S&P 500® Index	SPDR® S&P 500® ETF Trust	January 7, 2022
MerQube US Small-Cap Vol Advantage Index	MQUSSVA	E-mini® Russell 2000® futures	Russell 2000® Index	iShares® Russell 2000 ETF	June 21, 2022

An affiliate of ours has a 10% equity interest in the Index Sponsor, with a right to appoint an employee of J.P. Morgan Securities LLC, another of our affiliates, as a member of the board of directors of the Index Sponsor.

Each Index was established on the applicable live date set forth in the table above. Each Index is reported by the Bloomberg Professional® service (“**Bloomberg**”) under the applicable ticker symbol set forth in the table above.

Each Index attempts to provide a dynamic rules-based exposure to an unfunded rolling position in the applicable futures contracts set forth in the table above (each, a “**Futures Contract**” and collectively the “**Futures Contracts**”), while targeting a level of implied volatility, with a maximum exposure to that Futures Contract of 500% and a minimum exposure to that Futures Contract of 0%. Each Index is subject to a 6.0% per annum daily deduction.

Each Futures Contract references the applicable underlying index set forth in the table above (each, an “**Underlying Index**” and collectively the “**Underlying Indices**”):

- The Nasdaq-100 Index® is a modified market capitalization-weighted index that is designed to measure the performance of 100 of the largest non-financial companies listed on The Nasdaq Stock Market.
- The S&P 500® Index consists of stocks of 500 companies selected to provide a performance benchmark for the U.S. equity markets.
- The Russell 2000® Index consists of the middle 2,000 companies included in the Russell 3000E™ Index and, as a result of the index calculation methodology, consists of the smallest 2,000 companies included in the Russell 3000® Index. The Russell 2000® Index is designed to track the performance of the small capitalization segment of the U.S. equity market.

For more information about the Futures Contracts and the Underlying Indices, see “Background on the Futures Contracts,” “Background on the Nasdaq-100 Index®,” “Background on the S&P 500® Index” and “Background on the Russell 2000® Index,” as applicable, below.

For each Index, the 6.0% per annum daily deduction will offset any appreciation of the applicable Futures Contracts, will heighten any depreciation of the applicable Futures Contracts and will generally be

a drag on the performance of that Index. Each Index will trail the performance of an identical index without a deduction.

Holding the estimated value of the notes and market conditions constant, the economic terms available on the notes linked to an Index are expected to be more favorable to investors than the terms that would be available on a hypothetical note issued by us linked to an identical index without a daily deduction. However, there can be no assurance that any improvement in the terms of the notes derived from the daily deduction will offset the negative effect of the daily deduction on the performance of the applicable Index. The return on the notes may be lower than the return on a hypothetical note issued by us linked to an identical index without a daily deduction.

The daily deduction and the volatility of the applicable Index (as influenced by that Index's target volatility feature) are two of the primary variables that affect the economic terms of the notes linked to that Index. Additionally, the daily deduction and volatility of the applicable Index are two of the inputs our affiliates' internal pricing models use to value the derivative or derivatives underlying the economic terms of the notes linked to that Index for purposes of determining the estimated value of the notes set forth in the relevant terms supplement. The daily deduction will effectively reduce the value of the derivative or derivatives underlying the economic terms of the notes. See the discussion and risk factors relating to the estimated value of the notes in the accompanying product supplement and the relevant terms supplement.

Each Index is subject to risks associated with the use of significant leverage. In addition, each Index may be significantly uninvested on any given day, and, in that case, will realize only a portion of any gains due to appreciation of the applicable Futures Contracts on that day. The index deduction is deducted daily at a rate of 6.0% per annum from each Index, even when that Index is not fully invested.

No assurance can be given that the investment strategy used to construct the Indices will achieve its intended results or that any Index will be successful or will outperform any alternative index or strategy that might reference the applicable Futures Contracts.

Weekly Index Rebalancing

On each weekly Index Rebalance Day (as defined below), the exposure of an Index to the applicable Futures Contracts is set equal to (a) the 35% implied volatility target (the "**target volatility**") *divided by* (b) the one-week implied volatility of the exchange-traded fund that tracks the Underlying Index for that Index (each, an "**Underlying ETF**" and collectively, the "**Underlying ETFs**"), as set forth in the table above, subject to a maximum exposure of 500%. For example, if the implied volatility of an Underlying ETF is equal to 17.5%, the exposure of the applicable Index to the applicable Futures Contracts will equal 200% (or $35\% / 17.5\%$) and if the implied volatility of an Underlying ETF is equal to 40%, the exposure of the applicable Index to the applicable Futures Contracts will equal 87.5% (or $35\% / 40\%$). An Index's exposure to the applicable Futures Contracts will be greater than 100% when the implied volatility of its Underlying ETF is below 35%, and an Index's exposure to the applicable Futures Contracts will be less than 100% when the implied volatility of its Underlying ETF is above 35%. In general, the Indices' target volatility feature is expected to result in the volatility of each Index being more stable over time than if no target volatility feature were employed. No assurance can be provided that the volatility of any Index will be stable at any time.

Each Underlying ETF tracks the applicable Underlying Index:

- The investment objective of the QQQ Fund is to seek to track the investment results, before fees and expenses, of the Nasdaq-100 Index®.
- The SPY Fund seeks to provide investment results that, before expenses, correspond generally to the price and yield performance of the S&P 500® Index.

- The IWM Fund seeks to track the investment results, before fees and expenses, of an index composed of small-capitalization U.S. equities, which is currently the Russell 2000® Index.

For more information about the Underlying ETFs, see “Background on the Invesco QQQ TrustSM, Series 1,” “Background on the SDPR® S&P 500® ETF Trust” and “Background on the iShares Russell® 2000 ETF,” as applicable, below. Each Index uses the implied volatility of its Underlying ETF as a proxy for the volatility of the applicable Futures Contracts.

Volatility is a measure of the degree of variation in the value of an asset over a period of time. One common approach to estimating volatility is to infer the market’s expectation of the volatility of an asset over a future period from the prices of listed option contracts that reference the asset, which is referred to as implied volatility.

For each Index, the Index Calculation Agent calculates the one-week implied volatility of the applicable Underlying ETF by referencing out-of-the-money call options on that Underlying ETF and out-of-the-money put options on that Underlying ETF, centered around an at-the-money strike price, with a scheduled expiry date on the immediately following Index Rebalance Date. The options used for this purpose are put options with strikes at or below the at-the-money strike price, call options with strikes at or above the at-the-money strike price and put and call options with strikes equal to the at-the-money strike price. In calculating the implied volatility of an Underlying ETF, the contribution of a single option to the implied volatility of that Underlying ETF is generally proportional to the difference between strikes of the options on either side of that option and to the price of that option, and is inversely proportional to the square of that option’s strike price. In addition, the Index Calculation Agent adjusts the price of any American-style options that are selected to approximate a European option price for that option and makes an adjustment to account for differences between a year measured in calendar days and a year measured in business days.

The at-the-money strike price referred to above is equal to the forward price of the applicable Underlying ETF, determined based on the current price of that Underlying ETF, any expected dividend payments on that Underlying ETF and interest rates derived from official closing prices of Eurodollar futures. Eurodollar futures currently reference 3-month USD LIBOR rates. LIBOR, which stands for “London Interbank Offered Rate,” is the average interest rate estimated by leading banks in London that they would be charged if borrowing from other banks without pledging any collateral or security. On March 5, 2021, the U.K. Financial Conduct Authority, which regulates LIBOR, confirmed that 3-month USD LIBOR settings will cease to be provided by any administrator or no longer be representative immediately after June 30, 2023. Pursuant to amendments implemented by the Chicago Mercantile Exchange (“**CME**”), on April 14, 2023, trading in the 3-month Eurodollar futures will terminate and CME will convert open positions into positions in the corresponding CME Three-Month SOFR futures, subject to a fixed price adjustment. SOFR, the Secured Overnight Financing Rate, is intended to be a broad measure of the cost of borrowing cash overnight collateralized by Treasury securities. At this time, the Index Sponsor has not announced what changes, if any, it will make to the Indices as a result of the occurrence of a Fallback Event (which may include referencing alternative futures other than CME Three-Month SOFR futures) and it is impossible to predict the effect of any such changes on the Indices.

On an Index Rebalance Day, for each Index, the implied volatility of the applicable Underlying ETF used to determine the exposure of that Index to the applicable Futures Contracts is equal to the arithmetic average of the implied volatility of that Underlying ETF, calculated as described above at the end of each minute during the period from and including 2:30 p.m. to but excluding 3:00 p.m. (EST) on that day. If an Option Data Halt Event occurs on an Index Rebalance Day during that period, the Index Calculation Agent may use the most recent time period on that day for which options data was available to perform the relevant calculations, if in its discretion the data from that period is an accurate reflection of the current level of volatility in the market.

An “**Index Rebalance Day**” generally occurs each Friday. However, if the primary exchange on which options on the applicable Underlying ETF are listed (the “**Primary Option Market**”) or the Chicago Mercantile Exchange (the “**Futures Market**”) is not scheduled to open on any Friday, then the Index Rebalance Day for any affected Index will be moved to the immediately preceding business day on which

both the applicable Primary Option Market and the Futures Market are scheduled to open. In addition, if the applicable Primary Option Market or the Futures Market is subject to a Futures Market Disruption or an Option Market Disruption on any scheduled Index Rebalance Day, for any affected Index, that Index Rebalance Day will be postponed to the first immediately succeeding business day on which the applicable Primary Option Market and the Futures Market are scheduled to open that is not subject to a Futures Market Disruption or an Option Market Disruption. Furthermore, if, in the Index Calculation Agent's discretion, an Option Data Halt Event occurs on an Index Rebalance Day for any affected Index during the period described in the immediately preceding paragraph and the most recent available data is not an accurate reflection of the current level of volatility in the market, that Index Rebalance Day will be postponed to the first immediately succeeding business day on which the applicable Primary Option Market and the Futures Market are scheduled to open that is not subject to a Futures Market Disruption or an Option Market Disruption.

A **"Futures Market Disruption"** means the occurrence of (i) an unplanned closing of the Futures Market or (ii) the suspension from trading of the applicable Futures Contracts on the Futures Market, in each case, that the Index Calculation Agent determines is material.

An **"Option Market Disruption"** means the occurrence of (i) an unplanned closing of all the exchanges on which the options on the applicable Underlying ETF are listed, (ii) the suspension from trading of options on the applicable Underlying ETF or (iii) the suspension (temporary or not) of the data dissemination in respect of data referencing the applicable Underlying ETF from the Options Price Reporting Authority, in each case, that the Index Calculation Agent determines as material.

An **"Option Data Halt Event"** means the suspension (temporary or not) of the data dissemination in respect of data referencing the applicable Underlying ETF from the Options Price Reporting Authority.

Calculation and Publication of each Index Level

The level of each Index is calculated in U.S. dollars at the end of the day on each day on which the Futures Market is scheduled to be open and is not subject to a Futures Market Disruption (an **"Index Calculation Day"**). The level of each Index is rounded to two decimals.

The level of each Index is calculated by reference to the TWAP (time weighted average price) of that Index, as well as the TWAP and closing levels of a sub-index (each, a **"Futures Tracker"** and collectively the **"Futures Trackers"**) that tracks the performance of a rolling position in the applicable Futures Contracts, as described under "— The Futures Trackers" below.

The level of each Index was set to 1,000 on January 7, 2005 (or, in the case of the MerQube US Large-Cap Vol Advantage Index, on January 14, 2005), the first Index Rebalance Day of that Index.

On each subsequent Index Calculation Day, the level of each Index is calculated by:

- if the current Index Calculation Day is an Index Rebalance Day, adjusting the TWAP level of that Index on that Index Rebalance Day to reflect the percentage change from the TWAP level of the applicable Futures Tracker on the current Index Rebalance Day to the closing level of that Futures Tracker on the current Index Rebalance Day, with that percentage change scaled by the exposure of that Index to the applicable Futures Contracts determined on the current Index Rebalance Day; or
- if the current Index Calculation Day is not an Index Rebalance Day, adjusting the TWAP level of that Index on the immediately preceding Index Rebalance Day to reflect (a) the percentage change from the TWAP level of the applicable Futures Tracker on the immediately preceding Index Rebalance Day to the closing level of that Futures Tracker on the current Index Calculation Day, with that percentage change scaled by the exposure of that Index to the applicable Futures Contracts determined on the immediately preceding Index Rebalance Day, and (b) the 6% per annum daily deduction that has accrued since the immediately preceding Index Rebalance Day, calculated assuming a year with 360 days.

The TWAP level of each Index was set to 1,000 on the first Index Rebalance Day of that Index. On each subsequent Index Rebalance Day, the TWAP level of each Index is calculated by adjusting the TWAP level of that Index as of the immediately preceding Index Rebalance Day to reflect (a) the percentage change from the TWAP level of the applicable Futures Tracker on the immediately preceding Index Rebalance Day to the TWAP level of that Futures Tracker on the current Index Calculation Day, with that percentage change scaled by the exposure of that Index to the applicable Futures Contracts determined on the immediately preceding Index Rebalance Day, and (b) the 6% per annum daily deduction that has accrued since the immediately preceding Index Rebalance Day, calculated assuming a year with 360 days.

The Futures Trackers

All information contained in this underlying supplement regarding each of the Futures Trackers, including, without limitation, their make-up, method of calculation and changes in their components, has been derived from publicly available information and other information provided by the Index Sponsor, without independent verification. This information reflects the policies of, and is subject to change by, the Index Sponsor. Each Futures Tracker was developed by the Index Sponsor, in coordination with J.P. Morgan Securities LLC. Each Futures Tracker is maintained by the Index Sponsor and is calculated and published by the Index Calculation Agent. The Index Sponsor has no obligation to continue to publish, and may discontinue the publication of, any Futures Tracker.

Associated Index	Futures Tracker Start Date	TWAP Level Start Date	Initial TWAP Level
MerQube US Tech+ Vol Advantage Index	September 9, 1997	June 21, 1999	1,000
MerQube US Large-Cap Vol Advantage Index	June 21, 1999	January 7, 2005	1,053.82
MerQube US Small-Cap Vol Advantage Index	January 3, 2005	January 4, 2005	952.94

The Futures Tracker associated with each Index provides rules-based exposure to an unfunded rolling position in the applicable Futures Contracts for that Index. Each Futures Tracker generally provides exposure only to the applicable near expiry Futures Contract. Each Futures Tracker exits its notional position in its near expiry contract and enters a notional position in the next expiry contract in equal increments over a five-day rolling period each quarter shortly before the expiry of that near expiry contract. The rolling period consists of five Exposure Business Days, subject to postponement, beginning on the sixth Exposure Business Day immediately preceding the Rolling Futures Exposure Closing Day of the relevant near expiry contract.

For a Futures Tracker, an **“Exposure Business Day”** is a day on which the Futures Market is scheduled to be open for its regular trading session for the applicable Futures Contracts.

For a Futures Tracker, a **“Rolling Futures Exposure Business Day”** is an Exposure Business Day that is not subject to an Index Market Disruption Event.

For a Futures Tracker, an **“Index Market Disruption Event”** for this purpose means the non-publication of the official settlement price by the Futures Market of the applicable Future Contract(s) used to calculate the rolling futures exposure of that Futures Tracker and any events determined by the Index Calculation Agent that materially interfere with the ability of the Index Calculation Agent to calculate a level of that Futures Tracker representative of the relevant market.

The **“Rolling Futures Exposure Closing Day”** means, in respect of a Futures Contract, the earlier of (i) the last trading day for that Futures Contract and (ii) the first notice date for that Futures Contract, in each case as specified by the Futures Market.

The closing level of each Futures Tracker was set to 1,000 on the applicable Futures Tracker start date set forth in the table above. On each subsequent Rolling Futures Exposure Business Day, the closing level of each Futures Tracker is calculated by adjusting the closing level of that Futures Tracker

on the immediately preceding Rolling Futures Exposure Business Day to reflect the weighted performance of the relevant Futures Contract(s) from their official closing prices on the immediately preceding Rolling Futures Exposure Business Day to their official closing prices on the current Rolling Futures Exposure Business Day. Outside a rolling period, each Futures Tracker tracks a single Futures Contract, and a weight of 100% is assigned to that Futures Contract. During a rolling period, the weights of the Futures Contracts correspond to the weights associated with a roll from one Futures Contract to the next over five days in equal increments. If, however, an Index Market Disruption Event occurs on any Exposure Business Day during a rolling period prior to the last Exposure Business Day, then the portion of the roll will be postponed to the first Rolling Futures Exposure Business Day immediately following that Exposure Business Day. If an Index Market Disruption Event occurs on the last day of a rolling period, the roll period will be completed on that day and the Index Sponsor will calculate the closing level on that day using its good faith estimate.

The TWAP level of each Futures Tracker was set to the initial TWAP level of that Futures Tracker, as set forth in the table above, on the applicable TWAP level start date set forth in the table above. On each subsequent Rolling Futures Exposure Business Day, the TWAP level of each Futures Tracker is calculated by adjusting the closing level of that Futures Tracker on the immediately preceding Rolling Futures Exposure Business Day to reflect the weighted performance of the relevant Futures Contract(s) from their official closing prices on the immediately preceding Rolling Futures Exposure Business Day to their TWAP levels on the current Rolling Futures Exposure Business Day. Outside a rolling period, each Futures Tracker tracks a single Futures Contract, and a weight of 100% is assigned to that Futures Contract. During a rolling period, the weights of the Futures Contracts correspond to the weights associated with a roll from one Futures Contract to the next over five days in equal increments. If, however, an Index Market Disruption Event occurs on any Exposure Business Day during a rolling period prior to the last Exposure Business Day, then the portion of the roll will be postponed to the first Rolling Futures Exposure Business Day immediately following that Exposure Business Day. If an Index Market Disruption Event occurs on the last day of a rolling period, the roll period will be completed on that day and the Index Sponsor will calculate the TWAP level on that day using its good faith estimate.

The TWAP level of a Futures Contract on any Rolling Futures Exposure Business Day is equal to the time weighted average price of that Futures Contract as determined over a 10-minute period beginning at 3:50 PM EST (in the case of a regular trading session) or 12:50 PM EST (in the case of a half-day trading session). Prior to October 26, 2020, the TWAP level of a Futures Contract on any Rolling Futures Exposure Business Day was equal to the time weighted average price of that Futures Contract as determined over a 15-minute period beginning at 4:00 PM EST (in the case of a regular trading session) or 1:00 PM EST (in the case of a half-day trading session).

Index Committee

Each Index is overseen by an index committee. The index committee will review each Index's methodology at least once in every twelve-month period, make changes to the methodology as necessary and administer any consultations for any potential material methodology changes. If any scenario not explicitly covered in the methodology occurs, the index committee will use its discretion to determine the action to be taken. The Index Sponsor has advised that any such determination will be announced to clients in advance.

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BACKGROUND ON THE FUTURES CONTRACTS

Futures contracts are contracts that legally obligate the holder to buy or sell an asset at a predetermined delivery price during a specified future time period.

Background on E-Mini® Nasdaq-100 Futures

E-mini® Nasdaq-100 futures are U.S. dollar-denominated futures contracts on the Nasdaq-100 Index® traded on the Chicago Mercantile Exchange (the “CME”), where each futures contract references a value of \$20 *times* the level of the Nasdaq-100 Index®, measured in U.S. dollars and cents per index point.

E-mini® Nasdaq-100 futures listed for the nearest five quarters, for each March, June, September and December, and the nearest four Decembers are available for trading. Trading of the E-mini® Nasdaq-100 futures will terminate at 9:30 A.M. Eastern time on the third Friday of the contract month.

The daily settlement prices of the E-mini® Nasdaq-100 futures are based on trading activity in the relevant contract (and in the case of a lead month also being the expiry month, together with trading activity on lead month-second month spread contracts) on the CME during a specified settlement period. The final settlement price of the E-mini® Nasdaq-100 futures is based on the opening prices of the component stocks in the Nasdaq-100 Index®, determined on the third Friday of the contract month.

Background on E-mini® S&P 500® Futures

E-mini® S&P 500® futures are U.S. dollar-denominated futures contracts, based on the S&P 500® Index, traded on the CME, representing a contract unit of \$50 *multiplied by* the S&P 500® Index, measured in U.S. dollars and cents per index point.

E-mini® S&P 500® futures listed for the nearest nine quarters, for each March, June, September and December, and the nearest three Decembers are available for trading. Trading of the E-mini® S&P 500® futures will terminate at 9:30 A.M. Eastern time on the third Friday of the contract month.

The daily settlement prices of the E-mini® S&P 500® futures are based on trading activity in the relevant contract (and in the case of a lead month also being the expiry month, together with trading activity on lead month-second month spread contracts) on the CME during a specified settlement period. The final settlement price of the E-mini® S&P 500® futures is based on the opening prices of the component stocks in the S&P 500® Index, determined on the third Friday of the contract month.

Background on E-mini® Russell 2000® Futures

E-mini® Russell 2000® futures are U.S. dollar-denominated futures contracts, based on the Russell 2000® Index, traded on the CME, representing a contract unit of \$50 *multiplied by* the Russell 2000® Index, measured in U.S. dollars and cents per index point.

E-mini® Russell 2000® futures listed for the nearest five quarters, for each March, June, September and December. Trading of the E-mini® Russell 2000® futures will terminate at 9:30 A.M. Eastern time on the third Friday of the contract month.

The daily settlement prices of the E-mini® Russell 2000® futures are based on trading activity in the relevant contract (and in the case of a lead month also being the expiry month, together with trading activity on lead month-second month spread contracts) on the CME during a specified settlement period. The final settlement price of the E-mini® Russell 2000® futures is based on the opening prices of the component stocks in the Russell 2000® Index, determined on the third Friday of the contract month.

Overview of Futures Markets

Futures contracts are traded on regulated futures exchanges, in the over-the-counter market and on various types of electronic trading facilities and markets. As of the date of this underlying supplement, all of the Futures Contracts are exchange-traded futures contracts. A futures contract provides for a

specified settlement month in which the cash settlement is made by the seller (whose position is therefore described as “**short**”) and acquired by the purchaser (whose position is therefore described as “**long**”).

No purchase price is paid or received on the purchase or sale of a futures contract. Instead, an amount of cash or cash equivalents must be deposited with the broker as “initial margin.” This amount varies based on the requirements imposed by the exchange clearing houses, but it may be lower than 5% of the notional value of the contract. This margin deposit provides collateral for the obligations of the parties to the futures contract.

By depositing margin, which may vary in form depending on the exchange, with the clearing house or broker involved, a market participant may be able to earn interest on its margin funds, thereby increasing the total return that it may realize from an investment in futures contracts. The Indices are not total return indices and do not reflect interest that could be earned on funds notionally committed to the trading of futures contracts.

At any time prior to the expiration of a futures contract, a trader may elect to close out its position by taking an opposite position on the exchange on which the trader obtained the position, subject to the availability of a liquid secondary market. This operates to terminate the position and fix the trader’s profit or loss. Futures contracts are cleared through the facilities of a centralized clearing house and a brokerage firm that is a member of the clearing house.

Futures exchanges and clearing houses in the United States are subject to regulation by the Commodity Futures Trading Commission. Exchanges may adopt rules and take other actions that affect trading, including imposing speculative position limits, maximum price fluctuations and trading halts and suspensions and requiring liquidation of contracts in certain circumstances.

BACKGROUND ON THE NASDAQ-100 INDEX®

All information contained in this underlying supplement regarding the Nasdaq-100 Index®, including, without limitation, its make-up, method of calculation and changes in its components, has been derived from publicly available information, without independent verification. This information reflects the policies of, and is subject to change by, Nasdaq, Inc. (“**Nasdaq**”). The Nasdaq-100 Index® is calculated, maintained and published by Nasdaq. Nasdaq has no obligation to continue to publish, and may discontinue publication of, the Nasdaq-100 Index®. The Nasdaq-100 Index® is reported by Bloomberg L.P. under the ticker symbol “NDX.”

The Nasdaq-100 Index® is a modified market capitalization-weighted index that is designed to measure the performance of 100 of the largest non-financial companies listed on The Nasdaq Stock Market. The Nasdaq-100 Index®, which includes companies across a variety of major industry groups, was launched on January 31, 1985, with a base index value of 125.00, as adjusted.

The index share weights of the component securities of the Nasdaq-100 Index® at any time are based upon the total shares outstanding (“**TSO**”) in each of those securities and are additionally subject, in certain cases, to rebalancing. Accordingly, each security’s influence on the level of the Nasdaq-100 Index® is directly proportional to the value of its index share weight.

Calculation of the Nasdaq-100 Index®

At any moment in time, the value of the Nasdaq-100 Index® equals the aggregate value of the then-current index share weights of each of the Nasdaq-100 Index® component securities, which are based on the TSO of each Nasdaq-100 Index® component security, multiplied by each security’s respective last sale price on The Nasdaq Stock Market (which may be the official closing price published by The Nasdaq Stock Market) and divided by a scaling factor (the “**Divisor**”), which becomes the basis for the reported Nasdaq-100 Index® value. The Divisor serves the purpose of scaling the aggregate value to a lower order of magnitude which is more desirable for index reporting purposes.

Security Eligibility Criteria

Eligible security types generally include American depositary receipts, common stocks, ordinary shares and tracking stocks. Companies organized as real estate investment trusts (“**REITs**”) are not eligible for index inclusion. If the security is a depositary receipt representing a security of a non-U.S. issuer, then references to the “**issuer**” are references to the underlying security and the TSO is the actual depositary shares outstanding as reported by the depositary banks.

If an issuer has listed multiple security classes, all security classes are eligible, subject to meeting all other security eligibility criteria.

The issuer of the security’s primary U.S. listing must exclusively be listed on the Nasdaq Global Select Market or the Nasdaq Global Market. If the issuer of the security is organized under the laws of a jurisdiction outside the United States, then that security must have listed options on a registered options market in the United States or be eligible for listed options trading on a registered options market in the United States.

The security must be classified as a non-financial company (any industry other than financials) according to the Industry Classification Benchmark.

There is no market capitalization eligibility criterion. Each security must have a minimum average daily trading volume of 200,000 shares (measured over the three calendar months ending with the month that includes the reconstitution reference date).

The security must have traded for at least three full calendar months, not including the month of initial listing, on an eligible exchange, which includes Nasdaq (Nasdaq Global Select Market, Nasdaq Global Market or Nasdaq Capital Market), NYSE, NYSE American or CBOE BZX. Eligibility is determined as of

the constituent selection reference date and includes that month. A security that was added to the Nasdaq-100 Index® as the result of a spin-off event will be exempt from the seasoning requirement. There is no float eligibility criterion.

The issuer of the security generally may not currently be in bankruptcy proceedings.

The issuer of the security generally may not have entered into a definitive agreement or other arrangement that would make it ineligible for index inclusion and where the transaction is imminent as determined by the Nasdaq Index Management Committee.

Reconstitution and Rebalancing of the Nasdaq-100 Index®

Nasdaq selects constituents once annually in December. The security eligibility criteria are applied using market data as of the end of October and TSO as of the end of November. Index reconstitutions are announced in early December and become effective after the close of trading on the third Friday in December.

The Nasdaq-100 Index® is rebalanced on a quarterly basis in March, June, September and December. The Nasdaq-100 Index® rebalance uses the TSO and last sale price of all Nasdaq-100 Index® securities as of the prior month-end (February, May, August and November respectively). Index rebalance changes are announced in early March, June, September and December and become effective after the close of trading on the third Friday in March, June, September and December. A special rebalance may be conducted at any time based on the weighting restrictions described in the index rebalance procedure if it is determined to be necessary to maintain the integrity of the Nasdaq-100 Index®.

Constituent Selection

A reconstitution is conducted on an annual basis, at which time all eligible issuers, ranked by market capitalization, are considered for index inclusion based on the following order of criteria:

1. The top 75 ranked issuers will be selected for inclusion in the Nasdaq-100 Index®.
2. Any other issuers that were already members of the Nasdaq-100 Index® as of the reconstitution reference date and are ranked within the top 100 are also selected for inclusion in the Nasdaq-100 Index®.
3. In the event that fewer than 100 issuers pass the first two criteria, the remaining positions will first be filled, in rank order, by issuers currently in the Nasdaq-100 Index® ranked in positions 101-125 that were ranked in the top 100 at the previous reconstitution or replacement- or spin-off-issuers added since the previous reconstitution.
4. In the event that fewer than 100 issuers pass the first three criteria, the remaining positions will be filled, in rank order, by any issuers ranked in the top 100 that were not already members of the Nasdaq-100 Index® as of the reference date.

Constituent Weighting

The Nasdaq-100 Index® is a modified market capitalization-weighted index.

Quarterly Weight Adjustment

The Nasdaq-100 Index® quarterly weight adjustment employs a two-stage weight adjustment scheme according to issuer- level constraints.

Nasdaq-100 Index® securities' initial weights are determined using up to two calculations of market capitalization: TSO-derived market capitalization and index share-derived market capitalization. TSO-derived market capitalization is defined as a security's last sale price times its TSO. Nasdaq-100 Index®

share-derived market capitalization is defined as a security's last sale price times its updated index shares as of the prior month end. Both TSO-derived and index share-derived market capitalizations can be used to calculate TSO-derived and index share-derived initial index weights by dividing each index security's (TSO- or index share-derived) market capitalization by the aggregate (TSO- or index share-derived) market capitalization of all index securities.

When the rebalance coincides with the reconstitution, only TSO-derived initial weights are used. When the rebalance does not coincide with the reconstitution, index share-derived initial weights are used when doing so results in no weight adjustment; otherwise, TSO-derived weights are used in both stages of the weight adjustment procedure. Issuer weights are the aggregated weights of the issuers' respective index securities.

Stage 1. If no initial issuer weight exceeds 24%, initial weights are used as Stage 1 weights; otherwise, initial weights are adjusted so that no issuer weight may exceed 20% of the Nasdaq-100 Index®.

Stage 2. If the aggregate weight of the subset of issuers whose Stage 1 weights exceed 4.5% does not exceed 48%, Stage 1 weights are used as final weights; otherwise, Stage 1 weights are adjusted so that the aggregate weight of the subset of issuers whose Stage 1 weights exceed 4.5% is set to 40%.

Annual Weight Adjustment

The Nasdaq-100 Index® annual weight adjustment employs a two-stage weight adjustment scheme according to security-level constraints. Nasdaq-100 Index® securities' initial weights are determined via the quarterly weight adjustment procedure.

Stage 1. If no initial security weight exceeds 15%, initial weights are used as Stage 1 weights; otherwise, initial weights are adjusted so that no security weight may exceed 14% of the Nasdaq-100 Index®.

Stage 2. If the aggregate weight of the subset of index securities with the five largest market capitalizations is less than 40%, Stage 1 weights are used as final weights; otherwise, Stage 1 weights are adjusted so that (i) the aggregate weight of the subset of index securities with the five largest market capitalizations is set to 38.5% and (ii) no security with a market capitalization outside the largest five may have a final index weight exceeding the lesser of 4.4% or the final index weight of the index security ranked fifth by market capitalization.

Maintenance of the Nasdaq-100 Index®

Deletion Policy

If, at any time other than an index reconstitution, Nasdaq determines that an index security is ineligible for index inclusion, the index security is removed as soon as practicable.

This may include:

- Listing on an ineligible index exchange.
- Merger, acquisition or other major corporate event that would adversely impact the integrity of the Nasdaq-100 Index®.
- If a company is organized as a REIT.
- If an index security is classified as a financial company (financials industry) according to the ICB.
- If the issuer has an adjusted market capitalization below 0.10% of the aggregate adjusted market capitalization of the Nasdaq-100 Index® for two consecutive month ends.

- If a security that was added to the Nasdaq-100 Index® as the result of a spin-off event has an adjusted market capitalization below 0.10% of the aggregate adjusted market capitalization of the Nasdaq-100 Index® at the end of its second day of regular way trading as a Nasdaq-100 Index® member.

In the case of mergers and acquisitions, the effective date for the removal of an index issuer or security will be largely event-based, with the goal to remove the issuer or security as soon as completion of the acquisition or merger has been deemed highly probable. Notable events include, but are not limited to, completion of various regulatory reviews, the conclusion of material lawsuits and/or shareholder and board approvals.

If at the time of the removal of the index issuer or security there is not sufficient time to provide advance notification of the replacement issuer or security so that both the removal and replacement can be effective on the same day, the index issuer or security being removed will be retained and persisted in the index calculations at its last sale price until the effective date of the replacement issuer or security's entry to the Nasdaq-100 Index®.

Securities that are added as a result of a spin-off may be deleted as soon as practicable after being added to the Nasdaq-100 Index®. This may occur when Nasdaq determines that a security is ineligible for inclusion because of reasons such as ineligible exchange, security type, industry or adjusted market capitalization. Securities that are added as a result of a spin-off may be maintained in the Nasdaq-100 Index® until a later date and then removed, for example, if a spin-off security has liquidity characteristics that diverge materially from the security eligibility criteria and could affect the integrity of the Nasdaq-100 Index®.

Replacement Policy

Securities may be added to the Nasdaq-100 Index® outside of the index reconstitution when there is a deletion. The index security (or all index securities under the same issuer, if appropriate) is replaced as soon as practicable if the issuer in its entirety is being deleted from the Nasdaq-100 Index®. The issuer with the largest market capitalization as of the prior month end which is not in the Nasdaq-100 Index® will replace the deleted issuer. Issuers that are added as a result of a spin-off are not replaced until after they have been included in a reconstitution.

For pending deletions set to occur soon after an index reconstitution and/or index rebalance effective date, Nasdaq may decide to remove the index security from the Nasdaq-100 Index® in conjunction with the index reconstitution and/or index rebalance effective date.

Corporate Actions

In the periods between scheduled index reconstitution and rebalancing events, individual index securities may be subject to a variety of corporate actions and events that require maintenance and adjustments to the Nasdaq-100 Index®.

At the quarterly rebalancing, no changes are made to the Nasdaq-100 Index® from the previous month end until the quarterly share change effective date, with the exception of corporate actions with an ex-date.

Governance of the Nasdaq-100 Index®

The Nasdaq Index Management Committee approves all new index methodologies. This committee is comprised of full-time professional members of Nasdaq. The committee meets regularly and reviews items including, but not limited to, pending corporate actions that may affect Nasdaq-100 Index® constituents, statistics comparing the composition of the Nasdaq-100 Index® to the market, companies that are being considered as candidates for addition to the Nasdaq-100 Index® and any significant market events.

BACKGROUND ON THE S&P 500® INDEX

All information contained in this underlying supplement regarding the S&P 500® Index, including, without limitation, its make-up, method of calculation and changes in its components, has been derived from publicly available information, without independent verification. This information reflects the policies of, and is subject to change by, S&P Dow Jones Indices LLC (“**S&P Dow Jones**”). The S&P 500® Index, together with the S&P MidCap 400® Index and the S&P SmallCap 600® Index (each, an “**S&P U.S. Index**,” and collectively the “**S&P U.S. Indices**”), is calculated, maintained and published by S&P Dow Jones. S&P Dow Jones has no obligation to continue to publish, and may discontinue publication of, the S&P 500® Index.

The S&P U.S. Indices are part of a family of indices that are each designed to measure different market segments of the U.S. equity markets.

The S&P 500® Index consists of stocks of 500 companies selected to provide a performance benchmark for the U.S. equity markets. The S&P 500® Index is reported by Bloomberg L.P. under the ticker symbol “SPX.”

Composition of the S&P U.S. Indices

Additions to the S&P U.S. Indices are evaluated based on the following:

- *Domicile.* The company should be a U.S. company, meaning a company that has the following characteristics:
 - the company should file 10-K annual reports;
 - the U.S. portion of fixed assets and revenues should constitute a plurality of the total but need not exceed 50%. When these factors are in conflict, fixed assets determine plurality. Revenue determines plurality when there is incomplete asset information. Geographic information for revenue and fixed asset allocations are determined by the company as reported in its annual filings. If this criteria is not met or is ambiguous, S&P Dow Jones may still deem the company to be a U.S. company for index purposes if its primary listing, headquarters and incorporation are all in the United States and/or “**a domicile of convenience**” (Bermuda, Channel Islands, Gibraltar, islands in the Caribbean, Isle of Man, Luxembourg, Liberia or Panama); and
 - the primary listing must be on an eligible U.S. exchange as described under “Exchange Listing” below.

In situations where the only factor suggesting that a company is not a U.S. company is its tax registration in a domicile of convenience or another location chosen for tax-related reasons, S&P Dow Jones normally determines that the company is still a U.S. company. The final determination of domicile eligibility is made by the S&P Dow Jones’s U.S. index committee.

- *Exchange Listing.* A primary listing on one of the following U.S. exchanges is required: New York Stock Exchange, NYSE Arca, NYSE American, Nasdaq Global Select Market, Nasdaq Select Market, Nasdaq Capital Market, Cboe BZX, Cboe BYX, Cboe EDGA or Cboe EDGX exchanges. Ineligible exchanges include the OTC Bulletin Board and Pink Sheets.
- *Organizational Structure and Share Type.* Eligible organizational structures and share types are corporations, including equity and mortgage real estate investment trusts (“**REITs**”), and common stock (*i.e.*, shares). Ineligible organizational structures and share types include, but are not limited to, business development companies, limited partnerships, master limited partnerships, limited liability companies, closed-end funds, exchange-traded funds, exchange-traded notes, royalty trusts, special purposes acquisition companies, tracking

stocks, preferred and convertible preferred stock, unit trusts, equity warrants, convertible bonds, investment trusts, rights and American depositary receipts.

As of July 2017, the securities of companies with multiple share class structures (including companies with listed and unlisted share classes) are no longer eligible to be added to the S&P U.S. Indices, but securities already included in an S&P U.S. Index have been grandfathered and are not affected by this change.

- *Market Capitalization.* The total company market capitalization should be within a specified range for the relevant S&P U.S. Index. These ranges are reviewed quarterly and updated as needed to ensure they reflect current market conditions. A company meeting the total company market capitalization criteria is also required to have a security level float-adjusted market capitalization (“**FMC**”) that is at least 50% of the relevant S&P U.S. Index’s total company level minimum market capitalization threshold. For spin-offs, S&P U.S. Index membership eligibility is determined using when-issued prices, if available.
- *Investable Weight Factor (“**IWF**”).* For each component, S&P Dow Jones calculates an IWF, which represents the portion of the total shares outstanding that are considered part of the public float for purposes of the relevant S&P U.S. Index. An IWF of at least 0.10 is required for S&P U.S. Indices.
- *Liquidity.* A float-adjusted liquidity ratio (“**FALR**”), defined as the annual dollar value traded divided by the FMC, is used to measure liquidity. Using composite pricing and consolidated volume (excluding dark pools) across all venues (including historical values), annual dollar value traded is defined as the average closing price multiplied by the historical volume over the 365 calendar days prior to the evaluation date. This is reduced to the available trading period for initial public offerings (“**IPOs**”) or spin-offs that do not have 365 calendar days of trading history. In these cases, the dollar value traded available as of the evaluation date is annualized. The price, shares outstanding and IWF as of the evaluation date are used to calculate the FMC. The evaluation date is the open of trading on the day prior to the announcement date. The stock should trade a minimum of 250,000 shares in each of the six months leading up to the evaluation date. The FALR must be greater than or equal to 1.0 at the time of addition to an S&P U.S. Index. Current index constituents have no minimum requirement.
- *Financial Viability.* The sum of the most recent four consecutive quarters’ Generally Accepted Accounting Principles (“**GAAP**”) earnings (net income excluding discontinued operations) should be positive as should the most recent quarter. For equity REITs, financial viability is based on GAAP earnings and/or funds from operations, if reported.
- *Treatment of IPOs.* IPOs should be traded on an eligible exchange for at least 12 months before being considered for addition to an S&P U.S. Index. For former special purpose acquisition companies (“**SPACs**”), S&P Dow Jones considers the de-SPAC transaction to be an event equivalent to an IPO, and 12 months of trading post the de-SPAC event are required before a former SPAC can be considered for inclusion in an S&P U.S. Index. Spin-offs or in-specie distributions from existing constituents do not need to be seasoned for 12 months prior to their inclusion in an S&P U.S. Index.
- *Sector Classification.* The company is evaluated for its contribution to sector balance maintenance, as measured by a comparison of each Global Industry Classification Standard sector’s weight in the relevant S&P U.S. Index with its weight in the S&P Total Market Index, in the relevant market capitalization range. The S&P Total Market Index is a float-adjusted market capitalization-weighted index designed to track the broad U.S. equity market, including large-, mid-, small- and micro-cap stocks.

Companies that migrate from an ineligible exchange, emerge from bankruptcy, are newly designated to be domiciled in the U.S. for index purposes by S&P Dow Jones or convert from an ineligible share or

organizational type to an eligible type do not need to trade on an eligible U.S. exchange for 12 months before being considered for addition to an S&P U.S. Index.

Current constituents of an S&P U.S. Index can be migrated from one S&P U.S. Index to another provided they meet the total company level market capitalization eligibility criteria for the new index. Migrations from an S&P U.S. Index to another do not need to meet the financial viability, liquidity or 50% of the respective index's total company level minimum market capitalization threshold criteria.

Companies that are spun-off from current index constituents do not need to meet the outside addition criteria, but they should be considered U.S. domiciled for index purposes and have a total market cap representative of the relevant S&P U.S. Index.

Removals from the S&P U.S. Indices are evaluated based as follows:

- *Companies that are involved in mergers, acquisitions or significant restructuring such that they no longer meet the eligibility criteria.* Companies delisted as a result of merger, acquisition or other corporate action are removed at a time announced by S&P Dow Jones, normally at the close of the last day of trading or expiration of a tender offer. Constituents that are halted from trading may be kept in an S&P U.S. Index until trading resumes, at the discretion of S&P Dow Jones's U.S. index committee. If a stock is moved to Pink Sheets or the OTC Bulletin Board, the stock is removed.

Any company that is removed from an S&P U.S. Index (including discretionary and bankruptcy/exchange delistings) must wait a minimum of one year from its index removal date before being screened for the eligibility criteria.

- *Companies that substantially violate one or more of the addition criteria.* S&P Dow Jones believes turnover in index membership should be avoided when possible. At times, a stock may appear to temporarily violate one or more of the addition criteria. However, the addition criteria are for addition to an S&P U.S. Index, not for continued membership. As a result, an S&P U.S. Index constituent that appears to violate criteria for addition to that index is not deleted unless ongoing conditions warrant an index change. When a stock is removed from an S&P U.S. Index, S&P Dow Jones explains the basis for the removal.

Calculation of the S&P U.S. Indices

The S&P U.S. Indices are float-adjusted market capitalization-weighted indices. On any given day, the index value of each S&P U.S. Index is the total float-adjusted market capitalization of that S&P U.S. Index's constituents *divided* by its divisor. The float-adjusted market capitalization reflects the price of each stock in the relevant S&P U.S. Index *multiplied* by the number of shares used in the index value calculation.

Float Adjustment. Float adjustment means that the number of shares outstanding is reduced to exclude closely held shares from the calculation of the index value because such shares are not available to investors. The goal of float adjustment is to adjust each company's total shares outstanding for long-term strategic shareholders, who often have interests such as maintaining control rather than the shorter-term economic fortunes of the company. Generally, these long-term strategic shareholders include, but are not limited to, officers and directors, private equity, venture capital and special equity firms, asset managers and insurance companies with direct board of director representation, other publicly traded companies that hold shares, holders of restricted shares, company-sponsored employee share plans/trusts, defined contribution plans/savings, and investment plans, foundations or family trusts associated with the company, government entities at all levels (other than government retirement/pension funds), sovereign wealth funds and any individual person who controls a 5% or greater stake in a company as reported in regulatory filings. Restricted shares are generally not included in total shares outstanding except for shares held as part of a lock-up agreement. Shares that are not considered outstanding are also not included in the available float. These generally include treasury stock, stock options, equity participation units, warrants, preferred stock, convertible stock and rights.

Divisor. Continuity in index values of each S&P U.S. Index is maintained by adjusting its divisor for all changes in its constituents' share capital after its base date. This includes additions and deletions to the relevant S&P U.S. Index, rights issues, share buybacks and issuances and non-zero price spin-offs. The value of each S&P U.S. Index's divisor over time is, in effect, a chronological summary of all changes affecting the base capital of that S&P U.S. Index. The divisor of each S&P U.S. Index is adjusted such that the index value of that S&P U.S. Index at an instant just prior to a change in base capital equals the index value of that S&P U.S. Index at an instant immediately following that change.

Maintenance of the S&P U.S. Indices

Changes to index composition are made on an as-needed basis. There is no scheduled reconstitution. Rather, changes in response to corporate actions and market developments can be made at any time. Index additions and deletions are announced with at least three business days advance notice. Less than three business days' notice may be given at the discretion of the S&P Dow Jones's U.S. index committee.

Quarterly Update. Share counts are updated to the latest publicly available filings on a quarterly basis. IWF changes will only be made at the quarterly review if the change represents at least 5% of total current shares outstanding and is related to a single corporate action that did not qualify for the accelerated implementation rule, regardless of whether there is an associated share change.

Share/IWF Reference Date and Freeze Period. A reference date, after the market close five weeks prior to the third Friday in March, June, September and December, is the cutoff for publicly available information used for quarterly shares outstanding and IWF changes. All shares outstanding and ownership information contained in public filings and/or official sources dated on or before the reference date are included in that quarter's update. In addition, there is a freeze period on a quarterly basis for any changes that result from the accelerated implementation rule. The freeze period begins after the market close on the Tuesday prior to the second Friday of each rebalancing month (*i.e.*, March, June, September and December) and ends after the market close on the third Friday of the rebalancing month.

Pro-forma files for float-adjusted market capitalization indices are generally released after the market close on the first Friday, two weeks prior to the rebalancing effective date. For illustration purposes, if rebalancing pro-forma files are scheduled to be released on Friday, March 5, the share/IWF freeze period will begin after the close of trading on Tuesday, March 9, and will end after the close of trading the following Friday, March 19 (*i.e.*, the third Friday of the rebalancing month).

During the share/IWF freeze period, shares and IWFs are not changed and the accelerated implementation rule is suspended, except for mandatory corporate action events (such as merger activity, stock splits and rights offerings). The suspension includes all changes that qualify for accelerated implementation and would typically be announced or effective during the share/IWF freeze period. At the end of the freeze period, all suspended changes will be announced on the third Friday of the rebalancing month and implemented five business days after the quarterly rebalancing effective date.

Other Adjustments. In cases where there is no achievable market price for a stock being deleted, it can be removed at a zero or minimal price at the S&P Dow Jones's U.S. index committee's discretion.

The table below summarizes the treatment of certain corporate actions.

Corporate Action	Treatment
Company addition/deletion	<u>Addition</u> Companies are added at the float market capitalization weight. The net change to the market capitalization of the relevant S&P U.S. Index causes a divisor adjustment.

Corporate Action	Treatment
	<u>Deletion</u> The weights of all stocks in the relevant S&P U.S. Index will proportionally change. Relative weights will stay the same. The index divisor will change due to the net change in the market capitalization of that S&P U.S. Index.
Change in shares outstanding	Increasing (decreasing) the shares outstanding increases (decreases) the market capitalization of the relevant S&P U.S. Index. The change to the market capitalization of that S&P U.S. Index causes a divisor adjustment.
Split/reverse split	Shares outstanding are adjusted by the split ratio. Stock price is adjusted by the split ratio. There is no change to the market capitalization of the relevant S&P U.S. Index and no divisor adjustment.
Spin-off	<p>Generally, the spin-off is added to the relevant S&P U.S. Index on the ex-date at a price of zero and will remain in that S&P U.S. Index for at least one trading day. As a result, there will be no change to the index divisor on the ex-date.</p> <p>However, if the spin-off is ineligible for continued inclusion, it will be removed after the ex-date. The weight of the spin-off being deleted is reinvested across all the index components proportionally such that the relative weights of all index components are unchanged. The net change in the market capitalization of the relevant S&P U.S. Index will cause a divisor change.</p>
Change in IWF	Increasing (decreasing) the IWF increases (decreases) the market capitalization of the relevant S&P U.S. Index. A net change to the market capitalization of that S&P U.S. Index causes a divisor adjustment.
Ordinary dividend	When a company pays an ordinary cash dividend, the relevant S&P U.S. Index does not make any adjustments to the price or shares of the stock. As a result, there are no divisor adjustments to that S&P U.S. Index.
Special dividend	The stock price is adjusted by the amount of the dividend. The net change to the market capitalization of the relevant S&P U.S. Index causes a divisor adjustment.
Rights offering	All rights offerings that are in the money on the ex-date are applied under the assumption that the rights are fully subscribed. The stock price is adjusted by the value of the rights and the shares outstanding are increased by the rights ratio. The net change in the market capitalization of the relevant S&P U.S. Index causes a divisor adjustment.

Governance of the S&P U.S. Indices

The S&P U.S. Indices are maintained by S&P Dow Jones's U.S. index committee. All index committee members are full-time professional members of S&P Dow Jones' staff. The index committee meets monthly. At each meeting, the index committee reviews pending corporate actions that may affect index constituents, statistics comparing the composition of the S&P U.S. Indices to the market, companies that are being considered as candidates for addition to an S&P U.S. Index and any significant market events. In addition, the index committee may revise index policy covering rules for selecting companies, treatment of dividends, share counts or other matters.

BACKGROUND ON THE RUSSELL 2000® INDEX

All information contained in this underlying supplement regarding the Russell 2000® Index, including, without limitation, its make-up, method of calculation and changes in its components, has been derived from publicly available information, without independent verification. This information reflects the policies of, and is subject to change by, FTSE Russell (“**FTSE**”), which is wholly owned by the London Stock Exchange Group. The Russell 2000® Index, together with the Russell 1000® Index and the Russell 3000® Index (each, a “**Russell Index**,” and collectively, the “**Russell Indices**”), is calculated, maintained and published by FTSE. FTSE has no obligation to continue to publish, and may discontinue publication of, the Russell 2000® Index.

The Russell Indices are sub-indices of the Russell 3000E™ Index, which is composed of the 4,000 largest U.S. companies as determined by total market capitalization and represents approximately 97% of the U.S. equity market.

The Russell 2000® Index measures the capitalization-weighted price performance of 2,000 U.S. small-capitalization stocks listed on eligible U.S. exchanges and is designed to track the performance of the small-capitalization segment of the U.S. equity market. The companies included in the Russell 2000® Index are the middle 2,000 of the companies that form the Russell 3000E™ Index (*i.e.*, those ranking from 1,001 to 3,000 in the Russell 3000E™ Index). The Russell 2000® Index represents approximately 7% of the Russell 3000® Index. The Russell 2000® Index is reported by Bloomberg L.P. under the ticker symbol “RTY.”

Selection of Stocks Underlying the Russell Indices

To be eligible for inclusion in the Russell 3000E™ Index and, consequently, a Russell Index, a company must meet the following criteria as of the rank day in May (except that initial public offerings (“**IPOs**”) are considered for inclusion on a quarterly basis):

- *U.S. Equity Market. The company must be determined to be part of the U.S. equity market, meaning that its home country is the United States. If a company incorporates in, has a stated headquarters location in, and also trades in the same country (ADRs and ADSs are not eligible), the company is assigned to its country of incorporation.*

If any of the three criteria do not match, FTSE then defines three Home Country Indicators (“**HCIs**”): country of incorporation, country of headquarters and country of the most liquid exchange as defined by two-year average daily dollar trading volume from all exchanges within a country. After the HCIs are defined, the next step in the country assignment involves an analysis of assets by location. FTSE cross-compares the primary location of the company’s assets with the three HCIs. If the primary location of assets matches any of the HCIs, then the company is assigned to its primary asset location.

If there is not enough information to determine a company’s primary location of assets, FTSE uses the primary location of the company’s revenue for the same cross-comparison and assigns the company to the appropriate country in a similar fashion. FTSE uses an average of two years of assets or revenue data for analysis to reduce potential turnover.

If conclusive country details cannot be derived from assets or revenue, FTSE assigns the company to the country in which its headquarters are located unless the country is a Benefit Driven Incorporation (“**BDI**”) country. If the country in which its headquarters are located is a BDI country, the company is assigned to the country of its most liquid stock exchange. The BDI countries are Anguilla, Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bonaire, British Virgin Islands, Cayman Islands, Channel Islands, Cook Islands, Curacao, Faroe Islands, Gibraltar, Guernsey, Isle of Man, Jersey, Liberia, Marshall Islands, Panama, Saba, Sint Eustatius, Sint Maarten and Turks and Caicos Islands.

- *U.S. Eligible Exchange.* The following exchanges and markets are deemed to be eligible U.S. exchanges: the Chicago Board Options Exchange, the New York Stock Exchange, NYSE American, The Nasdaq Stock Market and NYSE Arca. Stocks that are not traded on an eligible U.S. exchange (Bulletin Board, Pink Sheet and over-the-counter securities, including securities for which prices are displayed on the FINRA Alternative Display Facility) are not eligible for inclusion.
- *Minimum Closing Price.* A stock must have a close price at or above \$1.00 (on its primary exchange), subject to exceptions to reduce turnover.
- *Minimum Total Market Capitalization.* Companies with a total market capitalization less than \$30 million are not eligible for inclusion.
- *Minimum Free Float.* Companies with less than an absolute 5% of their shares available in the marketplace are not eligible for inclusion.
- *Company Structure.* Companies structured in the following ways are not eligible for inclusion: royalty trusts, U.S. limited liability companies, closed-end investment companies, business development companies (and other companies that are required to report Acquired Fund Fees and Expenses, as defined by the SEC), blank-check companies, special-purpose acquisition companies, limited partnerships, exchange-traded funds and mutual funds.
- *UBTI.* Real estate investment trusts and publicly traded partnerships that generate or have historically generated unrelated business taxable income (“**UBTI**”) and have not taken steps to block UBTI to equity holders are not eligible for inclusion. Information used to confirm UBTI impact includes the following publicly available sources: 10-K, SEC Form S-3, K-1, company annual report, dividend notices or company website.
- *Security Types.* The following types of securities are not eligible for inclusion: preferred and convertible preferred stock, redeemable shares, participating preferred stock, warrants, rights, depositary receipts, installment receipts and trust receipts.
- *Minimum Voting Rights.* As of August 2017, more than 5% of a company's voting rights (aggregated across all of its equity securities, including, where identifiable, those that are not listed or trading) must be in the hands of unrestricted shareholders. Existing constituents have a five-year grandfathering period to comply or they will be removed from each applicable Russell Index at the June 2023 reconstitution. Shares referenced as “**non-voting**” or providing legally minimum rights only will be viewed as having no voting power as it relates to the minimum voting rights review.
- *Multiple Share Classes.* If an eligible company trades under multiple share classes, each share class is reviewed independently for eligibility for inclusion. Share classes in addition to the primary share class must meet the following minimum size, liquidity and float requirements to be eligible: (i) total market capitalization must be larger than \$30 million; (ii) average daily dollar trading value must exceed that of the global median; and (iii) more than 5% of shares must be available in the marketplace.

Securities of eligible companies are included in Russell Indices based on total market capitalization. Total market capitalization is determined by multiplying total outstanding shares by the market price (generally, the last price traded on the primary exchange of the share class with the highest two-year trading volume, subject to exceptions) as of the rank day in May (except that IPOs are considered for inclusion on a quarterly basis). Common stock, non-restricted exchangeable shares and partnership units/membership interests (but not operating partnership units of umbrella partnership real estate investment trusts) are used to calculate a company's total market capitalization. If multiple share classes of common stock exist, they are combined to determine total shares outstanding; however, in cases where the common stock share classes act independently of each other (e.g., tracking stocks), each class is considered for inclusion separately. For merger and spin-off transactions that are effective between rank day in May and the business day immediately before the index lock-down takes effect

ahead of the annual reconstitution in June, the market capitalizations of the impacted securities are recalculated and membership is re-evaluated as of the effective date of the corporate action.

The 4,000 securities with the greater total market capitalization become members of the Russell 3000E™ Index. All remaining Russell Indices are a subset of the Russell 3000E™ Index. Market capitalization breakpoints for the Russell Indices are determined by the breaks between the rankings of companies (based on descending total market capitalization). Market capitalization breakpoints for the Russell 2000® Index are determined by the break between the companies ranked #1,001 through #3,000. New members are assigned on the basis of the breakpoints, and existing members are reviewed to determine if they fall within a cumulative 5% market cap range around these new market capitalization breakpoints. If an existing member's market cap falls within this cumulative 5% of the market capitalization breakpoint, it will remain in its current Russell Index rather than be moved to a different Russell Index.

After membership is determined, a security's shares are adjusted to include only those shares available to the public ("**free float**"). The purpose of this adjustment is to exclude from market calculations the capitalization that is not available for purchase and is not part of the investable opportunity set. Stocks in the Russell Indices are weighted by their available (also called float-adjusted) market capitalization. The following types of shares are removed from total market capitalization to arrive at free float or available market capitalization, based on information recorded in SEC corporate filings: officers' and directors' holdings, private holdings exceeding 10% of shares outstanding, institutional holdings exceeding 30% of shares outstanding, shares held by publicly listed companies, shares held by an Employee Stock Ownership Plan or a Leveraged Employee Stock Ownership Plan; shares locked up during an IPO; direct government holdings; and indirect government holdings exceeding 10% of shares outstanding.

Reconstitution occurs on the fourth Friday in June. A full calendar for reconstitution is published each spring, with such reconstitution schedule governed by FTSE guidelines.

Corporate Actions and Events Affecting the Russell Indices

FTSE applies corporate actions to the Russell Indices on a daily basis. FTSE applies the following methodology guidelines, among others, when adjusting the applicable Russell Index in response to corporate actions:

- ***"No Replacement" Rule.*** Securities that leave the relevant Russell Index for any reason (e.g., mergers, acquisitions or other similar corporate activity) are not replaced. Thus, the number of securities in the relevant Russell Index over a year will fluctuate according to corporate activity.
- ***Statement of Principles and Adjustments for Specific Corporate Events.*** FTSE has stated as general principles that the treatment of corporate events (a) should reflect how such events are likely to be dealt with in investment portfolios to maintain the portfolio structure in line with the target set out in the index objective and index methodology and (b) should normally be designed to minimize the trading activity required by investors to match the index performance. No assurance can be provided that corporate actions and events will be treated by FTSE in a manner consistent with its statement of general principles.

In addition, FTSE has established guidance for the treatment of corporate actions and events, including, but not limited to, dividends, capital repayments, companies converting to a REIT structure, share buybacks, rights issues, mergers, acquisitions, tender offers, split-offs, spin-offs, bankruptcies, insolvencies, liquidations and trading suspensions. However, because of the complexities involved in some cases, those guidelines are not definitive rules that will determine FTSE's actions in all circumstances. FTSE reserves the right to determine the most appropriate method of implementation for any corporate event which is not covered by those guidelines or which is of a complex nature.

BACKGROUND ON THE INVESCO QQQ TRUSTSM, SERIES 1

All information contained in this underlying supplement regarding the Invesco QQQ TrustSM, Series 1 (the “**QQQ Fund**”) has been derived from publicly available information, without independent verification. This information reflects the policies of, and is subject to change by, The Bank of New York Mellon, as trustee of the QQQ Fund (the “**QQQ Fund Trustee**”), and Invesco Capital Management LLC, as sponsor of the QQQ Fund (the “**QQQ Fund Sponsor**”). The QQQ Fund is a unit investment trust that issues securities called “Invesco QQQ Shares.” The QQQ Fund is an exchange-traded fund that trades on The Nasdaq Stock Market under the ticker symbol “QQQ.”

The QQQ Fund is a unit investment trust. The investment objective of the QQQ Fund is to seek to track the investment results, before fees and expenses, of the Nasdaq-100 Index[®]. For more information about the Nasdaq-100 Index[®], please see “Background on the Nasdaq-100 Index[®].”

The QQQ Fund holds all of the stocks in the Nasdaq-100 Index[®] and cash and is not actively managed by traditional methods, which typically involve effecting changes in the holdings of securities on the basis of judgments made relating to economic, financial and market considerations. To maintain the correspondence between the composition and weights of the securities held by the QQQ Fund and the component securities of the Nasdaq-100 Index[®] (“**QQQ Index Securities**”), the QQQ Fund Trustee adjusts the holdings of the QQQ Fund from time to time to conform to periodic changes in the identity and/or relative weights of the QQQ Index Securities.

The QQQ Fund will not be able to replicate exactly the performance of the Nasdaq-100 Index[®] because the total return generated by the securities held by the QQQ Fund will be reduced by transaction costs incurred in adjusting the actual balance of the securities held by the QQQ Fund and other expenses of the QQQ Fund, whereas such transaction costs and expenses are not included in the calculation of the Nasdaq-100 Index[®]. It is also possible that for short periods of time, the QQQ Fund may not fully replicate the performance of the Nasdaq-100 Index[®] due to the temporary unavailability of certain QQQ Index Securities in the secondary market or due to other extraordinary circumstances. Such events are unlikely to continue for an extended period of time because the QQQ Fund Trustee is required to correct such imbalances by means of adjusting the composition of the securities held by the QQQ Fund. It is also possible that the composition of the QQQ Fund may not exactly replicate the composition of the Nasdaq-100 Index[®].

The QQQ Fund is a registered investment company. Information provided to or filed with the SEC by the QQQ Fund pursuant to the Securities Act of 1933, as amended, and the Investment Company Act of 1940, as amended, can be located by reference to SEC file numbers 333-61001 and 811-08947, respectively, through the SEC’s website at <http://www.sec.gov>.

BACKGROUND ON THE SPDR® S&P 500® ETF TRUST

All information contained in this underlying supplement regarding the SPDR® S&P 500® ETF Trust (the “**SPY Fund**”) has been derived from publicly available information, without independent verification. This information reflects the policies of, and is subject to change by, State Street Global Advisors Trust Company (“**SSGA TC**”), as trustee of the SPY Fund, and PDR Services LLC (“**PDRS**”), as sponsor of the SPY Fund. The SPY Fund is a unit investment trust that issues securities called “Units.” The SPY Fund trades on the NYSE Arca, Inc. under the ticker symbol “SPY.”

The SPY Fund seeks to provide investment results that, before expenses, correspond generally to the price and yield performance of the S&P 500® Index. For more information about the S&P 500® Index, please see “Background on the S&P 500® Index” in this underlying supplement.

The SPY Fund seeks to achieve its investment objective by holding a portfolio of common stocks that are included in the S&P 500® Index, with the weight of each stock in the portfolio substantially corresponding to the weight of that stock in the S&P 500® Index. At any time, the portfolio of the SPY Fund will consist of as many of the component stocks of the S&P 500® Index as is practicable. To maintain the correspondence between the composition and weightings of the stocks held by the SPY Fund and the component stocks of the S&P 500® Index, SSGA TC or its parent company, State Street Bank and Trust Company (“**SSBT**”) adjusts the portfolio of the SPY Fund from time to time to conform to periodic changes in the identity and/or relative weightings of the component stocks of the S&P 500® Index. SSGA TC or SSBT aggregates certain of these adjustments and makes changes to the portfolio of the SPY Fund at least monthly, or more frequently in the case of significant changes to the S&P 500® Index.

While the SPY Fund is intended to track the performance of the S&P 500® Index as closely as possible (*i.e.*, to achieve a high degree of correlation with the S&P 500® Index), the return of the SPY Fund may not match or achieve a high degree of correlation with the return of the S&P 500® Index due to expenses and transaction costs incurred in adjusting the SPY Fund’s portfolio. In addition, it is possible that the SPY Fund may not always fully replicate the performance of the S&P 500® Index due to the unavailability of certain component stocks of the S&P 500® Index in the secondary market or due to other extraordinary circumstances (*e.g.*, if trading in a security has been halted).

The SPY Fund is a registered investment company. Information provided to or filed with the SEC by the SPY Fund pursuant to the Securities Act of 1933, as amended, and the Investment Company Act of 1940, as amended, can be located by reference to SEC file numbers 033-46080 and 811-06125, respectively, through the SEC’s website at <http://www.sec.gov>.

BACKGROUND ON THE iSHARES® RUSSELL 2000 ETF

All information contained in this underlying supplement regarding the iShares® Russell 2000 ETF (the “**IWM Fund**”) has been derived from publicly available information, without independent verification. This information reflects the policies of, and is subject to change by, iShares® Trust and BlackRock Fund Advisors (“**BFA**”). As an investment portfolio of iShares® Trust, the IWM Fund is maintained and managed by iShares® Trust. BFA is currently the investment adviser to the IWM Fund. The IWM Fund is an exchange-traded fund that trades on the NYSE Arca, Inc. under the ticker symbol “IWM.”

The IWM Fund seeks to track the investment results, before fees and expenses, of an index composed of small-capitalization U.S. equities, which is currently the Russell 2000® Index. For more information about the Russell 2000® Index, please see “Background on the Russell 2000® Index” in this underlying supplement.

BFA uses a representative sampling indexing strategy to manage the IWM Fund. “Representative sampling” is an indexing strategy that involves investing in a representative sample of securities that collectively has an investment profile similar to that of the Russell 2000® Index. The securities selected are expected to have, in the aggregate, investment characteristics (based on factors such as market capitalization and industry weightings), fundamental characteristics (such as return variability and yield) and liquidity measures similar to those of the Russell 2000® Index. The IWM Fund may or may not hold all of the securities in the Russell 2000® Index.

The Russell 2000® Index is a financial calculation, based on a grouping of financial instruments, and is not an investment product, while the IWM Fund is an actual investment portfolio. The performance of the IWM Fund and the Russell 2000® Index may vary for a number of reasons, including transaction costs, non-U.S. currency valuations, asset valuations, corporate actions (such as mergers and spin-offs), timing variances and differences between the IWM Fund’s portfolio and the Russell 2000® Index resulting from the IWM Fund’s use of representative sampling or from legal restrictions (such as diversification requirements) that apply to the IWM Fund but not to the Russell 2000® Index. “Tracking error” is the divergence of the performance (return) of a fund’s portfolio from that of its underlying index. Because the IWM Fund uses a representative sampling indexing strategy, it can be expected to have a larger tracking error than if it used a replication indexing strategy. “Replication” is an indexing strategy in which a fund invests in substantially all of the securities in its underlying index in approximately the same proportions as in the underlying index.

iShares® Trust is a registered investment company that consists of numerous separate investment portfolios, including the IWM Fund. Information provided to or filed with the SEC by iShares® Trust pursuant to the Securities Act of 1933, as amended, and the Investment Company Act of 1940, as amended, can be located by reference to SEC file numbers 333-92935 and 811-09729, respectively, through the SEC’s website at <http://www.sec.gov>.

SUPPLEMENTAL TERMS OF THE NOTES

The following supplemental terms of the notes supplement, and to the extent they are inconsistent, supersede, the description of the general terms of the debt securities set forth in the accompanying product supplement. Except as noted below, capitalized terms used in this section without definitions are as defined in “The MerQube Vol Advantage Index Series” above.

Postponement of a Determination Date

Notes Linked Solely to an Index

Notwithstanding any contrary provision in the accompanying product supplement, for notes linked solely to an Index, the following provisions will apply. If a Determination Date is a Disrupted Day (as defined in the accompanying product supplement), the applicable Determination Date will be postponed to the immediately succeeding scheduled trading day that is not a Disrupted Day.

In no event, however, will any Determination Date be postponed to a date that is after the applicable Final Disrupted Determination Date (as defined in the accompanying product supplement). If a Determination Date is or has been postponed to the applicable Final Disrupted Determination Date and that day is a Disrupted Day, the calculation agent will determine the closing level of the relevant Index for that Determination Date on that Final Disrupted Determination Date in accordance with the formula for and method of calculating the closing level of that Index last in effect prior to the commencement of the market disruption event (or prior to the non-trading day), using the official settlement price and/or time weighted average price (or, if trading in the relevant futures contract has been materially suspended or materially limited, the calculation agent’s good faith estimate of the relevant price that would have prevailed but for that suspension or limitation or non-trading day) on that Final Disrupted Determination Date of the futures contract(s) included in an Index.

Notes Linked to an Index and Other Reference Assets

If the notes are linked to an Index and other reference assets, the provisions relating to postponement of a Determination Date as set forth in the accompanying product supplement will apply, except that if a Determination Date is or has been postponed to the applicable Final Disrupted Determination Date and, on that day, the closing level of the relevant Index has not been established in accordance with the postponement provisions of the accompanying product supplement that apply prior to the applicable Final Disrupted Determination Date, the closing level of that Index for that Determination Date will be determined by the calculation agent on the applicable Final Disrupted Determination Date in accordance with the formula for and method of calculating the closing level of that Index last in effect prior to the commencement of the market disruption event (or prior to the non-trading day), using the official settlement price and/or time weighted average price (or, if trading in the relevant futures contract has been materially suspended or materially limited, the calculation agent’s good faith estimate of the relevant price that would have prevailed but for that suspension or limitation or non-trading day) on that Final Disrupted Determination Date of the futures contract(s) included in an Index.

Additional Defined Terms

Notwithstanding any contrary definition in the accompanying product supplement, with respect to an Index or any relevant successor index, a “**scheduled trading day**” is, unless otherwise specified in the relevant terms supplement, a day, as determined by the calculation agent, on which:

- (a) the relevant exchange for that Index or that successor index, as applicable, is scheduled to be open for trading for its regular trading session;
- (b) banking institutions in the City of New York and that principal financial center are not otherwise authorized or required by law, regulation or executive order to close; and

- (c) that Index or that successor index, as applicable, is scheduled to calculate and publish the closing level of that Index (or that successor index).

Notwithstanding any contrary definition in the accompanying product supplement, with respect to an Index or any relevant successor index, a **“trading day”** is, unless otherwise specified in the relevant terms supplement, a day, as determined by the calculation agent, on which:

- (a) trading is generally conducted on the relevant exchange for that Index or that successor index, as applicable;
- (b) banking institutions in the City of New York and that principal financial center are not otherwise authorized or required by law, regulation or executive order to close; and
- (c) that Index or that successor index, as applicable, is scheduled to calculate and publish the closing level of that Index (or that successor index).

Notwithstanding anything to the contrary in the accompanying product supplement, with respect to an Index or any relevant successor index, **“relevant exchange”** means the primary exchange or market of trading for the futures contract(s) then included in that Index or that successor index, as applicable.

Market Disruption Events

Notwithstanding any contrary provision in the accompanying product supplement, the following provisions will apply to notes linked in whole or in part to an Index. With respect to an Index (or any relevant successor index), a **“market disruption event,”** unless otherwise specified in the relevant terms supplement, means:

- (1) any termination or suspension of, or limitation on, trading imposed by the relevant exchange for that Index (or that successor index);
- (2) a failure by the relevant exchange for that Index (or that successor index) to calculate and publish the official settlement price of the futures contract(s) included in that Index (or that successor index) on any day upon which the official settlement price of that futures contract is scheduled to be calculated and published by the relevant exchange;
- (3) the closure of the relevant exchange for that Index (or that successor index) prior to its scheduled closing time unless such earlier closing time is announced at least one hour prior to the actual closing time;
- (4) the failure of any relevant exchange for that Index (or that successor index) to open;
- (5) any other event that disrupts or impairs the ability of market participants in general to effect transactions in, or obtain market values for the futures contract included in that Index (or that successor index);
- (6) the failure of the sponsor of that Index (or that successor index) to calculate and publish the closing level of that Index (or that successor index),

in each case as determined by the calculation agent in its sole discretion; and

- a determination by the calculation agent in its sole discretion that the applicable event described above materially interfered with the Issuer's ability or the ability of any of its affiliates to adjust or unwind all or a material portion of any hedge with respect to the notes.

A limitation on the hours or number of days of trading will not constitute a market disruption event with respect to an Index or any relevant successor index if the limitation results from an announced change in the regular business hours of the relevant exchange or market.

Discontinuation of an Index; Alteration of Method of Calculation

The provisions relating to the discontinuation of an Index as set forth in the accompanying product supplement will apply, except that if the calculation agent is to determine the closing level of that Index for any day because no successor index for that Index is available at that time, or the calculation agent has previously selected a successor index for that Index and publication of that successor index is discontinued prior to, and that discontinuation is continuing on, that day, then the closing level of that Index for that day will be computed by the calculation agent in accordance with the formula for and method of calculating that Index or that successor index, as applicable, last in effect prior to that discontinuation, and giving effect to that Index methodology for rolling from one futures contract to the next over time.