

**UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, D.C. 20549**

FORM 10-K

- (Mark One)
- ☒ **ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**
- For the Fiscal Year Ended December 31, 2022**
- OR**
- ☐ **TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

Commission File Number 001-31553

CME GROUP INC.

(Exact name of registrant as specified in its charter)

Delaware
(State or Other Jurisdiction of
Incorporation or Organization)

20 South Wacker Drive

(Address of Principal Executive Offices)

Chicago Illinois

36-4459170
(IRS Employer
Identification No.)
60606
(Zip Code)

Registrant's telephone number, including area code: (312) 930-1000

Securities registered pursuant to Section 12(b) of the Act:

Title Of Each Class	Trading symbol	Name Of Each Exchange On Which Registered
Class A Common Stock \$0.01 par value	CME	Nasdaq

Securities registered pursuant to Section 12(g) of the Act: Class B common stock, Class B-1, \$0.01 par value; Class B common stock, Class B-2, \$0.01 par value; Class B common stock, Class B-3, \$0.01 par value; and Class B common stock, Class B-4, \$0.01 par value.

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes ☒ No ☐

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act. Yes ☐ No ☒

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes ☒ No ☐

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). Yes ☒ No ☐

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company" and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large Accelerated Filer ☒

Non-accelerated filer ☐

Accelerated filer ☐

Smaller reporting company ☐

Emerging growth company ☐

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☐

Indicate by check mark whether the registrant has filed a report on and attestation to its management's assessment of the effectiveness of its internal control over financial reporting under Section 404(b) of the Sarbanes-Oxley Act (15 U.S.C. 7262(b)) by the registered public accounting firm that prepared or issued its audit report. ☒

If securities are registered pursuant to Section 12(b) of the Act, indicate by check mark whether the financial statements of the registrant included in the filing reflect the correction of an error to previously issued financial statements. ☐

Indicate by check mark whether any of those error corrections are restatements that required a recovery analysis of incentive-based compensation received by any of the registrant's executive officers during the relevant recovery period pursuant to §240.10D-1(b). ☐

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). Yes ☐ No ☒

The aggregate market value of the voting and non-voting common equity held by non-affiliates of the registrant as of June 30, 2022, was approximately \$ 73.2 billion (based on the closing price per share of CME Group Inc. Class A common stock on the Nasdaq Global Select Market (Nasdaq) on such date). The number of shares outstanding of each of the registrant's classes of common stock as of February 8, 2023 was as follows: 359,717,173 shares of Class A common stock, \$0.01 par value; 625 shares of Class B common stock, Class B-1, \$0.01 par value; 813 shares of Class B common stock, Class B-2, \$0.01 par value; 1,287 shares of Class B common stock, Class B-3, \$0.01 par value; and 413 shares of Class B common stock, Class B-4, \$0.01 par value.

DOCUMENTS INCORPORATED BY REFERENCE:

Documents	Form 10-K Reference
Portions of CME Group Inc.'s Proxy Statement for the 2023 Annual Meeting of Shareholders	Part III

CME GROUP INC.
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PART I

Certain Terms

All references to "options" or "options contracts" in the text of this document refer to options on futures contracts. Further information about CME Group and its products can be found at <http://www.cmegroup.com>. Information made available on our website does not constitute a part of this Annual Report on Form 10-K.

Information about Contract Volume and Average Rate per Contract

All amounts regarding contract volume and average rate per contract are for CME Group's listed futures and options on futures contracts unless otherwise noted.

Trademark Information

CME Group, the Globe logo, CME, Chicago Mercantile Exchange, Globex, and E-mini are trademarks of Chicago Mercantile Exchange Inc. CBOT and Chicago Board of Trade are trademarks of Board of Trade of the City of Chicago, Inc. NYMEX, New York Mercantile Exchange and ClearPort are trademarks of New York Mercantile Exchange, Inc. COMEX is a trademark of Commodity Exchange, Inc. BrokerTec and EBS are trademarks of various entities of NEX Group Limited. Dow Jones, Dow Jones Industrial Average, S&P 500 and S&P are service and/or trademarks of Dow Jones Trademark Holdings LLC, Standard & Poor's Financial Services LLC and S&P Dow Jones Indices LLC, as the case may be, and have been licensed for use by Chicago Mercantile Exchange Inc. (CME). All other trademarks are the property of their respective owners.

FORWARD-LOOKING STATEMENTS

From time to time, in this Annual Report on Form 10-K as well as in other written reports and verbal statements, we discuss our expectations regarding future performance. These forward-looking statements are identified by their use of terms and phrases such as "believe," "anticipate," "could," "estimate," "intend," "may," "plan," "expect" and similar expressions, including references to assumptions. These forward-looking statements are based on currently available competitive, financial and economic data, current expectations, estimates, forecasts and projections about the industries in which we operate and management's beliefs and assumptions. These statements are not guarantees of future performance and involve risks, uncertainties and assumptions that are difficult to predict. Therefore, actual outcomes and results may differ materially from what is expressed or implied in any forward-looking statements. We want to caution you not to place undue reliance on any forward-looking statements. We undertake no obligation to publicly update any forward-looking statements, whether as a result of new information, future events or otherwise. Among the factors that might affect our performance are:

- increasing competition by foreign and domestic entities, including increased competition from new entrants into our markets and consolidation of existing entities;
- our ability to keep pace with rapid technological developments, including our ability to complete the development, implementation and maintenance of the enhanced functionality required by our customers while maintaining reliability and ensuring that such technology is not vulnerable to security risks;
- our ability to continue introducing competitive new products and services on a timely, cost-effective basis, including through our electronic trading capabilities, and our ability to maintain the competitiveness of our existing products and services;
- our ability to adjust our fixed costs and expenses if our revenues decline;
- our ability to maintain existing customers at substantially similar trading levels, develop strategic relationships and attract new customers;
- our ability to expand and globally offer our products and services;
- changes in regulations, including the impact of any changes in laws or government policies with respect to our products or services or our industry, such as any changes to regulations and policies that require increased financial and operational resources from us or our customers;
- the costs associated with protecting our intellectual property rights and our ability to operate our business without violating the intellectual property rights of others;
- decreases in revenue from our market data as a result of decreased demand or changes to regulations in various jurisdictions;
- changes in our rate per contract due to shifts in the mix of the products traded, the trading venue and the mix of customers (whether the customer receives member or non-member fees or participates in one of our various incentive programs) and the impact of our tiered pricing structure;
- the ability of our credit and liquidity risk management practices to adequately protect us from the credit risks of clearing members and other counterparties, and to satisfy the margin and liquidity requirements associated with the BrokerTec matched principal business;

- the ability of our compliance and risk management programs to effectively monitor and manage our risks, including our ability to prevent errors and misconduct and protect our infrastructure against security breaches and misappropriation of our intellectual property assets;
- our dependence on third-party providers and exposure to risk through third parties, including risks related to the performance, reliability and security of technology used by our third-party providers and third-party providers that our clients rely on;
- volatility in commodity, equity and fixed income prices, and price volatility of financial benchmarks and instruments such as interest rates, credit spreads, equity indices, fixed income instruments and foreign exchange rates;
- economic, social, political and market conditions, including the volatility of the capital and credit markets and the impact of economic conditions on the trading activity of our current and potential customers;
- the impact of the COVID-19 pandemic and response by governments and other third parties;
- our ability to accommodate increases in contract volume and order transaction traffic and to implement enhancements without failure or degradation of the performance of our trading and clearing systems;
- our ability to execute our growth strategy and maintain our growth effectively;
- our ability to manage the risks, control the costs and achieve the synergies associated with our strategy for acquisitions, investments and alliances, including those associated with the performance of our joint ventures with S&P Dow Jones (S&P Dow Jones Indices LLC) in index services and in trade processing/post trade services (OSTTRA), our primary data distribution partners' actions and our partnership with Google Cloud;
- variances in earnings on cash accounts and collateral that our clearing house holds for its clients;
- impact of CME Group pricing and incentive changes;
- impact of aggregation services and internalization on trade flow and volumes;
- any negative financial impacts from changes to the terms of intellectual property and index rights;
- uncertainty related to the adoption and growth of SOFR and its impact on our business;
- our ability to continue to generate funds and/or manage our indebtedness to allow us to continue to invest in our business;
- industry, channel partner and customer consolidation;
- decreases in trading and clearing activity;
- the imposition of a transaction tax or user fee on futures and options transactions and/or repeal of the 60/40 tax treatment of such transactions;
- our ability to maintain our brand and reputation; and
- the unfavorable resolution of material legal proceedings.

For a detailed discussion of these and other factors that might affect our performance, see Item 1A. of this Report beginning on page 15.

ITEM 1. BUSINESS

CME Group provides market participants worldwide the ability to efficiently manage risk within and across multiple asset classes, by trading futures, options, cash and over-the-counter (OTC) products. CME Group provides primary price discovery and referential pricing information through its market data in a variety of formats, including real time, historical and derived data for customers in both listed and cash products. CME Group also offers industry-leading research and analytics tools to provide customers with market education resources.

GENERAL DEVELOPMENT OF BUSINESS

CME was founded in 1898 as a not-for-profit corporation. It established its clearing house in 1919, which is operated as part of CME. CME demutualized in 2000, and in 2002 its parent company, CME Group, completed an initial public offering of its Class A common stock (Nasdaq: CME). CME Group subsequently acquired CBOT Holdings, Inc. in 2007, NYMEX Holdings, Inc. (NYMEX and COMEX) in 2008, the Kansas City Board of Trade in 2012 and NEX Group plc (NEX) in 2018. The combination with NEX expanded our global customer base and product offerings through the complementary combination of CME Group's exchange-traded derivative products and NEX's cash and OTC products. It also created a leading, client-centric, global markets company, generating capital efficiencies across futures, cash and OTC products for market participants seeking to lower their cost of trading and better manage risk. Our principal executive offices are located at 20 South Wacker Drive, Chicago, Illinois 60606, our telephone number is 312-930-1000 and our website is *cmegroup.com*.

DESCRIPTION OF BUSINESS

CME Group exchanges offer the widest range of global benchmark products across interest rates, equity indexes, foreign exchange (FX), agricultural commodities, energy and metals. We also offer cash and repo fixed income trading via BrokerTec, and cash and OTC FX trading via EBS.

In addition, we operate one of the world's leading central counterparty clearing providers, CME Clearing, operated by CME.

Derivatives Exchange Business: Through our derivatives exchanges and clearing house, we believe our customers prefer CME Group's diversity of products, liquidity, price transparency and technological capabilities. Market liquidity - or the ability of a market to absorb the execution of large purchases or sales quickly and efficiently - is key to attracting and retaining customers and contributing to a market's success. Our products provide a means for hedging, speculation and asset allocation related to the risks associated with, among other things, interest rate sensitive instruments, equity ownership, changes in the value of foreign currency and changes in the prices of agricultural, energy and metal commodities.

- **CME's** product slate includes agricultural, equities, FX, cryptocurrencies/alternative investments and interest rate products, including Eurodollar futures and options, Secured Overnight Financing Rate (SOFR) futures and options, Bloomberg Short-Term Bank Yield (BSBY), livestock and cash-settled contracts based on the S&P 500, including the E-mini S&P 500 ESG (Environmental, Social and Governance) contract, Micro E-mini Equity Index contracts, Nasdaq-100, FTSE Russell and Bitcoin and Ether Reference Rate.
- **CBOT's** product slate consists of agricultural, equities and interest rate products, including contracts for United States (U.S.) Treasury futures, soybean, corn, and wheat and contracts based on the Dow Jones Industrial Index.
- **NYMEX's** product slate consists of energy and metals products, including contracts for crude oil, natural gas, heating oil, gasoline and emissions (GEO and NGO).
- **COMEX's** product slate consists of metals products, including contracts for gold, silver, copper and other base metals.

We believe the breadth and diversity of our products and services lines are beneficial to our customers and CME Group's overall performance. Our asset classes contain products designed to address differing risk management needs, and customers are able to manage risks and achieve operational and capital efficiencies by accessing our diverse products through our platforms and our clearing house.

CME Group products are traded primarily through CME Globex, as well as by open outcry in Chicago for Eurodollar options and SOFR options and through privately negotiated transactions.

We strive to provide the most flexible and scalable platforms to support the operational and capacity needs of our business along with the delivery of innovative technology solutions to the marketplace. Our CME Globex electronic platform is the trading engine for our central limit order book markets and is available on a global basis nearly 24 hours a day throughout the trading week. The CME Globex platform is accessible through a wide variety of vendor-provided and custom-built trading systems that benefit from our open application programming interface approach. For electronic and privately negotiated markets, we offer brokers and customers the CME Direct platform for arranging, executing, recording and risk-managing trades across all six major asset classes. We also provide the functionality to connect to CME Direct on a mobile device through our CME Direct Mobile application with full trading and on-the-go order management capabilities.

Together, our platforms offer:

- certainty of execution;
- extensive capabilities to facilitate complex and demanding trading;
- direct market access;
- fairness, price transparency and anonymity;
- convenience and efficiency;
- connectivity through highly secure, resilient and low-latency network options;
- access to market data; and
- global distribution, including connectivity through high-speed international telecommunications hubs in key financial centers or order routing to our global partner exchanges.

We maintain comprehensive business continuity and disaster recovery plans and facilities designed to provide nearly continuous availability of our markets in the event of a business disruption or disaster. We also maintain incident and crisis management plans that address responses to disruptive events.

The customer base of our derivatives exchanges includes professional traders, financial institutions, institutional and individual investors, major corporations, manufacturers, producers, governments and central banks. Customers may be members of one or more of our exchanges. Rights to directly access our derivatives markets will depend upon the nature of the customer, such as whether the entity or individual is a member of one of our exchanges or has executed an agreement with us for direct access.

U.S. trading rights and privileges are exchange-specific. Open outcry trading is conducted exclusively by our members. Membership on one of our derivatives exchanges also enables a customer to trade specific products at lower fees. Under the terms of the organizational documents of our exchanges, our members have certain rights that relate primarily to trading right protections, certain trading fee protections and certain membership benefit protections. In 2022, 83% of our contract volume was from trades by our members.

CME Clearing Business: Through our clearing house, CME Clearing, which is operated by CME, we provide clearing and settlement services for a broad range of exchange-traded futures and options on futures contracts and OTC derivatives. Our integrated clearing function is designed to ensure the safety and the soundness of our markets by serving as the counterparty to every trade, becoming the buyer to each seller and the seller to each buyer, and limiting counterparty credit risk. CME Clearing marks open positions to market at least twice a trading day, requiring payments from clearing firms whose positions have lost value and making payments to clearing firms whose positions have gained value. For select cleared-only markets, positions are marked-to-market daily, with the capacity to mark-to-market more frequently as market conditions warrant. The CME ClearPort front-end system provides access to our flexible clearing services for block transactions, bi-lateral trades and swaps.

The majority of clearing and transaction fees received from clearing firms represents charges for trades executed and cleared on behalf of their customers. One firm represented at least 10% of our clearing and transaction fees revenue for 2022. In the event a clearing firm were to withdraw, our experience indicates that the customer portion of the firm's trading activity would likely transfer to one or more other clearing firms of the exchange.

Cash Markets Business: Our cash markets business is comprised of BrokerTec and EBS. Certain BrokerTec and EBS products are cleared at third-party clearing houses. BrokerTec and EBS offer anonymous and disclosed trading venues, offering clients multiple execution and distribution options and the benefit of an established and far-reaching distribution network of liquidity providers and consumers. Our BrokerTec Central Limit Order Books were migrated from a third-party platform to our CME Globex electronic platform in the first quarter of 2021 and our EBS Central Limit Order Books were migrated to the CME Globex platform in the second quarter of 2022.

- **BrokerTec** operates global electronic trading for fixed income products on the CME Globex platform, with a leading position in cash U.S. Treasuries, E.U. and U.S. repo fixed income instruments and European Government Bonds. It facilitates trading for banks and non-bank professional trading firms. BrokerTec Quote is a third party Request For Quote platform that offers a dealer-to-client trading solution for the European and U.S. government repo markets. BrokerTec Stream is a relationship-based trading platform offering U.S. Treasury instruments.
- **EBS** provides for the trading of FX products across major and emerging market currencies. EBS also offers execution of non-deliverable forwards through a Commodity Futures Trading Commission (CFTC) registered swap execution facility (SEF), operated by one of our subsidiaries. EBS operates both as a Central Limit Order Book platform for spot and non-deliverable forwards currency pairs, as well as a relationship-based third-party trading platform offering spot FX, FX forwards and FX swaps.

Market Data Business: We offer a variety of market data services through industry-leading market data platforms and third-party distribution partners, which are designed to meet the risk-management, trading, investment and business needs of our

global client base. As such, we provide proprietary real-time and historical market data related to CME Group's vibrant and deeply liquid exchanges and cash markets businesses. We further offer derived cash markets pricing, third-party and alternative data sets, as well as a wide range of analytic tools. As customers continue to leverage cloud technology to improve and evolve their businesses, CME Group has taken a leading role by becoming the first derivatives marketplace to provide live market data natively in the cloud with the launch of our cloud connect capabilities on the Google Cloud Platform. CME Group is also the distributor of leading benchmark equity and commodity indices on behalf of third parties as well as our own proprietary benchmarks and indices, including CME Term SOFR Reference Rates (CME Term SOFR), which is a benchmark designed to adhere to the IOSCO Principles for Financial Benchmarks.

Our Strategic Initiatives

The following is a description of our strategic initiatives:

Maximize Futures and Options Growth Globally - We continue to focus on driving growth and new customer acquisition by expanding, innovating and scaling our core offerings, and increasing participation from non-U.S. customers. We do this by expanding our global sales team, cross-selling our products, expanding the strength of our existing benchmark products, launching new products and services and deepening open interest in our core futures and options offerings. We have further focused on building upon cloud-based data distribution capabilities as a more flexible and potentially cost-effective means of providing data to our clients.

In 2022, CME Group futures and options had an average daily volume of 23.3 million contracts, with a volume record in our equity asset class for the seventh consecutive year. It was also a year of volume records for multiple products, including Ultra 10 Year Treasury Note futures, SOFR futures, Bitcoin futures, Micro E-Mini Equity Index futures and a record number of contracts executed via Basis Trade at Index Close. We set records in the volume traded for our Micro E-Mini Equity Index futures in total, as well as for each of the Micro E-Mini Nasdaq-100, Russell 2000 and Dow 30 contracts.

We continue to expand and deepen our customer base worldwide and offer customers around the world the most broad and diversified portfolio of benchmark products. Some of our products introduced over the past two years include:

- E-mini Nasdaq 100 Weekly Options (2021)
- E-mini Russell 2000 Weekly Options (2021)
- Micro Bitcoin Futures (2021)
- Ether and Micro Ether Futures (2021)
- Micro Treasury Yield Futures (2021)
- Micro WTI Futures (2021)
- Global Emissions Offset (GEO) and Nature-based Global Emissions Offset (N-GEO) Futures (2021)
- Additional Cryptocurrency Reference Rates and Real-Time Indices (2022)
- CBL Core Global Emissions Offset Futures (2022)
- 20-year U.S. Treasury Bond Futures (2022)
- Micro Bitcoin and Ether Options (2022)
- Aluminum Options (2022)
- Canadian Wheat Futures (2022)
- Micro WTI Options (2022)
- Six new E-mini sector index Futures (2022)
- Euro-denominated Bitcoin and Ether Futures (2022)
- Ether Options (2022)
- Ten event contracts linked to our global benchmarks (2022)
- TBA futures for Mortgage-backed Securities (2022)
- Euro Short-Term Rate (€STR) Futures and RepoFunds Rate (RFR) Futures (2022)

In addition to the individual product launches noted above, we have completed many product extensions across our asset classes, including short-dated options products (Monday and Wednesday weekly options on Gold, Silver and Copper and Tuesday and Thursday weekly options on the E-Mini S&P 500).

We continue to expand and deepen our customer base worldwide and offer customers around the world with the most broad and diversified portfolio of benchmark products. We believe we have a significant opportunity to expand the participation of our non-U.S. customer base in our markets. Our penetration of these markets lags our development in the U.S., and we believe that there is room for significant growth and development of these financial markets. In 2022, approximately 28% of our electronic

futures and options volume was from transactions reported as outside the U.S. and approximately 52% of our market data revenue was derived from outside the U.S. We also achieved 27% growth in trading volume during Asian trading hours and 10% growth during European trading hours in 2022 compared to 2021.

CME Group continues to introduce tools which assist our clients in managing their risks. In 2021, we updated the FX Market Profile Tool and launched a Metals Market Profile and, in 2022, we launched an UST Market Profile. The FX and Metals Market Profile Tool on Quant Analytics offers a simple but effective method for clients to compare and contrast our leading FX and metals products and liquidity pools side-by-side, which in turn enables clients to analyze their opportunity to minimize costs and achieve best execution by accessing highly complementary liquidity pools across cash and futures markets. We expect to continue to expand this Quant Analytics suite in the future as well.

Our CME Liquidity Tool enables market participants to analyze liquidity across CME Group products during U.S., London or Singapore trading hours and was expanded to 37 products in 2021 to meet customer demand for our growing product suite. CME Group Volatility Indexes (CVOL) comprises a total of 39 indexes, including six unique broad-based benchmarks such as the Treasury Volatility Index and Commodity Volatility Index. In 2022, we launched real-time streaming versions of the CVOL indexes. CVOL provide a representative measure of the market expectation of 30-day forward risk, comprising both end of day and live streaming values. We have increased our customer base and continue to target cross-asset sales across client segments and across cash and futures platforms, driving global sales and generating new client participation across all regions. We have a long history of providing customer value and responsiveness and believe our products and services position us to help our customers adapt to and comply with new regulations, while enabling them to efficiently manage their risks. We have a broad distribution network comprised of a combination of internal and external channels and proprietary front-end capabilities.

Diversify our Business and Revenue - Our acquisition of NEX in 2018 strengthened our role in global financial markets infrastructure and information services, adding complementary cash and OTC businesses and scale to our listed interest rate and FX products, while broadening our global client base. We are positioned to take direct advantage of growth in treasury issuance, unwinding of the Fed's balance sheet, liquid treasury holdings and the trading of treasury instruments, as well as growing repo activity in the U.S. and Europe. The transaction expanded CME Group's position in the large, highly competitive and highly fragmented global FX marketplace, offering both order book trading and relationship-based trading solutions for customers. The acquisition added strength in underlying customer marketplaces, especially around regional bank customers and other market participants outside of North America, and expanded our market data solutions beyond futures and options into cash and OTC offerings.

During 2021, the Alternative Reference Rates Committee (ARRC) formally recommended the forward-looking term rates based on SOFR published by our subsidiary, CME Group Benchmark Administration Limited. The ARRC formalized this recommendation in July 2021. Through the end of 2022, we have licensed the CME Term SOFR to over 1,900 firms and over 7,000 users in more than 90 countries.

In 2010, CME Group acquired a majority stake in Dow Jones Indexes, which was combined with S&P's index business in 2012 to form S&P Dow Jones Indices LLC, of which CME Group now has a 27% ownership stake. S&P Dow Jones Indices LLC combines the world class capabilities of the S&P and Dow Jones Indices, and is a significant player in passive investing, including the exchange-traded fund (ETF) industry value chain. As part of the joint venture, we acquired a long-term, ownership-linked, exclusive license to list futures and options based on the S&P 500 Index and certain other S&P indices. We also act as the joint venture's licensing agent and distribution services provider. In 2022, we invested \$410.0 million in this joint venture to fund our portion of the acquisition of the IHS Markit indices business, which includes leading fixed income and credit indices, such as iBoxx, iTraxx and CDX.

In 2021, CME Group and IHS Markit established a 50/50 joint venture, OSTTRA. We contributed to OSTTRA our post-trade businesses (Traiana, TriOptima and Reset) and IHS Markit contributed its MarkitSERV business. OSTTRA serves as the leading optimization business and provider of progressive post-trade solutions for the global OTC markets across interest rate, FX, equity and credit asset classes. In February 2022, IHS Markit was acquired by S&P Global.

Deliver Unparalleled Customer Efficiencies and Operational Excellence - With changing regulatory requirements for many of our customers, including additional margin requirements on uncleared trades, and the need for greater efficiencies, we have added tools to enable customers to manage clearing positions in our markets in an efficient manner. With the ongoing implementation of regulatory reform in the United States and in Europe, along with global implementation of Basel III capital requirements on financial institutions, we expect centralized clearing and capital efficiencies to continue to be important for our global client base.

We provide a comprehensive multi-asset class clearing solution to market participants for maximum operational ease and the capital efficiency that comes with connecting to our clearing house. Our clearing services offer the ability to optimize collateral and capital efficiencies across portfolios within the clearing house while meeting the heightened regulatory requirements on derivatives. The majority of our clearing volumes and activities are related to our listed futures and options, which represents

the majority of our open interest and collateral held against these positions. We also offer clearing services for OTC interest rate swaps, FX forwards and commodity swaps.

CME Group provides various tools and services to assist customers with capital and operational efficiencies, including:

- CME Clearing provides compression via coupon blending as well as CME CORE, an interactive margin calculator that enables clients to optimize their capital by providing insights on margin requirements prior to trading.
- Portfolio margining allows firms to capitalize on margin offsets between futures, options and cleared OTC instruments with common risk factors.
- Cross-margining allows firms to achieve portfolio margin efficiencies for offsetting positions between two clearing houses, including CME and Fixed Income Clearing Corporation (FICC) or CME and Options Clearing Corporation (OCC), through reduced performance bond requirements.

Partnership with Google Cloud - In November 2021, we announced a 10-year strategic partnership with Google Cloud to accelerate CME Group's move to the cloud, which we expect will transform derivatives markets by expanding access and creating efficiencies for market participants. The partnership will focus on expanding access to CME Group's infrastructure, advancing real-time data and analytics capabilities, co-innovating new products and services, increasing efficiencies and driving resiliency in the financial markets' ecosystem. 2022 was a foundational year, where we built the Cloud platform and successfully migrated some applications. In 2023, we plan to accelerate our application migration, including launching and commercializing data products in the Cloud.

Patents, Trademarks and Licenses

We own the rights to a large number of trademarks, service marks, domain names and trade names in the U.S., Europe and other parts of the world. We have registered many of our most important trademarks in the U.S. and other countries. We hold the rights to a number of patents and have a number of patent applications pending. Our patents cover match engine, trader user interface, trading floor support, market data, general technology and clearing house functionalities. We also own copyrights to a variety of materials. Those copyrights, some of which are registered, include printed and online publications, websites, advertisements, educational materials, graphic presentations and other literature, both textual and electronic. We protect our intellectual property rights by relying on trademarks, patents, copyrights, database rights, trade secrets, restrictions on disclosure and other methods.

We offer equity index futures and options on key benchmarks, including S&P, Nasdaq, Dow Jones, FTSE Russell and fixed income index futures on the BSBY indexes. These products are listed by us subject to license agreements with the applicable owners of the indexes, some of which are exclusive. In connection with S&P Dow Jones Indices, we have a license agreement (S&P License Agreement) for certain S&P stock indexes and related trade names, trademarks and service marks in connection with the creation, marketing, trading, clearing and promoting of futures contracts and/or options on futures contracts that are indexed to certain S&P stock indexes. Our license for the S&P 500 Index will be exclusive for futures and options until one year prior to the termination of the S&P License Agreement, and non-exclusive for the last year. The license for the other S&P stock indexes is generally exclusive for futures and options. The term of the S&P License Agreement will continue until the date that is one year after the date that CME Group ceases to own at least 5% (accounting for dilution) of the outstanding interests in S&P Dow Jones Indices. Upon the occurrence of certain events, including certain terminations of the joint venture, the term may be extended up to an additional ten years. In connection with S&P Dow Jones Indices, we also have an exclusive license agreement (Dow Jones License Agreement) for certain Dow Jones indexes. The initial term of the agreement is through June 30, 2026. Following the initial term, the Dow Jones License Agreement will automatically renew for renewal terms of five years thereafter, so long as there is open interest in any of CBOT's or its affiliates' products based on one or more of the Dow Jones licensed indexes. In the event there is no open interest in any such products, then we may terminate the agreement. We also have an exclusive license agreement for certain Nasdaq indexes through 2029. In 2015, we entered into an exclusive license agreement with FTSE Russell and launched the E-mini Russell 2000 futures in 2017. We pay the applicable third-party, per-trade fees based on contract volume under the terms of these licensing agreements. A copy of the S&P License Agreement has been filed as a material contract.

CME Group is the owner of CME Term SOFR, a daily set of forward-looking interest rate estimates, calculated and published for 1-month, 3-month and 12-month tenors. CME Term SOFR was endorsed by the ARRC convened by the Federal Reserve Board and the New York Federal Reserve and the Board itself under its Final Rule published in January 2023, which Rule has generally designated CME Term SOFR as a replacement rate for USD LIBOR under the LIBOR Act.

We cannot guarantee we will be able to maintain the exclusivity of our licensing agreements with S&P, Dow Jones, Nasdaq and FTSE Russell or be able to maintain existing exclusive and non-exclusive licensing arrangements beyond the term of the current agreements or that any renewal will be on terms as favorable to us. In addition, we cannot guarantee that others will not succeed in creating stock index futures based on information similar to that which we own or have obtained by license, or that market participants will not increasingly use other instruments, including securities and options based on the S&P, Dow Jones,

Nasdaq or FTSE Russell indexes, to manage or speculate on U.S. stock risks. Parties also may succeed in offering indexed products that are similar to our licensed products without being required to obtain a license, or in countries that are beyond our and/or our licensors' jurisdictional reach.

Competition

The industry in which we operate is highly competitive and has seen multiple new entrants over time, and we expect competition to continue to intensify and become more global, especially in light of changes in the financial services industry driven by regulatory reforms such as the Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank), European Market Infrastructure Regulation (EMIR), EMIR 2.2, Markets in Financial Instruments Directive II (MiFID II), Capital Requirements Directive IV, Market Abuse Regulation, Benchmarks Regulation, Basel III and various other laws and regulations.

Please also refer to the discussion below and in "Item 1A - Risk Factors" beginning on page 15 for a description of competitive risks and uncertainties.

Competition in our Derivatives Exchange Business

We believe competition in the derivatives business is based on a number of factors, including, among others:

- brand and reputation;
- efficient and secure settlement, clearing and support services;
- depth and liquidity of markets;
- capital efficiencies;
- diversity of product offerings and frequency and quality of new product development and innovative services;
- ability to position and expand upon existing products to address changing market needs;
- efficient and seamless customer experience;
- transparency, reliability, anonymity and security in transaction processing;
- regulatory environment;
- connectivity, accessibility, flexibility in execution methods, and distribution;
- technological capability and innovation; and
- overall transaction costs.

We believe we compete favorably with respect to these factors. Our deep, liquid markets; diverse and complementary product offerings; frequency and quality of new product development; and efficient, secure settlement, clearing and support services, distinguish us from others in the industry. We believe that in order to maintain our competitive position, we must continue to expand globally; develop and offer new and innovative products; enhance our technology infrastructure, including its reliability, functionality and security; maintain liquidity and low transaction costs; continue to strengthen our risk management capabilities and solutions; and implement customer protections designed to ensure the integrity of our market and the confidence of our customers.

We compete in a large and expanding financial services trading, clearing and settlement marketplace globally. Our competitors include, among other entities, exchanges such as Intercontinental Exchange, Inc. (ICE), the Hong Kong Exchanges and Clearing Limited and Deutsche Börse AG. We have also seen the emergence of new players in the derivatives exchange business, in some cases backed by market makers and broker-dealers, as well as crypto platforms. Competition also includes alternative means of developing exposures through alternative instruments (depending on market factors) such as cash, OTC, ETFs, options, warrants, contracts for differences, structured products and other offerings and incorporates large customer and channel internalization of trade flows and data. New emerging competitors have targeted different segments of our industry, with multiple execution models and products, and emerging technologies will continue to offer additional alternative products in the future. Competition in our industry continues to be dynamic, and recent developments and alliances may result in a growing number of well-capitalized trading service providers that compete with all or a portion of our business.

Competition in our CME Clearing Business

In recent years there has been increased competition in the provision of clearing services, and we expect competition to continue to increase in connection with compliance with Dodd-Frank, EMIR 2.2, Basel III, MiFID II and other various laws and regulations.

Our competitors in the clearing services space include, among others, companies such as ICE, LCH Group, the OCC, CBOE Clear, Depository Trust & Clearing Corporation, Hong Kong Exchanges and Clearing, Japan Securities Clearing Corporation, LME Clearing and Deutsche Börse AG. In light of the implementation of new regulatory requirements and other financial

services reforms, we believe other exchanges and infrastructure providers also may undertake to provide clearing and other related post-trade services in the U.S. as CFTC-regulated clearing organizations.

We believe competition in clearing services is based on, among other things, the value of providing customers with capital and margin efficiencies; quality and reliability of the services; creditworthiness of the clearing house; regulatory costs; timely delivery of the services; reputation; diversity of the service offerings; confidentiality of positions and information security protective measures; and the fees charged for the services provided.

Competition in our Cash Markets Business

The cash markets businesses face substantial competition across a wide and growing array of venues. In FX, the marketplace is highly fragmented, and there is competition from other electronic communication networks, single-dealer platforms, bank-owned multi-participant platforms, streaming and request for quote services, trading venues tied to data platforms, voice brokers, other broker enabled platforms and other venues. There is a growing array of platforms and technologies, often owned by well-capitalized financial institutions and intermediaries that are also driving internalization of client FX trade flows. In the fixed income space, there are also multiple providers of treasury, European and U.S. repo, and European bond trading, as well as other products such as corporate bonds, municipal bonds, mortgage-backed bonds and agencies, and a multitude of competitors and new entrants offering single-dealer liquidity, bank-owned multi-participant platforms, streaming and request for quote services, and other broker and exchange-enabled platforms.

Competition in our Market Data Business

Technology companies, market data and information vendors and front-end software vendors also represent actual and potential competitors because they have their own substantial market data calculation and distribution capabilities that could serve as alternative means for receiving open market data feeds instead of connecting directly to our exchange. Multiple other industry participants offer both referential and indicative pricing alternatives to CME offerings, which are widely distributed and available across a variety of media. Distributors and consumers of our market data also may use our market data as an input into products that compete against our traded or cleared products. Although we may receive license fees for such products, such fees may not offset the impact of any loss in revenue from our comparable product.

Regulatory Matters

Our businesses are regulated and serve a customer base that includes regulated market participants, and as such, we are subject to extensive regulation, primarily in the United States and Europe. Developments in the regulatory environment therefore have the potential to significantly affect our businesses.

Please also refer to the discussion below and in "Item 1A - Risk Factors" beginning on page 15 for a description of regulatory and legislative risks and uncertainties.

Regulation of our Derivatives Business, CME Clearing and our SEF

Our operation of U.S. futures exchanges, CME Clearing and our SEF is subject to extensive regulation by the CFTC that requires our regulated subsidiaries to satisfy the requirements of certain core principles relating to the operation and oversight of our markets and our clearing house. The CFTC carries out the regulation of the futures and swaps markets and clearing houses in accordance with the provisions of the Commodity Exchange Act as amended by, among others, the Commodity Futures Modernization Act and Dodd-Frank.

Regulations implementing Dodd-Frank include rules relating to the implementation of mandatory clearing of certain OTC derivatives, swap reporting, operation of a clearing house, anti-manipulation, large trader reporting, product definitions, the definition of an agricultural commodity and certain provisions of the rules applicable to designated contract markets, swap execution facilities and swap data repositories.

CME has been designated as a systemically important financial market utility and a systemically important derivatives clearing organization. These designations carry with them additional regulatory oversight of certain of our risk-management standards and clearing and settlement activities by the CFTC and the Federal Reserve Board.

In connection with the global offering of our products and clearing services, this business is also subject to the rules and regulations of the local jurisdictions in which we conduct business, including the European Securities and Markets Authority (ESMA), the U.K. Financial Conduct Authority (FCA) and Bank of England, the Netherlands Authority for the Financial Markets (AFM) and the Federal Financial Supervisory Authority (BaFin) in Germany, among others.

Regulation of our Cash Markets Business

The operation of BrokerTec subjects us to regulation by the Financial Industry Regulatory Authority (FINRA) and the U.S. Securities and Exchange Commission (SEC) as a broker-dealer and alternative trading system operator. It also subjects us to regulation by authorities in the E.U. as a multilateral trading facility and regulated market and by the applicable regulators in

Singapore and Canada. Our EBS business holds various permissions, approvals and exemptions globally, including those that subject certain of its activities to CFTC, FCA, AFM, Monetary Authority of Singapore, Australian Securities and Investments Commission and Hong Kong Monetary Authority oversight.

The settlement of matched principal and exchange-traded businesses requires access to clearing houses either directly or through third-party providers of clearing and settlement services. BrokerTec Americas is a member of the Fixed Income Clearing Corporation, through which it clears U.S. Treasury and repo products.

Regulation of our Market Data Business

Our subsidiary, CME Group Benchmark Administration, is a registered benchmark administrator, authorized and supervised by the FCA under the UK Benchmark Regulations. CME Group Benchmark offers a variety of different multi-asset class data products, including CME Term SOFR.

Key Areas of Focus

We actively monitor and participate in the domestic and international legislative and rulemaking processes for our industry, including providing government testimony, commenting on proposed legislation and rulemaking, and educating our regulators and policymakers on potential impacts to the marketplace. We are also focused on the U.S. Presidential administration and its federal regulatory appointees and any anticipated changes that may result.

Our key areas of focus in the regulatory environment are:

- The implementation of a transaction tax or user fee in the U.S., U.K. or E.U., or in the States of Illinois or New Jersey, which could discourage institutions and individuals from using our markets or products or encourage them to trade in another less costly jurisdiction. Legislation to impose a financial transaction tax has been proposed previously in the U.S. Congress, Illinois General Assembly and State of New Jersey Legislature. Additionally, from time to time, including this fiscal year, the proposed U.S. Presidential budget request has included a proposal to impose a user fee to fund all or a portion of the budget of the CFTC. Legislation would be necessary to impose such a fee. Federal legislation was also recently proposed by Congress that would impose a user fee on digital asset spot markets to fund CFTC regulation of those assets. Such a user fee, if adopted, could potentially be expanded to apply more broadly to the futures and options markets.
- Legislation that proposes to eliminate the 60/40 tax treatment of certain of our futures and options contracts, which would result in 60% of the gains being taxed at the short-term capital gain rate instead of the long-term capital gain rate. This would impose a significant increase in tax rates applicable to certain market participants and could result in a decrease in their trading activity.
- Certain provisions in relation to the E.U. Regulations on Benchmarks have yet to come into effect, and prices and data provided by CME Group for use by E.U. supervised entities and use of those benchmarks may be impacted.
- Concerns that European legislators will prohibit or restrict exclusive licenses for benchmark indexes, which might impact the profitability of several of our most popular contracts.
- The implementation of rules resulting in negative treatment of the liquidity profile of U.S. Treasury securities, including as qualifying liquidity resources, or any potential limitation on the use of U.S. Treasury securities as collateral could result in increased costs to us and our clearing firms.
- The outcome of the debate regarding the regulation of cryptocurrencies, which may impact our existing offerings or our ability to provide future offerings.
- New regulations governing treasury market structure, including potential clearing obligations or promotions of all-to-all cash treasury models. The SEC has issued a rule proposal regarding central clearing of U.S. Treasury securities and repurchase agreements; how the SEC finalizes this rule could have an impact on trading in our markets.
- The potential for regulatory or policy actions that could result in changes to market structure for the clearing of derivative transactions, which may impact our business model or the competitive landscape of the industry.

Please also see "Item 1A - Risk Factors" beginning on page 15 for additional information on our areas of regulatory risks.

Human Capital Management

We rely on a highly skilled and experienced global workforce to meet our business objectives. As of December 31, 2022, our global employee population consisted of approximately 3,460 staff, with 66% (approximately 2,280) of these employees working in the United States. and the remaining 34% (approximately 1,180) working in our various non-U.S. locations (Australia, Brazil, Canada, China, France, Hong Kong, India, Israel, Japan, Netherlands, Singapore, South Korea, Sweden, Switzerland and the U.K.).

We recognize that fostering a diverse and inclusive global culture is critical to our business success. We provide our workforce with a compelling employee experience that allows us to attract, retain and develop industry-leading talent. We are continually seeking new ways to challenge, develop and support our employees. Select highlights of our employee experience include the following:

- We offer a wide range of benefits designed to support our employees' health and well-being, retirement needs, and work/life balance.
- We provide a variety of avenues for employees to grow their expertise, including tuition assistance for continuing education, onsite professional development training courses, access to external seminars and technical skills training, as well as an integrated series of leadership development programs to prepare employees for each stage of their careers.
- Our competitive compensation programs align employee rewards with shareholder interests and emphasize our pay-for-performance philosophy.
- Our Employee Resource Groups (ERGs) are essential to fostering an inclusive culture grounded in mutual respect. All employees are eligible to join our ERGs and employees are encouraged to form new ERGs that align with our shared mission and values, creating communities around professional and personal interests.

We conduct regular employee engagement surveys and we monitor our performance against specific voluntary turnover, open role placement and internal promotion metrics to understand where further workforce investments may be necessary. During fiscal year 2022, our performance against these metrics was:

- 10.2% voluntary turnover
- 43.7% of open roles filled with internal candidates
- 21.5% of employees promoted

Diversity and Inclusion

At CME Group, we embrace an exchange of ideas driven by the rich diversity of our people, cultures and experiences. We know that when our employees bring their authentic selves to work each day, it makes our business and our culture that much stronger. Leveraging the collective mix of perspectives and insights that our individual backgrounds bring, we can continually provide our global clients with innovative products and solutions, strengthen our competitive advantage and best serve the communities in which we live and work.

We have anchored our commitment to diversity and inclusion by incorporating it into our corporate goals, and our Chief Human Resources Officer provides our senior management and Board with regular updates. Our Diversity and Inclusion (D&I) Council is responsible for driving our corporate D&I strategy. Members of our management team and employees from across our global workforce serve on the Council, representing a wide variety of backgrounds and perspectives.

For more information regarding our sustainability practices and to review our annual Corporate Citizenship & Sustainability Reports, including our report for 2022 when issued, please visit: <https://www.cmegroup.com/company/corporate-citizenship/esg.html>. Information made available on our website does not constitute a part of this Annual Report on Form 10-K.

Information about our Executive Officers

The following are CME Group's executive officers. Ages are as of February 8, 2023.

Terrence A. Duffy, 64. Mr. Duffy has served as our Chairman and Chief Executive Officer since 2016. Mr. Duffy previously served as our Executive Chairman and President since 2012 and as Executive Chairman from 2006. Mr. Duffy has been a member of our board of directors since 1995. He also served as President of TDA Trading, Inc. from 1981 to 2002 and has been a member of our CME exchange since 1981.

Sunil Cutinho, 51. Mr. Cutinho has served as our Chief Information Officer since February 2022 and previously served as President of CME Clearing since 2014. He joined CME Group in 2002 and since then has held various positions of increasing responsibility within the organization, including as Managing Director, Deputy Head of CME Clearing from April 2014 through September 2014.

Lynne Fitzpatrick, 44. Ms. Fitzpatrick has served as Senior Managing Director & Deputy Chief Financial Officer since February 2022. She previously served as Managing Director of Corporate Development and Treasurer of CME Group since 2017, leading the company's business development, mergers and acquisitions, CME Ventures and corporate treasury functions. Since joining the company in 2006, Ms. Fitzpatrick has held a variety of positions with increasing levels of responsibility within the finance organization. Prior to CME Group she worked as an investment banker at Credit Suisse and UBS.

Julie Holzrichter, 54. Ms. Holzrichter has served as our Senior Managing Director, Chief Operating Officer since 2014 and in February 2022, her role expanded to oversee Global Operations and CME Clearing. She previously served as our Senior Managing Director, Global Operations from 2007. Ms. Holzrichter rejoined us in 2006 as our Managing Director, CME Globex Services and Technology Integration. Ms. Holzrichter previously held positions of increasing responsibility in our organization from 1986 to 2003 in trading operations. Ms. Holzrichter also serves as a director of Constellation Energy Corporation.

Jonathan Marcus, 54. Mr. Marcus has served as our Senior Managing Director and General Counsel since October 2022. Prior to joining CME Group, Mr. Marcus most recently worked in private practice as a partner at Reed Smith LLP, where he specialized in derivatives regulation, litigation and enforcement. He previously served as General Counsel of the CFTC from 2013 to 2017. Mr. Marcus also served as the CFTC's Deputy General Counsel for Litigation and as an Assistant to the Solicitor General of the United States. His career also includes senior roles at other nationally recognized law firms and he began his career as a clerk for Judge Jose Cabranes of the U.S. Court of Appeals for the Second Circuit.

Tim McCourt, 44. Mr. McCourt has served as Senior Managing Director, Global Head of Equity and FX Products since February 2022. He is responsible for leading the development and execution of the company's global equity index, foreign exchange, cryptocurrency and alternative investment product strategies. He serves on the CME Ventures Investment Committee and the S&P Dow Jones Indices U.S. Advisory Panel. Before joining CME Group in 2013 as Global Head of Equity Products, Mr. McCourt worked for the Royal Bank of Scotland (RBS), where he was responsible for building and managing the Americas Index and Delta One trading book. Prior to RBS, he held a senior trading role with JPMorgan in New York, spending 10 years with the Equity Derivatives Group.

Hilda Harris Piell, 55. Ms. Piell has served as Senior Managing Director and Chief Human Resources Officer since 2007. A practicing attorney for seventeen years, Ms. Piell previously held positions of increasing responsibility in our Legal & Market Regulation division, most recently as Managing Director and Senior Associate General Counsel. Prior to joining CME Group in 2000, Ms. Piell served as Associate Commercial Counsel at MCI Telecommunications (1996-2000) and Associate Litigation Attorney at Jenner & Block (1992-1996). Her career also includes service as a clerk for a judge of the U.S. District Court for the Northern District of Illinois.

John W. Pietrowicz, 58. Mr. Pietrowicz has served as Senior Managing Director and Chief Financial Officer since 2014. Previously, Mr. Pietrowicz served as our Senior Managing Director, Business Development and Corporate Finance since 2010. Mr. Pietrowicz joined us in 2003 and since then has held various positions of increasing responsibility, including Managing Director and Deputy Chief Financial Officer from 2009 to 2010 and Managing Director, Corporate Finance and Treasury from 2006 to 2009. Mr. Pietrowicz also serves as a director of S&P Dow Jones Indices LLC and on the board of the World Federation of Exchanges. Mr. Pietrowicz announced his plans to retire in 2023 and Ms. Fitzpatrick will succeed him.

Derek Sammann, 54. Mr. Sammann has served as our Senior Managing Director, Global Head of Commodities and Options and International Markets since November 2021 and previously served as our Senior Managing Director, Commodities and Options Products since 2014. He previously served as our Senior Managing Director, Financial Products and Services since 2009 and Global Head of Foreign Exchange Products since joining us in 2006. Prior to joining us, Mr. Sammann served as Managing Director, Global Head of FX Options and Structured Products at Calyon Corporate and Investment Bank in London from 1997 to 2006.

Suzanne Sprague, 42. Ms. Sprague has served as Senior Managing Director & Global Head of Clearing and Post-Trade Services for CME Group since February 2022. She joined the company in 2002 and has held numerous roles and leadership positions in financial management and risk management since that time. During her tenure, she has played a key role in the company's development of risk management policy. Since 2015, she served as Managing Director, Credit & Liquidity Risk, Risk Policy & Banking, overseeing CME Clearing's exposure to counterparty credit risk, liquidity risk management and financial performance, acceptable collateral and collateral services, risk management policies and procedures, financial operations, and banking.

Jack Tobin, 59. Mr. Tobin has served as Managing Director and Chief Accounting Officer since 2015. Mr. Tobin most recently served as our Managing Director, Corporate Finance since 2007. Prior to our merger with CBOT Holdings, Mr. Tobin served as the Director, Corporate Finance for CBOT Holdings and CBOT from 2002 to 2007. Prior to joining CBOT, Mr. Tobin served as a principal consultant with PricewaterhouseCoopers from 1997 to 2002. Mr. Tobin is a registered certified public accountant.

Sean Tully, 59. Mr. Tully has served as Senior Managing Director, Global Head of Rates and OTC Products since February 2022. He previously served as Senior Managing Director, Financial and OTC Products of CME Group since 2014 and as Senior Managing Director, Interest Rates and OTC Products during 2014. Prior to these roles, he served as Managing Director, Interest Rate and OTC Products since 2013 and as our Managing Director, Interest Rate Products since joining us in 2011. Before joining the company, Mr. Tully most recently served as Managing Director, Global Head of Fixed Income Trading at WestLB in London.

Kendal Vroman, 51. Mr. Vroman has served as our Senior Managing Director, Chief Transformation Officer since November 2021. He previously served as Senior Managing Director, International and Optimization Services since February 2020 and as our Senior Managing Director, Cash Markets and Optimization Service since 2018. Since joining the company in 2001, he has held a variety of senior leadership roles, including Managing Director, Planning and Execution; Global Head, Commodity Products and OTC Solutions, and Managing Director and Chief Corporate Development Officer. Prior to joining us, Mr. Vroman most recently served as Vice President, Corporate Operations/Chief of Staff to the Chief Executive Officer for marchFirst Inc.

Julie Winkler, 48. Ms. Winkler has served as our Senior Managing Director, Chief Commercial Officer since 2016. She leads the company's sales, product marketing, research and product development, data analytics, and innovation lab functions, as well as the data services business line. She previously served as Senior Managing Director, Research and Product Development and Index Services of CME Group since 2014 and as Managing Director, Research and Product Development since 2007. Prior to our merger with CBOT Holdings, Ms. Winkler held positions of increasing responsibility for CBOT Holdings since 1996. Ms. Winkler also serves as a director of S&P Dow Jones Indices LLC.

AVAILABLE INFORMATION

Our website is www.cmegroup.com. Information made available on our website does not constitute part of this document. We make available on our website our Annual Reports on Form 10-K, Quarterly Reports on Form 10-Q, Current Reports on Form 8-K and amendments to those reports as soon as reasonably practicable after we electronically file or furnish such materials to the SEC. Our corporate governance materials may also be found on our website. The SEC also maintains an Internet site that contains reports, proxy and information statements, and other reports that we file or furnish with the SEC at <http://www.sec.gov>. Copies of these materials also are available to shareholders free of charge upon request to Shareholder Relations, officeofthesecretary@cmegroup.com. Information regarding our sustainability practices is available in our annual Corporate Citizenship & Sustainability Reports, including our report for 2022 when issued, at the following: <https://www.cmegroup.com/company/corporate-citizenship/esg.html>.

ITEM 1A. RISK FACTORS

In addition to the other information contained in this Annual Report on Form 10-K, you should carefully consider the factors discussed below, which are the risks we believe are material at this time. These risks could materially and adversely affect our business, financial condition and results of operations. These risks and uncertainties are not the only ones facing us. Additional risks and uncertainties not presently known to us or that we currently believe to be immaterial may also adversely affect our business.

RISKS RELATING TO OUR INDUSTRY

Our business is subject to the impact of global market, economic and political conditions that are beyond our control and that could significantly impact our business and make our financial results more volatile.

Our revenue is substantially derived from fees for transactions executed and cleared in our markets. The trading volumes in our markets are directly affected by domestic and international factors that are beyond our control, including:

- economic, political and geopolitical market conditions, including the instability caused by the war between Russia and Ukraine;
- legislative and regulatory changes, including any direct or indirect restrictions on or increased costs associated with trading in our markets or our clearing services;
- broad trends in the industry and financial markets;
- changes in price levels, trading volumes and volatility in the derivatives, cash and over-the-counter (OTC) markets and in their underlying markets;
- shifts in demand or supply in commodities underlying our products;
- competition;
- changes in government monetary policies, including central bank decisions related to quantitative easing and the U.S. Federal Reserve and other international banks' forecasted interest rates;
- availability of capital to our market participants and their appetite for risk-taking;
- levels of assets under our customers' management;
- volatile weather patterns, droughts, natural disasters and other catastrophes;
- pandemics affecting our customer base or our ability to operate our markets; and
- consolidation or expansion in our customer base and within our industry.

Any one or more of these factors may contribute to reduced activity in our markets. Historically, periods of heightened uncertainty have tended to increase our trading volume due to increased hedging activity and the increased need to manage the risks associated with, or speculate on, volatility. However, as evidenced by our past performance, in the period after a material market disturbance, there may persist extreme uncertainties, which may lead to decreased volume due to factors such as reduced risk exposure, lower interest rates, central bank asset purchase programs and lack of available capital. The shifts in market trading patterns we experienced as a result of the financial crisis of 2008 may or may not recur in the future, and our business will be affected by future economic uncertainties, which may result in decreased trading volume and a more challenging business environment for us. A reduction in overall trading volume or in certain products could render our markets less attractive to market participants as a source of liquidity, which could result in further loss of trading volume and associated transaction-based revenue. Material decreases in trading volume would have a material adverse effect on our financial condition and operating results.

Please see "Item 1A - Risk Factors - Risks Relating To Our Business" beginning on page 19 for additional information.

We operate in a heavily regulated environment that imposes significant costs and competitive burdens on our business, and our failure to maintain compliance with regulations, our status as a regulated entity, or BrokerTec Americas' status as a member in good standing at FICC, could result in the loss of customers, fines or other consequences to our regulated status.

We are primarily subject to the jurisdiction of the regulatory agencies in the U.S., U.K. and European Union. As a result of our global operations, we are also subject to the rules and regulations of other local jurisdictions in which we conduct business and offer our products and services, as appropriate.

Our businesses and those of many of our clients have been and continue to be subject to extensive legislation and regulatory scrutiny, and we face the risk of continued increasing oversight and changes to our regulatory environment and business in the future and have incurred and expect to continue to incur significant costs to comply. Additional new laws or regulations or changes in enforcement practices applicable to our businesses or those of our clients could be imposed in the U.S. or other jurisdictions, which could change, or require us to change, our business practices or the structure of our business, including its current governance, risk oversight or regulatory structure, or impose significant costs on us by, for example, requiring more of our funds to be set aside for the guaranty fund or to meet other compliance requirements. This could adversely affect our ability to compete effectively with other institutions that are not affected in the same way or impact our clients' overall trading volume and demand for our market data and other services. Additionally, regulations imposed on financial institutions or market participants generally may adversely impact their trading activity in our markets. To the extent the legislative and regulatory environment becomes more onerous for us to comply or less beneficial for us or our customers, our business, financial condition and operating results could be negatively affected.

Legislation may be proposed, both domestically and internationally, that could add a transaction tax on our products or change the way our market participants are taxed on the products they trade on our markets. If such proposals were to become law, they could have a negative impact on our industry and on us by making transactions more costly to market participants, which may reduce trading and could make our markets less competitive, with a resulting negative impact on our business, financial condition and operating results.

If we fail to comply with applicable laws, rules or regulations, we may be subject to censure, fines, cease-and-desist orders, suspension of our business, removal of personnel or other sanctions, including revocation of our designations as a contract market, derivatives clearing organization, swap execution facility, swap data repository, broker-dealer, multilateral trading facility or other regulatory status.

Our broker-dealer and multilateral trading facility businesses, BrokerTec and EBS, are also extensively regulated in various jurisdictions. These regulatory obligations generally include proper licensing and qualification of the firms and individuals, substantive conduct standards, communication and disclosure rules, monitoring and surveillance, training, capital requirements, supervisory obligations, maintenance of anti-money laundering programs, suspicious activity reporting, risk management standards, trade reporting, and ongoing examinations and reviews. The risks from failing to comply with these regulatory obligations include potential liability and/or disciplinary action against the firm and individuals, monetary penalties and restrictions on future activities.

BrokerTec Americas' matched principal platform facilitates anonymous trading in significant volumes from wholesale market participants, many of which are FICC members and understand that BrokerTec Americas is also a FICC member, such that their trades are expected to be novated promptly to FICC, which will be their ultimate counterparty. A failure of BrokerTec Americas to maintain its membership could adversely impact the willingness of such participants to continue trading on our platform. As part of maintaining its FICC membership, BrokerTec Americas is required to timely and fully meet all margin calls and other obligations established by FICC, and as such must maintain ready access to sufficient liquidity to satisfy those obligations. BrokerTec Americas maintains access to liquidity resources it believes will satisfy these obligations in normal and stressed circumstances, but there can be no guarantee it will never experience a shortfall.

Please see "Item 1 - Business - Regulatory Matters" beginning on page 11 for additional information on our areas of regulatory focus.

Some of CME Clearing's largest clearing firms have indicated their belief that clearing facilities should not be owned or controlled by exchanges and should be operated as utilities and not for profit. These clearing firms have sought, and may seek in the future, legislative or regulatory changes that would, if adopted, enable them to use alternative clearing services for positions established on our exchanges or to freely move open positions among clearing houses in order to take advantage of our liquidity. Even if they are not successful, these factors may cause them to limit the use of our markets.

Our clearing house seeks to offer customers, intermediaries and clearing firms universal access in order to maximize the efficient use of capital, exercise appropriate oversight of value at risk and maintain operating leverage from clearing activities on our exchanges. Our strategic business plan for our futures and options business is to operate an efficient and transparent vertically integrated transaction execution, clearing and settlement business. Some of our clearing firms have expressed the view that clearing firms should control the governance of clearing houses or that clearing houses should be operated as utilities rather than as part of for-profit enterprises. Some of these firms, along with certain industry associations, have sought, and may seek in the future, legislative or regulatory changes to be adopted that would facilitate mechanisms or policies that allow market participants to transfer positions of futures or options from an exchange-owned clearing house to a clearing house owned and controlled by clearing firms. If these legislative or regulatory changes are adopted, our business, financial condition and operating results could be adversely affected.

We face intense competition from other companies. If we are not able to successfully compete, our business, financial condition and operating results will be materially harmed.

Our industry is highly competitive, and we expect competition to continue to intensify. We encounter competition in all aspects of our business, including from entities having substantially greater capital and resources, offering a wide range of products and services and in some cases operating under a different and possibly less stringent regulatory regime. We face competition from other futures, securities and securities option exchanges; OTC markets; clearing organizations; consortia formed by our members and large industry participants; swap execution facilities; alternative trade execution facilities; technology firms, including market data distributors and electronic trading system developers; and others. Our competitors and potential competitors may have greater financial, marketing, technological and personnel resources than we do.

Our competitors may:

- respond more quickly to competitive pressures and opportunities, including responses based upon their corporate governance structures, which may be more flexible and efficient than our corporate governance structure;
- develop products that are preferred by our customers compared to those offered by CME Group;
- develop risk transfer products that compete with our products;
- price their products and services more competitively;
- develop and expand their network infrastructure and service offerings more efficiently;
- utilize better, more user-friendly or more reliable technology;
- take greater advantage of acquisitions, alliances and other opportunities that provide a competitive advantage;
- more effectively market, promote and sell their products and services;
- better leverage existing relationships with customers and alliance partners or exploit better recognized brand names to market and sell their services; or
- exploit regulatory disparities between traditional, regulated exchanges and alternative markets that benefit from a reduced regulatory burden and lower-cost business model.

If our products, markets and services are not competitive or are viewed as less competitive, our business, financial condition and operating results could be adversely affected. A decline in our fees or loss of customers could lower our revenues, which would adversely affect our profitability.

Please see "Item 1 - Business - Competition" beginning on page 10 for additional information on the competitive environment and its potential impact on our business.

Our trading volume, and consequently our revenues and profits, would be adversely affected if we are unable to retain our current customers at substantially similar trading levels or attract new customers.

The success of our business depends, in part, on our ability to maintain and increase trading volume in our markets. To do so, we must maintain and expand our product offerings, our customer base and our trade execution facilities, our pre-and post-trade services and clearing facilities. Our success also depends on our ability to offer

competitive prices and services in an increasingly price-sensitive business. For example, some of our competitors have engaged in aggressive pricing strategies in the

past, such as lowering the fees they charge for taking liquidity and increasing liquidity payments or rebates. We cannot provide assurances that we will be able to continue to expand our products and services, that we will be able to retain our current customers or attract new customers or that we will not be required to modify our pricing structure to compete effectively. Changes in our pricing structure may result in a decrease in our profit margin.

Our clearing firm clients must meet certain capital requirements and must deposit collateral to meet performance bond and guaranty fund requirements. There is no guarantee the collateral deposited will continue to maintain its value. To the extent a clearing firm were to experience a decrease in capital and be unable to meet requirements, it may be required to decrease its trading activity.

Additionally, from time to time, certain customers may represent a significant portion of the open interest in our individual product lines or contracts, and a substantial decrease in their trading activity could have a negative impact on the liquidity of the particular product line or contract.

If we fail to maintain trading volume, as a result of a loss of customers or decrease in trading activity; expand our product offerings or execution facilities; or are unable to attract new customers, our business and revenues will be adversely affected. Declines in trading volume may also negatively impact market liquidity, which could lead to further loss of trading volume. Because our cost structure is largely fixed, if demand for our products and services and our resulting revenues decline, we may not be able to adjust our cost structure on a timely basis, and our profitability could be adversely affected.

Our role in the global marketplace places us at greater risk than other public companies for a cyber attack and other cyber-security risks. Our technology, our customers and our people and those of our third-party service providers may be vulnerable to cyber-security threats, which could result in wrongful use of our data or our customers' data or cause interruptions in our operations that cause us to lose customers and trading volume and result in substantial liabilities. We also could be required to incur significant expense to protect or remediate damage to our systems and/or investigate any alleged attack.

We regard the secure storage and transmission of data and the ability to continuously transact and clear on our electronic trading platforms as critical elements of our operations and our operational resiliency. Our technology, our customers, our people and those of our third-party service providers may be vulnerable to targeted attacks, such as "phishing" attacks, unauthorized access, fraud, computer viruses, denial of service attacks, terrorism, "ransomware" attacks, firewall or encryption failures or other security or operational risks. Criminal groups, political activist groups and nation-state actors have targeted the financial services industry in general, including as a result of the Russian and Ukraine war, and our role in the global marketplace places us at greater risk than other public companies for a cyber attack and other information security threats. While we have not experienced cyber incidents that are individually, or in the aggregate, material, we have experienced cyber attacks of varying degrees in the past.

Our usage of mobile, web, and cloud technologies, such as those pursuant to our partnership with Google Cloud, may increase our risk of a cyber attack. Our security defenses may also be impacted or breached due to employee error, malfeasance, system errors or vulnerabilities. Additionally, outside parties may attempt to fraudulently induce employees, users, or customers to disclose sensitive information in order to gain access to our technology systems and data, or our customers' data. Any such breach or unauthorized access could result in significant legal and financial exposure, damage to our reputation, and a loss of confidence in the services we provide that could potentially have an adverse effect on our business, while resulting in regulatory penalties or the imposition of additional obligations by regulators or others. The regulatory environment related to information security, privacy, data collection and data usage is increasingly rigorous and complex, and any failure to comply may carry significant penalties and reputational damage.

We have designed our cyber defense program to mitigate such attacks and security risks through administrative, physical and technical safeguards. As part of our global information security and privacy programs, we employ resources to prevent, detect and respond to cyber-attacks and security risks that could impact our people, processes and technology infrastructure, including rapid response to zero-day vulnerabilities. However, our security measures or those of our third-party providers, including any cloud-based technologies, such as those pursuant to our partnership with Google Cloud, may prove insufficient depending upon the attack or threat posed. Any security attack or breach could result in system failures and delays, malfunctions in our operations, loss of customers or lower trading volume, loss of competitive position, damage to our reputation, disruption of our business, legal liability or regulatory fines and significant costs, which in turn may cause our revenues and earnings to decline. Though we have insurance against certain cyber and privacy risks and attacks, we may be subject to litigation and financial losses that exceed our policy limits or are not covered under any of our current insurance policies.

As a financial services provider, we are subject to significant litigation risk and regulatory liability and penalties.

Many aspects of our business present substantial litigation risks. These risks include, among others, potential liability from disputes over terms of a trade, the claim that a system failure or delay caused monetary losses to a customer, that we entered into an unauthorized transaction, that we provided materially false or misleading statements in connection with a transaction or

that we failed to effectively fulfill our regulatory oversight responsibilities. We may be subject to disputes regarding the quality of trade execution, the settlement of trades or other matters relating to our services. We may become subject to these claims as a result of failures or malfunctions of our systems and services we provide. We could incur significant legal expenses defending claims, even those without merit. In addition, an adverse resolution of any future lawsuit or claim against us could have a material adverse effect on our business and our reputation. To the extent we are found to have failed to fulfill our regulatory obligations, we could lose our authorizations or licenses or become subject to conditions that could make future operations more costly and impair our profitability. Such events could also result in customer dissatisfaction and a decline in their willingness to trade on our markets.

We may be at greater risk from terrorism, which poses physical security risks and cyber-security risks, than other companies.

Given our role in the global financial services industry, we may be more likely than other companies to be a direct target of, or an indirect casualty of, attacks by terrorists or terrorist organizations. It is impossible to accurately predict the likelihood or impact of any terrorist attack on our industry generally or on our business. While we have implemented significant physical security protection measures, business continuity plans, and established backup sites to provide operational resiliency, in the event of an attack or a threat of an attack, these security measures and contingency plans may be inadequate to prevent significant disruptions in our business, technology or access to the infrastructure necessary to maintain our business. Such an attack may result in harm to our personnel or the closure of our facilities or render our backup data and recovery systems inoperable. Damage to our facilities due to terrorist attacks may be significantly in excess of any amount of insurance coverage available, or we may not be able to insure against such damage at a reasonable price or at all. The threat of terrorist attacks also may negatively affect our ability to attract and retain employees. Any of these events could have a material adverse effect on our business, financial condition, and operating results.

RISKS RELATING TO OUR BUSINESS

The COVID-19 pandemic has negatively affected the global economy, including the U.S. economy and the global financial markets, and has disrupted our business and our clients' businesses. The ultimate impact from COVID-19, including duration, is unknown and could have an adverse effect on our business, financial condition and results of operations.

The COVID-19 pandemic continues to cause disruptions in the international and U.S. economies and financial markets. The spread of COVID-19 has caused illness, quarantines, cancellation of events and travel, business and school shutdowns, reduction in business activity and financial transactions, labor shortages, employee attrition, supply chain interruptions and overall economic and financial market instability in the U.S. Similar impacts also had been experienced throughout the world, including in every country in which we do business. Given the unique and unpredictable nature of this event, future impacts to our business are unknown and could be material. Those impacts may include, among others, the following:

- Disruption to our business and operations;
- Key members of senior management or a significant number of our employees being unable to work as a result of contracting COVID-19 or related illnesses;
- Impacts on our third-party suppliers and their ability to fulfill their obligations to us;
- Decreased trading volume and unprecedented market stresses in global financial markets;
- Changes in demand for our products and services, based upon fiscal, monetary, and trade policies adopted in response to the economic impact of the pandemic;
- Reduced economic activity generally, which could cause businesses to have less need to hedge in our markets; and
- Increased financial and operational stress experienced by our clearing firm members due to unprecedented volatility or downturn, including significant losses that may result in a reduction of business or a default.

These potential impacts may exist for a significant period of time and may adversely affect our business, financial condition, and results of operations even if the COVID-19 pandemic becomes endemic.

Moreover, since implementing broad work-from-home measures during the pandemic, we have an increased dependency on remote equipment and connectivity infrastructure to access critical business systems that may be subject to failure or disruption of availability, which could negatively impact our business operations. Further, we have been subject to increased phishing and other social engineering attempts by malicious actors to manipulate individuals into divulging confidential or personal information or access to our networks. If our cybersecurity diligence and efforts to offset the increased risks associated with this greater reliance on mobile, collaborative and remote technologies are not effective or successful, we will be at increased risk for cyber security or data privacy incidents.

The extent to which COVID-19 further impacts our business, results of operations or financial condition will depend on future developments, which are highly uncertain and difficult to predict, but may include, among others, the duration and spread of the

virus, including through new variant strains, its severity, the actions taken by governments and other third parties to contain the virus or treat its impact, such as vaccination, and the effect of such actions on our business practices, the impact of any future federal stimulus measures, and the pace at which, and the extent to which, normal economic and operating conditions resume.

In addition, many of the other risk factors described herein could be heightened by the effects of COVID-19 and related economic conditions, which could result in a material impact on our results of operations, financial condition and liquidity.

Damage to our reputation or brand could harm our business.

Maintaining our reputation and brand is critical to attracting and retaining customers, investors and employees and to maintaining our relationships with our regulators and other government officials. Negative publicity regarding our company or actual, alleged or perceived issues regarding our company, products or services, including social and environmental concerns relating to our company or certain commodity products and increased impact from climate change or criticism or market reaction to the performance of our market in periods of extreme volatility, could give rise to reputational risk, which could significantly harm our business prospects. These issues may include, but are not limited to, any of the risks discussed in this Item 1A, including risks from customer disputes, system failures or intrusions, failures to meet our regulatory obligations, failures of a clearing firm or other counterparty, issues relating to our third-party suppliers, alleged or actual fraud or misconduct or manipulative activity, or ineffective risk management.

The success of our markets depends on our ability to complete development of, successfully implement and maintain the electronic trading and clearing systems that have the functionality, performance, availability and resilience, capacity, security and speed required by our customers.

The success of our business depends in large part on our ability to create interactive electronic marketplaces for a wide range of products that have the required functionality, performance, availability and resilience, capacity, security and speed to attract and retain customers. In 2022, 93% of our overall contract volume was generated through electronic trading on our CME Globex electronic platform.

We must continue to enhance our electronic trading platforms and other technology offerings to remain competitive. As a result, we will continue to be subject to risks, expenses and uncertainties encountered in the rapidly evolving market for electronic transaction services. These risks include our failure or inability to:

- provide reliable and cost-effective services to our customers;
- develop, in a timely manner, the required functionality to support electronic trading in a manner that is competitive with the functionality supported by other electronic markets;
- maintain the competitiveness of our fee structure;
- attract independent software vendors to write front-end software that will effectively access our electronic trading systems and automated order routing system;
- respond to technological developments or service offerings by competitors; and
- generate sufficient revenue to justify the substantial capital investment we have made and will continue to make to enhance our electronic trading platforms and other technology offerings.

The success of our markets depends on our ability to complete development of, successfully implement and maintain the electronic trading and clearing systems that have the functionality, performance, availability and resilience, capacity, security and speed required by our customers. If we do not successfully enhance our electronic trading systems and technology offerings, including the development and migration of our marketplace and supporting operational and business functions to the Cloud, if we are unable to develop our trading systems and technology offerings to include other products and markets, or if they do not have the required functionality, performance, availability and resilience, capacity, security and speed desired by our customers, our ability to successfully compete and our revenues and profits will be adversely affected.

Additionally, we rely on our customers' ability to have the necessary back office functionality to support our new products and our trading and clearing functionality. To the extent our customers are not prepared and/or lack the resources or infrastructure, the success of our new initiatives may be compromised.

If we experience systems failures or capacity constraints, our ability to conduct our operations and execute our business strategy could be materially harmed, and we could be subjected to significant costs and liabilities.

Our business is highly dependent on our ability to process, execute and monitor, in an efficient and uninterrupted manner, a large number of transactions, which occur at high volumes and frequencies across multiple systems and our ability to access key business data, financial information, order processing and invoicing. We are heavily reliant on the capacity, reliability and security of our information technology and communications and other business systems and software supporting our operations. Our systems, or those of our third-party providers, including cloud providers, may fail or be shut down or, due to capacity constraints, may operate slowly, causing one or more of the following to occur:

- unanticipated disruptions in service to our customers;
- slower response times and delays in our customers' trade execution and processing;
- failed settlement of trades;
- incomplete or inaccurate accounting, recording, or processing of trades;
- financial losses;
- security breaches;
- litigation or other customer claims;
- loss of customers; or
- regulatory sanctions.

We cannot assure that we will not experience system failures from power or telecommunications failures, acts of God, war or terrorism, human error on our part or on the part of our third-party providers or partners, natural disasters, fire, sabotage, hardware or software malfunctions or defects, computer viruses, cyber attacks, acts of vandalism or similar occurrences. If any of our systems or the systems of our third-party providers do not operate properly, are compromised or are disabled, including as a result of system failure, employee or customer error or misuse of our systems, we could suffer financial loss, liability to customers, regulatory intervention or reputational damage that could affect demand by current and potential users of our market.

From time to time, we have experienced system errors and failures that have resulted in some customers being unable to connect to our electronic trading platforms and technology offerings, or that resulted in erroneous reporting, such as transactions that were not authorized by any customer or reporting of filled orders as canceled. Such errors may result in CME Group being liable or in our voluntary assumption of financial liability. We cannot assure that if we experience system errors or failures in the future that they will not have a material adverse impact on our business. Any such system failures that cause an interruption in service or decrease our responsiveness could impact our trading volumes, impair our reputation, damage our brand, result in regulatory fines and have a material adverse effect on our business, financial condition and operating results.

Regulations relating to our trading and clearing systems generally require the handling of anticipated present and future peak trading volume. Heavy use of our systems during peak trading times or at times of unusual market volatility could cause them to operate slowly or even to fail for periods of time. We constantly monitor system loads and performance, and regularly implement system upgrades to handle estimated increases in volume. However, we cannot assure that our estimates of future trading volume and order messaging traffic will be accurate or that our systems will always be able to accommodate actual trading volume and order messaging traffic without failure or degradation of performance or speed. Increased trading volume and order messaging traffic may result in connectivity problems or erroneous reports that may affect users of our platforms. System failure or degradation could lead our customers to file formal complaints with industry regulatory organizations, to file lawsuits against us or to cease doing business with us or could lead our regulators to initiate inquiries or proceedings for failure to comply with applicable laws and regulations.

We will need to continue to upgrade, expand and increase the capacity of our systems as our business grows and as we execute our business strategy. Although many of our systems are designed to accommodate additional volume and products and services without redesign or replacement, we will need to continue to make significant investments in additional hardware and software to accommodate the increases in volume of transactions and order transaction traffic and to provide processing services to third parties. If we cannot increase the capacity and capabilities of our systems to accommodate an increasing volume of transactions and to execute our business strategy, our ability to maintain or expand our businesses could be adversely affected.

We, as well as many of our customers, depend on third-party suppliers and service providers for a number of services that are important. An interruption or cessation of an important supply or service by any third party could have a material adverse effect on our business, including revenues derived from our customers' trading activity.

We depend on a number of suppliers, such as banking, clearing and settlement organizations, telephone companies, internet service providers, data processors, cloud hosting providers, data center providers, and software and hardware vendors, for elements of our trading, clearing, and other systems, as well as communications and networking equipment, computer hardware and software and related support and maintenance. Although we conduct due diligence and monitor important suppliers and service providers (including their resiliency), we cannot provide assurances of their performance and any interruption or cessation of their supplies or services could negatively impact our operations or those of our customers, as well as affect our reputation, financial or regulatory posture.

Many of our customers rely on third parties, such as independent software vendors, to provide them with front-end systems to access our trading platforms and other back office systems for their trade processing and risk management needs. While these service providers have undertaken to keep current and certify as to our enhancements and changes to their software to our

interfaces and functionality, we cannot guarantee that they will continue to make the necessary monetary, resource and time investments to keep up with our enhancements and changes.

To the extent any of our service providers or the organizations that provide services to our customers in connection with their trading activities cease to provide these services or provide these services in an efficient, cost-effective manner, or fail to adequately expand their services to meet our needs and the needs of our customers, we could experience decreased trading volume, lower revenues, and higher costs. In addition, while we may be entitled to recovery for breaches of, or liabilities otherwise incurred in connection with, our agreements with third-party suppliers and service providers, such recovery is limited by the terms of these agreements and may not compensate us in full.

Our business exposes us to substantial credit risk of our clearing firms and other counterparties and, consequently, a decrease in their financial resources could adversely affect us.

Our clearing house operations expose us to counterparties with differing risk profiles. We routinely guarantee transactions submitted by our clearing firm customers with counterparties in the financial industry, including brokers and dealers, commercial banks, investment banks, mutual and hedge funds and other institutional customers. We could be adversely impacted by the financial distress or failure of one or more of our clearing firms. Additionally, we are exposed to the risk of loss from the failure of a matched principal counterparty to settle its trades at BrokerTec Americas.

A substantial part of our working capital may be at risk if a clearing firm defaults on its obligations to our clearing house and its margin and guaranty fund deposits are insufficient to meet its obligations. Additionally, BrokerTec Americas is exposed to the potential risk of loss in the event a counterparty fails to meet its obligations. Although we have policies and procedures to help ensure that our clearing firms and other counterparties can satisfy their obligations, these policies and procedures may not succeed in detecting problems or preventing defaults. We also have in place various measures intended to enable us to cure any default and maintain liquidity. However, we cannot guarantee that these measures will be sufficient to protect market participants from a default or that we will not be adversely affected in the event of a significant default. In addition, we have established a fund (currently \$98.0 million) to provide payments, up to certain maximum levels, to qualified family farmers, ranchers and other agricultural industry participants who use our products and who suffer losses to their segregated account balances if their clearing firm becomes insolvent.

Our Three-Month Eurodollar futures and options contracts are based on the three-month U.S. Dollar London Interbank Offered Rate (LIBOR) underlying rate and will be transitioned to the three-month Secured Overnight Financing Rate (SOFR) futures and options in the first half of 2023. To the extent trading in Eurodollar contracts decreases ahead of this transition or our alternative contracts are not successful, our revenues would be negatively impacted. Certain of our other businesses could also be negatively affected by changes to LIBOR.

Our Eurodollar futures and options contracts are based on the three-month U.S. Dollar ICE LIBOR underlying rate. In 2022, average trading volume in our Eurodollar contracts was 2.4 million contracts and open interest was 17 million contracts and our average trading volume in our SOFR contracts was 2.2 million contracts and open interest was 29.3 million contracts. The U.K. FCA, which regulates LIBOR, announced its intention to phase out the use of LIBOR with the cessation of one-week and two-month USD LIBOR, as well as non-USD LIBOR tenors, after December 31, 2021, and the cessation of publication of the remaining USD LIBOR settings in a "representative" form (including three-month USD LIBOR) after June 30, 2023. In 2021, the U.S. Federal Reserve Board and other regulatory bodies issued guidance encouraging banks and other financial market participants to cease entering into new contracts that use USD LIBOR as a reference rate no later than December 31, 2021, and in March 2022, the Adjustable Interest Rate (LIBOR) Act was signed into law, establishing a framework for the replacement of LIBOR as a benchmark interest rate in U.S. contracts that do not provide for the use of a clearly defined and practicable benchmark replacement rate following the cessation of publication or publication in a "representative" form. In light of these developments, financial institutions that currently report information used to set USD LIBOR are expected to stop doing so during 2023, and we expect banks and other financial market participants to continue to cease entering into new contracts based on USD LIBOR. There is no guarantee that these market participants will adopt reference rates associated with our alternative products.

The U.S. Federal Reserve, in conjunction with the Alternative Reference Rates Committee, a steering committee comprised of large U.S. financial institutions, has recommended replacing USD LIBOR with SOFR. However, it is unknown whether SOFR will attain the same level of market acceptance as a replacement for LIBOR.

The transition away from LIBOR to alternative reference rates is complex and could have a material adverse effect on our business, financial condition and results of operations. We have closely engaged with the industry, regulators and market participants to launch products using alternative reference rates, including our SOFR and Sterling Overnight Index Average (SONIA) futures contracts, and we have announced that our Eurodollar futures and options contracts will be transitioned to SOFR futures and options in the first half of 2023. While these actions have resulted in an increase in market acceptance of

SOFR, there is no guarantee that this transition will be successful, maintain current market structure, or replace the revenue we derive from our Eurodollar contracts if trading volume were to decline or discontinue altogether.

Our market data revenues may be reduced by decreased demand, poor overall economic conditions, regulatory changes or a significant change in how market participants trade and use market data.

We offer a wide range of data services designed to support the trading, risk management, investment and business needs of our customers. Revenues from our market data and information services represented 12% of our total revenues during the years ended December 31, 2022 and December 31, 2021. Factors that may affect our performance and demand for our data include, but are not limited to:

- Our ability to maintain existing customers utilizing our data and to attract new customers with our products and services;
- A decrease in overall trading volume, which may lead to a decreased demand for our market data;
- A challenging business environment for our customers, which may require them to reduce their usage of our market data;
- The impacts of new regulations, laws, rules or other government policies;
- Our ability to ensure that customers are appropriately licensed and are paying fees for the data used;
- The protection of our intellectual property rights and identification of misappropriation and/or misuses of CME Group market data; and
- Our ability to keep pace with technological developments and client preferences.

We may have difficulty executing our growth strategy and maintaining our growth effectively.

We continue to execute on strategic initiatives to grow our business, including efforts to serve the OTC markets and to distribute our products and services on a global basis. There is no guarantee that our efforts will be successful. Continued growth will require additional investment in personnel, facilities, information technology infrastructure and financial and management systems and controls, and may place a significant strain on our management and resources. For example, if we encounter limited resources, we may be required to increase our expenses to obtain the necessary resources, defer existing initiatives or not pursue certain opportunities. We may not be successful in implementing all of the processes that are necessary to support our growth organically or, as described below, through acquisitions, other investments or strategic alliances and partnerships. Our growth strategy also may subject us to increased legal, compliance and regulatory obligations. Unless our growth results in an increase in revenues that is proportionate to the increase in our costs associated with our growth, our future profitability could be adversely affected, and we may have to incur significant expenditures to address the additional operational and control requirements as a result of our growth.

We intend to continue to explore acquisitions, other investments and strategic alliances. We may not be successful in identifying opportunities or in integrating the acquired businesses. Any such transaction may not produce the results we anticipate, which could adversely affect our business and our stock price.

We intend to continue to explore and pursue acquisitions and other strategic opportunities to strengthen our business and grow our company. We may make acquisitions or investments or enter into strategic partnerships, joint ventures and other alliances. The market for such transactions is highly competitive, especially in light of historical merger and acquisition activity in our industry. As a result, we may be unable to identify strategic opportunities or we may be unable to negotiate or finance future transactions on terms favorable to us, which could impact our ability to identify growth opportunities. We may issue additional equity and/or debt or, as was the case in connection with our transaction with Google Cloud, issue additional equity as part of strategic partnerships with third parties. The issuance of additional equity in connection with any future transaction could be substantially dilutive to our existing shareholders. The issuance of additional debt could increase our leverage substantially.

The process of integration also may produce unforeseen regulatory and operating difficulties and expenditures and may divert the attention of management from the ongoing operation of our business. To the extent we enter into joint ventures and alliances, we may experience difficulties in the development and expansion of the business of any newly formed ventures, in the exercise of influence over the activities of any ventures in which we do not have a controlling interest, as well as encounter potential conflicts with our joint venture or alliance partners. We may not realize the anticipated growth and other benefits from our growth initiatives and investments, which may have an adverse impact on our financial condition and operating results. We also may be required to take an impairment charge in our financial statements relating to our acquisitions and/or investments, which could negatively affect our stock price. OSTTRA, our joint venture with IHS Markit (now a part of S&P Global), is subject to many of these risks, including the potential we may not achieve the expected cost savings, synergies and other strategic benefits from the transaction within the anticipated time frames, that the joint venture may be more costly than expected, or that we may experience customer attrition.

The expansion of our global operations is complex and subjects us to increased business and economic risks that could adversely affect our financial results.

In connection with our expanded global operations, we face certain risks inherent in doing business internationally. These risks include:

- fluctuations in currency exchange rates;
- complying with extensive and complex compliance requirements, regulations and oversight by regulators other than our primary functional regulators, including sanctions and anti-bribery laws;
- difficulties in staffing and associated costs in managing multiple international locations;
- general economic, social, and political conditions;
- protectionist laws and business practices that favor local businesses in some countries;
- reduced protection for intellectual property rights in some countries;
- language and cultural differences; and
- potentially adverse tax consequences.

If we are unable to manage the complexity of our global operations successfully, or if the risks above become substantial for us, our financial performance and operating results could suffer. Further, any measures we may implement to reduce risks of our international operations may not be effective, may increase our expenses and may require significant management time and effort.

As our consolidated financial statements are presented in U.S. dollars, we must translate our foreign subsidiaries' financial statements from local currencies into U.S. dollars at exchange rates in effect during or at the end of each reporting period. Therefore, any increases or decreases in the value of the U.S. dollar against the other currencies may affect our operating income and the value of balance sheet items denominated in foreign currencies.

The E.U.-U.K. Trade and Cooperation Agreement was effective on January 1, 2021. As a result of Brexit, we have established a CME Group business in Amsterdam, an E.U. jurisdiction, which allows this business to continue offering products and services to customers in the E.U.; however, this has resulted in, and may continue to result in, increased legal, compliance and operational costs.

Our risk management, compliance and monitoring programs might not be effective and may result in outcomes that could adversely affect our reputation, financial condition and operating results.

In the normal course of our business, we discuss matters with our regulators, including during supervisory engagements and regulatory examinations, and we are subject to their inquiry and oversight. Our regulators have broad enforcement and supervisory powers, including the power to censure, fine, issue cease-and-desist orders, prohibit us from engaging in some of our businesses or suspend or revoke our regulatory designations or the registration of our officers or employees who violate applicable laws or regulations. Our ability to manage our risks and comply with applicable laws and regulations in the jurisdictions where we operate is largely dependent on our establishment and maintenance of effective risk management, compliance and monitoring programs. In the case of alleged non-compliance with applicable laws or regulations, we could be subject to investigations and judicial or administrative proceedings that may result in substantial penalties or civil lawsuits, including by customers, for damages, which could be significant. Any of these outcomes may adversely affect our reputation, financial condition and operating results. In extreme cases, these outcomes could adversely affect our ability to conduct our business.

We maintain risk management, compliance and monitoring policies, procedures and programs that are designed to prevent, detect, deter, monitor and manage our risks, including enterprise risk, compliance and internal audit programs, but such policies, procedures and programs may not be fully effective in their operation. Some of our risk management processes depend upon evaluation of information regarding markets, customers, employees or other matters or potential threats that are publicly available or otherwise accessible by us. That information may not in all cases be accurate, complete, up-to-date or properly evaluated. Management of operational, financial, legal and compliance, regulatory, reputational and strategic risk requires, among other things, policies and procedures to record properly and verify a large number of transactions and events. We cannot guarantee that our policies and procedures will always be effective or that we will always be successful in monitoring or evaluating the risks to which we are or may be exposed.

We could be harmed by misconduct or errors that are difficult to detect and deter.

There continue to be highly publicized cases involving fraud or other misconduct or manipulative activity by employees of financial services firms and other market participants. Improper trading activity on our platforms by participants could include activities such as spoofing, layering, wash trading and manipulation. Misconduct by our employees and agents could include

hiding unauthorized activities from us, improper or unauthorized activities on behalf of customers or the company, improper securities trading activities, circumvention of controls and procedures, improper use or unauthorized disclosure of assets, data or confidential information of the company or its customers, among other potential misconduct.

It is not always possible to deter misconduct, and the precautions we take to prevent and detect this activity may not be effective in all cases. If we were found to have not met our regulatory oversight and compliance obligations, we could be subject to regulatory sanctions, enforcement actions, financial penalties and restrictions on our activities for failure to properly identify, monitor and respond to potentially problematic activity, and such outcomes could seriously harm our reputation. Our employees and agents also may commit errors that could subject us to financial claims for negligence, as well as regulatory actions, or result in our voluntary assumption of financial liability. Further, allegations by regulatory or criminal authorities of improper trading activities in our markets could affect our brand and reputation and reduce the number of participants trading in our markets. If that should occur, we could face a corresponding decline in trading volume and revenue.

Intellectual property rights licensed from third-party price reporting agencies form the basis for many of our products from which we derive a significant portion of our volume and revenue. Material changes in the intellectual property landscape or regulatory framework pertaining to such benchmarks could have a negative impact on our ability to offer such products.

We are significantly dependent on the contract volume of products that are based on intellectual property rights of indexes derived from third-party price reporting agencies. To comply with CFTC core principles, we must be able to demonstrate that our products may not be readily susceptible to manipulation. Our inability to offer products based on these indexes could have a negative impact on our contract volume and revenues.

A failure to protect our intellectual property rights, or allegations that we have infringed the intellectual property rights of others, could adversely affect our business.

Our business is dependent on proprietary technology and other intellectual property that we own or license from third parties. We own the rights to a large number of trademarks, service marks, domain names and trade names in the U.S., Europe, and other parts of the world. We have registered many of our most important trademarks in the U.S. and other countries. We hold the rights to a number of patents and have patent applications pending. Our patents cover match engine, trader user interface, trading floor support, market data, general technology and clearing house functionalities. We attempt to protect our proprietary technology and intellectual property rights by relying on trademarks, copyright, database rights, trade secrets, restrictions on disclosure, and other methods. Notwithstanding the precautions we take to protect our proprietary technology and intellectual property rights, it is possible that employees or third parties may copy, misappropriate, or otherwise obtain and use our proprietary technology without authorization or otherwise infringe on our rights. In addition, in the future, we may have to rely on litigation to enforce our intellectual property rights, protect our trade secrets, determine the validity and scope of the proprietary rights of others or defend against claims of infringement or invalidity. Any such litigation, whether successful or unsuccessful, could result in substantial costs to us and diversions of our resources, either of which could adversely affect our business.

Patents of third parties may have an important bearing on our ability to offer certain products and services. Our competitors as well as other companies and individuals may obtain, and may be expected to obtain in the future, patents related to the types of products and services we offer or plan to offer. We cannot guarantee that we are or will be aware of all patents containing claims that may pose a risk of infringement by our products and services. In addition, some patent applications in the U.S. are confidential until a patent is issued and, therefore, we cannot evaluate the extent to which our products and services may be covered or asserted to be covered by claims contained in pending patent applications. These claims of infringement are not uncommon in our industry. As a result, we may face allegations that we have infringed the intellectual property rights of third parties, which may be costly for us to defend. If one or more of our products or services is found to infringe on patents held by others, we may be required to stop developing or marketing the products or services, to obtain licenses to develop and market the services from the holders of the patents or to redesign the products or services in such a way as to avoid infringing on the patents. We could also be required to pay damages if we were found to infringe patents held by others, which could materially adversely affect our business, financial condition and operating results. We cannot assess the extent to which we may be required in the future to obtain licenses with respect to patents held by others, whether such licenses would be available or, if available, whether we would be able to obtain such licenses on commercially reasonable terms. If we were unable to obtain such licenses, we may not be able to redesign our products or services at a reasonable cost to avoid infringement, which could materially adversely affect our business, financial condition and operating results.

RISKS RELATING TO AN INVESTMENT IN OUR CLASS A COMMON STOCK

Our indebtedness could adversely affect our financial condition and operations and prevent us from fulfilling our debt service obligations. We might still be able to incur more debt, intensifying these risks.

As of December 31, 2022, we had approximately \$3.4 billion of total indebtedness and we had excess borrowing capacity for general corporate purposes under our existing facilities of approximately \$2.3 billion.

Our indebtedness could have important consequences. For example, our indebtedness may:

- require us to dedicate a significant portion of our cash flow from operations to payments on our debt, thereby reducing the availability of cash flows to fund capital expenditures, to pursue acquisitions or investments, to pay dividends and for general corporate purposes;
- increase our vulnerability to general adverse economic conditions;
- limit our flexibility in planning for, or reacting to, changes in or challenges relating to our business and industry; or
- place us at a competitive disadvantage against any less leveraged competitors.

The occurrence of any one of these events could have a material adverse effect on our business, financial condition, results of operations, prospects and ability to satisfy our debt service obligations. In addition, the agreements governing our outstanding indebtedness do not significantly limit our ability to incur additional indebtedness, which, particularly given the recent changes in interest rates could increase the risks described above to the extent that we incur additional debt. Our regulated businesses are also required to maintain minimum capital requirements set by their applicable regulators.

Please see "Item 7 - Management's Discussion and Analysis of Financial Condition and Results of Operations — Regulatory Requirements" beginning on page 45 for additional information regarding capital requirements.

Any reduction in our credit rating could increase the cost of our funding from the capital markets.

Our long-term debt is currently rated investment grade by two of the major rating agencies. These rating agencies regularly evaluate us. Their ratings of our long-term debt are based on a number of factors, including our financial strength, as well as factors not entirely within our control, such as conditions affecting the financial services industry generally. In light of the difficulties in the financial services industry and the financial markets over the last few years, including in connection with the global pandemic and rising interest rates, there can be no assurance that we will maintain our current ratings. In the past, we have experienced ratings downgrades. Our failure to maintain our ratings could adversely affect the cost and other terms upon which we are able to obtain funding and increase our cost of capital. Additionally, if our ratings are downgraded below investment grade due to a change of control, we are required to make an offer to repurchase all of our fixed-rate notes at a price equal to 101% of the principal amount, plus accrued and unpaid interest.

Our average rate per contract for our derivatives business is subject to fluctuation due to a number of factors. As a result, our average rate per contract in any particular period may not be a reliable indication of our future average rate per contract.

Our average rate per contract for our derivatives business, which impacts our operating results, is subject to fluctuation due to shifts in the mix of products traded, the trading venue and the mix of customers (whether the customer receives member or non-member fees or participates in one of our various incentive programs) and the impact of our tiered pricing structure. In addition, our members and participants in our various incentive programs generally are charged lower fees than our non-member customers. Variation in each of these factors is difficult to predict and will have an impact on our average rate per contract in the particular period. Because of this fluctuation, we cannot assure that our average rate per contract in any particular period serves as an indication of our future average rate per contract. If we fail to meet securities analysts' expectations regarding our operating results, the price of our Class A common stock could decline substantially.

Ten of our board members own trading rights, or are officers or directors of firms that own trading rights, on our derivatives exchanges. As members, these individuals may have interests that differ from or conflict with those of shareholders who are not also members. Our dependence on the trading and clearing activities of our exchange members, combined with the CME members' rights to elect six directors, may enable them to exert substantial influence over the operation of our business.

Ten of our directors own, or are officers or directors of firms that own trading rights on our exchanges. We are dependent on the revenues from the trading and clearing activities of our exchange members. In 2022, 83% of our derivatives contract volume was derived from our members. This dependence may give them substantial influence over how we operate our business.

Many of our members and clearing firms derive a substantial portion of their income and profit from their trading or clearing activities on or through our exchanges. In addition, trading rights on our exchanges have substantial independent value. The amount of profit that members derive from their trading, brokering and clearing activities and the value of their trading rights

are, in part, dependent on the fees they are charged to trade, broker, clear and access our markets, and the rules and structure of our markets. As a result, members may not have the same economic interests as holders of our Class A common stock. In addition, our members may have differing interests among themselves depending on the roles they serve in our markets, their methods of trading and the products they trade. Consequently, members may advocate that we enhance and protect their clearing and trading opportunities and the value of their trading privileges over their investment in our Class A common stock, if any.

Our members have been granted special rights, which protect their trading privileges and require that we maintain open outcry for options products still meeting certain volume thresholds and, in the case of our Class B shareholders, provide them with special board representation.

Under the terms of the organizational documents of our exchanges, our exchange members have certain rights that relate primarily to trading right protections, certain trading fee protections and certain membership benefit protections. Additionally, our Class B shareholders, who are members of our CME exchange, are entitled to elect six directors to our board even if their Class A share ownership interest is very small or non-existent. We have limited ability to eliminate these election rights, and prior attempts to do so did not receive the necessary shareholder approvals. In connection with these rights, our ability to take certain actions that we may deem to be in the best interests of the company and its shareholders, including actions relating to certain pricing decisions, may be limited by the rights of our members.

ITEM 1B. UNRESOLVED STAFF COMMENTS

Not applicable.

ITEM 2. PROPERTIES

Our corporate headquarters are located at 20 South Wacker Drive, Chicago, IL, where we lease approximately 575,000 square feet of general office space. This lease expires in 2032. Our European headquarters are located at the London Fruit & Wool Exchange at 1 Duval Square, London, where we lease approximately 120,000 square feet of general office space. This lease expires in 2038.

We also lease our largest data center from CyrusOne in Aurora, IL. This lease expires in 2031.

In addition to the above properties, we have other offices and data centers in various locations around the globe. The company's management believes that its properties are suitable for the purposes for which they are used and our current needs. Please see note 5. Property and note 11. Leases to the consolidated financial statements for more information.

ITEM 3. LEGAL PROCEEDINGS

See "Legal and Regulatory Matters" in note 12. Contingencies to the consolidated financial statements beginning on page 74 for CME Group's legal proceedings disclosure, which is incorporated herein by reference.

ITEM 4. MINE SAFETY DISCLOSURES

Not applicable.

PART II

ITEM 5. MARKET FOR REGISTRANT'S COMMON EQUITY, RELATED SHAREHOLDER MATTERS AND ISSUER PURCHASES OF EQUITY SECURITIES

Class A Common Stock

Our Class A common stock is currently listed on Nasdaq under the ticker symbol "CME." As of February 8, 2023, there were approximately 4,365 holders of record of our Class A common stock.

Class B Common Stock

Our Class B common stock is not listed on a national securities exchange or traded in an organized over-the-counter (OTC) market. Each class of our Class B common stock is associated with a membership in a specific division of our CME exchange. CME's rules provide exchange members with trading rights and the ability to use or lease these trading rights. Each share of our Class B common stock can be transferred only in connection with the transfer of the associated trading rights.

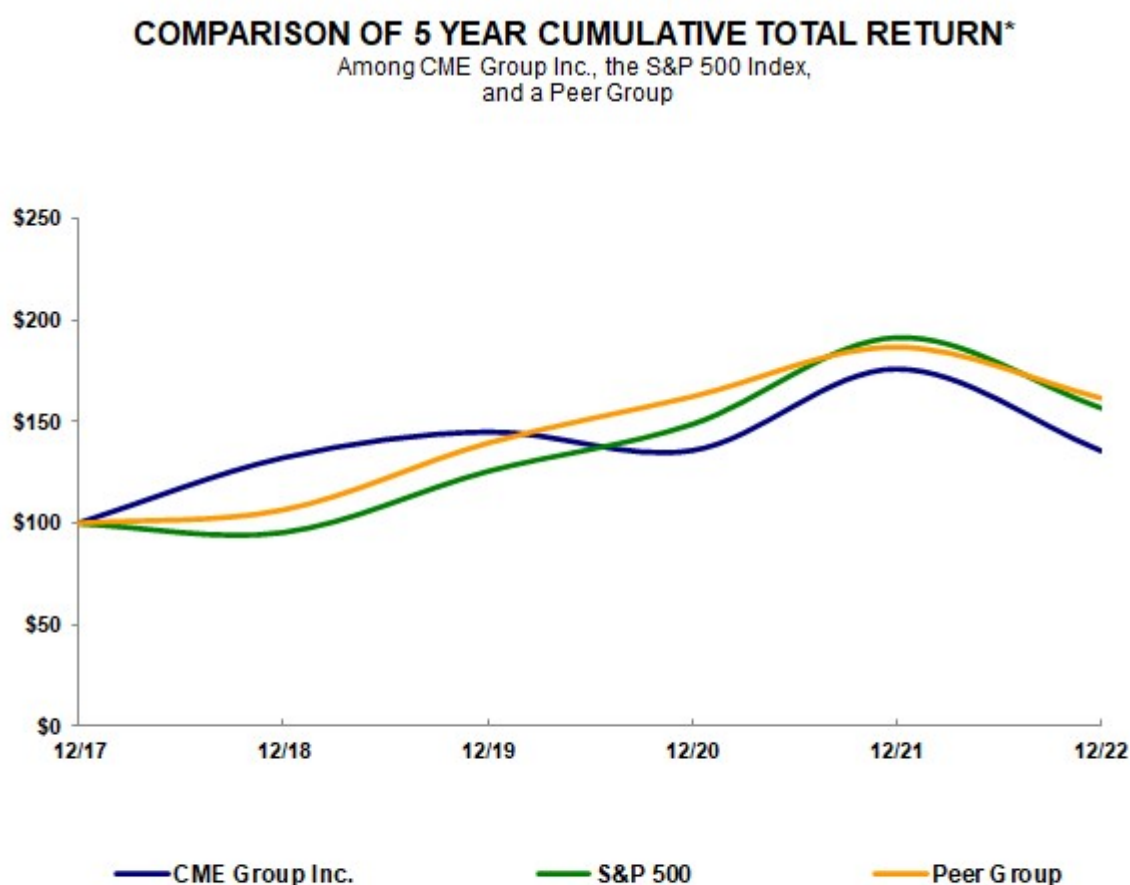
Class B shares and the associated trading rights are bought and sold or leased through our membership department. Although our Class B shareholders have special voting rights, because our Class B shares have the same equitable interest in our earnings and the same dividend payments as our Class A shares, we expect that the market price of our Class B common stock, if reported separately from the associated trading rights, would be primarily determined by the value of our Class A common stock. As of February 8, 2023, there were approximately 1,535 holders of record of our Class B common stock.

Preferred Stock

In 2021, we issued and sold in a private placement approximately 4.6 million shares of Series G Non-Voting Convertible Preferred Stock. Series G Non-Voting Convertible Preferred Stock is not listed on a national securities exchange or traded in an organized OTC market. These shares are convertible to Class A common stock at the discretion of the holder at a specified conversion rate, which is initially 1:1. Series G Non-Voting Convertible Preferred Stock has the same equitable interest in our earnings and the same dividend payments per share as our Class A shares on an as converted basis. As of February 8, 2023, there was one holder of record of our Series G Non-Voting Convertible Preferred Stock.

PERFORMANCE GRAPH

The graph below compares the cumulative five-year total return on CME Group Inc.'s Class A common stock relative to the cumulative total returns of the S&P 500 index and a customized peer group of five companies that include: Cboe Global Markets Inc, Deutsche Boerse Ag, Intercontinental Exchange Inc, London Stock Exchange Group Plc and Nasdaq Inc. An investment of \$100 (with reinvestment of all dividends) is assumed to have been made in our Class A common stock, in the peer group and the S&P 500 index on December 29, 2017 and its relative performance is tracked through December 31, 2022.



*\$100 invested on 12/31/17 in stock or index, including reinvestment of dividends.
Fiscal year ending December 31.

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The stock price performance included in this graph is not necessarily indicative of future stock price performance.

		2018		2019		2020		2021		2022
CME Group Inc.	\$	132.12	\$	144.90	\$	135.72	\$	175.75	\$	135.51
S&P 500		95.62		125.72		148.85		191.58		156.89
Peer Group		106.56		139.51		162.48		186.96		161.77

Unregistered Sales of Equity Securities

Not applicable.

Issuer Purchases of Equity Securities

Period in 2022	Total Number of Shares (or Units) Purchased ⁽¹⁾	Average Price Paid Per Share (or Unit)	Total Number of Shares (or Units) Purchased as Part of Publicly Announced Plans or Programs	Maximum Number (or Approximate Dollar Value) of Shares (or Units) that May Yet Be Purchased Under the Plans or Programs (in millions)
October 1 to October 31	—	\$ —	—	\$ —
November 1 to November 30	5	174.25	—	—
December 1 to December 31	20,531	168.16	—	—
Total	<u>20,536</u>		<u>—</u>	

(1) Shares purchased consist of an aggregate of 20,536 shares of Class A common stock surrendered to satisfy employee tax obligations upon the vesting of restricted stock.

ITEM 6. [RESERVED]

ITEM 7. MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

INTRODUCTION

Management's Discussion and Analysis of Financial Condition and Results of Operations is organized as follows:

- **Executive Summary:** Includes an overview of our business; current economic, competitive and regulatory trends relevant to our business; our current business strategy; and our primary sources of operating and non-operating revenues and expenses.
- **Critical Accounting Policies:** Provides an explanation of accounting policies that may have a significant impact on our financial results and the estimates, assumptions and risks associated with those policies.
- **Results of Operations:** Includes an analysis of our 2022 financial results and a discussion of any known events or trends that are likely to impact future results.
- **Liquidity and Capital Resources:** Includes a discussion of our future cash requirements, capital resources, significant planned expenditures and financing arrangements.

References in this discussion and analysis to "we" and "our" are to CME Group Inc. (CME Group) and its consolidated subsidiaries, collectively. References to "exchange" are to Chicago Mercantile Exchange Inc. (CME), the Board of Trade of the City of Chicago, Inc. (CBOT), New York Mercantile Exchange, Inc. (NYMEX) and Commodity Exchange, Inc. (COMEX), collectively, unless otherwise noted.

EXECUTIVE SUMMARY

Business Overview

CME Group, a Delaware stock corporation, is the holding company for CME, CBOT, NYMEX, COMEX, NEX and their respective subsidiaries. The holding company structure is designed to provide strategic and operational flexibility. CME Group's Class A common stock is listed on the Nasdaq Global Select Market (Nasdaq) under the ticker symbol "CME."

Our exchange consists of designated contract markets for the trading of futures and options contracts. We also clear futures, options and swaps contracts through our clearing house. Futures contracts, options contracts and swaps contracts provide investors with vehicles for protecting against, and potentially profiting from, price changes in financial instruments and physical commodities.

We are a global company with customer access available virtually all over the world. Our customers consist of professional traders, financial institutions, individual and institutional investors, major corporations, manufacturers, producers, governments and central banks. Customers include both members of the exchange and non-members.

We offer our customers the opportunity to trade futures contracts and options contracts on a range of products, including those based on interest rates, equity indexes, foreign exchange, agricultural commodities, energy and metals. Through our cash markets business, we offer fixed income trading through BrokerTec and foreign currency trading through EBS. Our products provide a means for hedging, speculating and allocating assets. We identify new products by monitoring economic trends and their impact on the risk management and speculative needs of our existing and prospective customers.

Most of our products are available for trading through our electronic trading platforms. These execution facilities offer our customers immediate trade execution and price transparency. In addition, trades can be executed through privately negotiated transactions that are cleared and settled through our clearing house.

Prior to September 2021, we provided optimization services that delivered transaction lifecycle management and information services to help our customers optimize their capital, mitigate their risk and reduce operational costs. Optimization services included Traiana, TriOptima and Reset. In September 2021, we contributed the net assets of our optimization business to OSTTRA, our joint venture with IHS Markit (later acquired by S&P Global).

Our clearing house clears, settles and guarantees futures and options contracts traded through our exchanges, in addition to cleared swaps products. Our clearing house's performance guarantee is an important function of our business. Because of this guarantee, our customers do not need to evaluate the credit of each potential counterparty or limit themselves to a selected set of counterparties. This flexibility increases the potential liquidity available for each trade. Additionally, the substitution of our clearing house as the counterparty to every transaction allows our customers to establish a position with one party and offset the position with another party. This contract offsetting process provides our customers with flexibility in establishing and adjusting positions and provides for collateral and margining efficiencies. Certain BrokerTec contracts are cleared at third-party clearing houses.

Business Trends

Economic Environment. Our customers continue to use our markets as an effective and transparent means to manage risk and meet their investment needs. Trading activity in our centralized markets has fluctuated due to the ongoing uncertainty in the financial markets, fluctuations in the availability of credit, variations in the amount of assets under management as well as the Federal Reserve Bank's interest rate policy and quantitative easing. We continue to maintain high quality and diverse products as well as various clearing and market data services, which support our customers in any economic environment.

Competitive Environment. Our industry is competitive and we continue to encounter competition in all aspects of our business. We expect competition to continue to intensify, especially in light of ongoing regulatory reform in the financial services industry. Competition is influenced by our brand and reputation; the efficiency and security of our settlement, clearing and support services; depth and liquidity of our markets; diversity of product offerings, including frequency and quality of new product development and innovative services; our ability to position and expand upon existing products to address changing market needs; efficient and seamless customer experience; transparency, reliability, anonymity and security of transaction processing; the regulatory environment; connectivity, accessibility, flexibility in execution methods and distribution; and technology capability and innovation, as well as overall transaction costs. We believe we are very well positioned with respect to these factors. Our asset classes contain products designed to address differing risk management needs, and customers are able to achieve operational and capital efficiencies by accessing our diverse products through our platforms and our clearing house. We compete in a large and expanding financial services trading, clearing and settlement marketplace globally. As markets continue to evolve, we will continue to adapt our trading technology and clearing services to meet the needs of our customers. The competitive environment to which we are subject is discussed in "Item 1 - Business" beginning on page 10.

Regulatory Environment. Our exchange-traded derivatives exchanges and other businesses are regulated and we serve a customer base that includes regulated institutions and individuals. Developments in the regulatory environment have the potential to significantly impact our business. Compliance with regulations may require us and our customers to dedicate significant financial and operational resources, which could adversely affect our profitability. The regulatory environment to which we are subject is discussed in "Item 1 - Business" beginning on page 11.

Business Strategy

Our strategy focuses on maximizing futures and options growth globally, diversifying our business and revenues and delivering unparalleled customer efficiencies and operational excellence, including through our partnership with Google Cloud. This strategy allows us to continue to develop into a more broadly diversified financial exchange that provides trading and clearing solutions across a wide range of products and asset classes. Our strategic initiatives are discussed in "Item 1 - Business" beginning on page 7.

Revenues

Clearing and transaction fees. A majority of our revenue is derived from clearing and transaction fees, which include electronic trading fees, surcharges for privately negotiated transactions and other volume-related charges for exchange-traded and over-the-counter (OTC) contracts. Because clearing and transaction fees are assessed on a per-contract or notional value basis, revenues and profitability fluctuate with changes in contract volume. In addition to the business trends noted earlier, our contract volume, and consequently our revenues, tend to increase during periods of economic and geopolitical uncertainty as our customers seek to manage their exposure to, or speculate on, the market volatility resulting from that uncertainty.

While volume has the most significant impact on our clearing and transaction fees revenue, there are four other factors that also influence this source of revenue:

- rate structure;
- product mix;
- venue; and
- the percentage of trades executed by customers who are members compared with non-member customers.

Rate structure. Customers benefit from volume discounts and limits on fees as part of our effort to increase liquidity in certain products. We offer various incentive programs to promote trading and clearing in various products and geographic locations. We may periodically change fees, volume discounts, fee limits and member discounts, perhaps significantly, based on our review of operations and the business environment.

Product mix. We offer exchange-traded futures and options contracts as well as cleared-only interest rate swap contracts. We also offer foreign exchange spot and forward contracts and fixed income products. Rates are varied by product in order to optimize revenue on existing products and to encourage contract volume upon introduction of new products.

Venue. Our exchange and platforms are an international marketplace that brings together buyers and sellers mainly through our electronic trading as well as through open outcry trading and privately negotiated

transactions. Any customer who is guaranteed by a clearing firm and who agrees to be bound by our exchange rules is able to obtain direct access to our

electronic platforms. Open outcry trading is conducted exclusively by our members, who may execute trades on behalf of customers or for themselves. Beginning in May 2021, open outcry trading is now limited to Eurodollar options and Secured Overnight Financing Rate (SOFR) options products following the permanent closure of most of our open outcry pits.

Typically, customers submitting trades through our electronic platforms are charged fees for using the platforms in addition to the fees assessed on all transactions executed on our exchange. Customers entering into privately negotiated transactions also incur additional charges beyond the fees assessed on other transactions.

Member/non-member mix. Generally, member customers are charged lower fees than our non-member customers. Holding all other factors constant, revenue decreases if the percentage of trades executed by members increases, and increases if the percentage of non-member trades increases.

Clearing and transaction fees for cash markets business. Our cash markets business provides matching services whereby we match a buyer and seller of financial instruments to allow both parties to complete the trade bilaterally or through a third-party clearing house. We are not involved in the settlement of the contract but charge a transaction fee generally based on volume or notional value of the trade for providing the matching service. BrokerTec Americas also generates revenue from a matched principal business. This business serves as a fully matched counterparty to offsetting positions entered into by clients on our electronic trading platform to facilitate anonymity and access to clearing and settlement. Revenue is generated from this business generally on a transaction fee basis.

Other sources. Revenue is also derived from other sources, including market data and information services and other various services related to our exchange operations.

Market data and information services. We receive market data and information services revenue from the dissemination of our market data to subscribers. Subscribers can obtain access to our market data services either directly or through third-party distributors.

Our service offerings include access to real-time, delayed and end-of-day quotations, trade and summary market data for our products and other data sources. Users of our basic service receive real-time quotes and pay a flat monthly fee for each screen, or device, displaying our market data. Alternatively, customers can subscribe to market data provided on a limited group of products. The fee for this service is also a flat rate per month.

Pricing for our market data services is based on the value of the service provided and the price of comparable services offered by our competitors. Increases or decreases in our market data and information services revenue are influenced by changes in our price structure and incentive programs for existing market data offerings, introduction of new market data services and changes in the number of devices in use. General economic factors that affect the financial services industry, which constitutes our primary customer base, also influence revenue from our market data services.

Other revenues. Other revenue includes access and communication fees. Access and communication fees are connectivity fees charged to members and clearing firms that utilize our various telecommunications networks and communications services. Our communication services include our co-location program as well as the connectivity charges to customers of the CME Globex platform. Access fee revenue varies depending on the type of connection provided to customers.

Prior to the contribution of the net assets of our optimization business to OSTTRA, other revenues included revenues from our optimization services, which included fees for risk management and information services for the OTC markets, including portfolio reconciliation and post-trade processing. Revenue earned from these services was typically generated through subscriptions or transaction fees.

Other revenues also include fees for collateral management, equity subscription fees and fees for trade order routing through agreements from various strategic relationships as well as other services to members and clearing firms.

Expenses

The majority of our expenses do not vary directly with changes in our contract volume. However, licensing and other fee agreements can vary directly with certain equity, energy and swap volumes, and the majority of our employee bonuses vary indirectly with overall contract volume, as bonuses are primarily based on our financial performance.

Compensation and benefits. Compensation and benefits expense is our most significant expense and includes employee wages, bonuses, stock-based compensation, benefits and employer taxes. Changes in this expense are driven by fluctuations in the number of employees, increases in wages as a result of labor market conditions, changes in rates for employer taxes and other cost increases affecting benefit plans. In addition, this expense is affected by the composition of our workforce. The expense associated with our bonus and stock-based compensation plans can also have a significant impact on this expense category.

The bonus component of our compensation and benefits expense is based on our financial performance. Under the performance criteria of our annual incentive plans, the bonus funded under the plans is based on achieving certain financial performance targets established by the compensation committee of our board of directors. The compensation committee has discretion to make equitable adjustments to the cash earnings performance calculation to reflect effects of unplanned operating results or capital expenditures to meet intermediate- to long-term growth opportunities.

In general, stock-based compensation is a non-cash expense related to restricted stock and performance share grants. Stock-based compensation varies depending on the quantity and fair value of awards granted. The fair value of restricted stock awards and other performance share grants is based on either the share price on the date of the grant or a model of expected future stock prices.

Professional fees and outside services. This expense includes fees for consulting services received on strategic and technology initiatives; regulatory and other compliance matters; temporary labor as well as legal and accounting fees. This expense may fluctuate as a result of changes in services required to complete initiatives, handle legal proceedings and comply with regulatory and compliance requirements.

Depreciation and amortization. Depreciation and amortization expense results from the depreciation of long-lived assets such as buildings, leasehold improvements, furniture, fixtures and equipment. This expense also includes the amortization of purchased and internally developed software.

Amortization of purchased intangibles. Amortization of purchased intangibles includes amortization of intangible assets obtained in our acquisitions of CBOT Holdings, Inc., NYMEX Holdings, Inc. and NEX as well as other asset and business acquisitions. Intangible assets subject to amortization consist primarily of clearing firm, market data and other customer relationships.

Other expenses. We incur additional ongoing expenses for communications, technology support services and various other activities necessary to support our operations.

- Technology expense consists of costs related to maintenance of the hardware and software required to support our technology. It also includes costs for network connections for our electronic platforms and some market data customers; telecommunications costs of our exchange, and fees paid for access to external market data. This expense may be driven by system capacity, cloud consumption, functionality and redundancy requirements. It also may be impacted by growth in electronic contract volume and changes in the number of telecommunications hubs and connections which allow customers outside the U.S. to access our electronic platforms directly.
- Licensing and other fee agreements expense includes license fees paid as a result of contract volume in equity index products. This expense also includes royalty fees and broker rebates on energy and metals products, as well as revenue sharing on cleared swaps contracts and some new product launches. This expense fluctuates with changes in contract volumes as well as changes in fee structures.
- Other expenses include occupancy and building operations expenses including rent, maintenance, real estate taxes, utilities and other related costs related to leased property in Chicago, New York, the U.K., and India, as well as other smaller locations throughout the world. Other expenses also include marketing and travel-related expenses as well as general and administrative costs. Marketing, advertising and public relations expense includes media, print and other advertising costs, as well as costs associated with our product promotion. Other expenses also include litigation and customer settlements, impairment charges on operating assets, gains and losses on disposals of certain operating assets, and foreign currency transaction gains and losses resulting from changes in exchange rates on certain foreign monetary assets and liabilities.

Non-Operating Income and Expenses

Income and expenses incurred through activities outside of our core operations are considered non-operating. These activities include non-core investing and financing activities.

- Investment income includes income from short-term investment of clearing firms' cash performance bonds and guaranty fund contributions as well as excess operating cash; interest income and realized gains and losses from our marketable securities; realized gains and losses and dividend income from our strategic equity investments, and gains and losses on trading securities in our non-qualified deferred compensation plans. Investment income is influenced by market interest rates, changes in the levels of cash performance bonds deposited by clearing firms, the amount of dividends distributed by our strategic investments and the availability of funds generated by operations.
- Interest and other borrowing costs expense includes charges associated with various short-term and long-term funding facilities, including commitment fees on lines of credit agreements.

- Equity in net earnings (losses) of unconsolidated subsidiaries includes income and losses from our investments in S&P Dow Jones Indices LLC, OSTTRA, Shanghai CFETS-NEX International Money Broking Co., Ltd. and Dubai Mercantile Exchange.
- Other income (expense) includes expenses related to the distribution of a portion of interest earned on performance bond collateral reinvestment to the clearing firms, gains and losses on derivative contracts and other various income and expenses outside our core operations.

CRITICAL ACCOUNTING POLICIES

The notes to our consolidated financial statements include disclosure of our significant accounting policies. In establishing these policies within the framework of accounting principles generally accepted in the U.S., management must make certain assessments, estimates and choices that will result in the application of these principles in a manner that appropriately reflects our financial condition and results of operations. Critical accounting policies are those policies that we believe present the most complex or subjective measurements and have the most potential to affect our financial position and operating results. While all decisions regarding accounting policies are important, there are certain accounting policies that we consider to be critical. These critical policies, which are presented in detail in the notes to our consolidated financial statements, relate to the valuation of financial instruments, goodwill and intangible assets, revenue recognition, income taxes and internal use software costs.

Valuation of financial instruments. Fair value is defined as the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date, or an exit price. We have categorized financial instruments measured at fair value into the following three-level fair value hierarchy based upon the level of judgment associated with the inputs used to measure the fair value:

- Level 1 inputs, which are considered the most reliable evidence of fair value, consist of quoted prices (unadjusted) for identical assets or liabilities in active markets.
- Level 2 inputs consist of observable market data, such as quoted prices for similar assets and liabilities in active markets, or inputs other than quoted prices that are directly observable.
- Level 3 inputs consist of unobservable inputs, which are derived and cannot be corroborated by market data or other entity-specific inputs.

For further discussion regarding the fair value of financial assets and liabilities, see note 2. Summary of Significant Accounting Policies and note 17. Fair Value Measurements to the consolidated financial statements.

Goodwill and intangible assets. We review goodwill for impairment on a quarterly basis and whenever events or circumstances indicate that its carrying value may not be recoverable. Goodwill may be tested quantitatively for impairment by comparing the carrying value of a reporting unit to its estimated fair value. Estimating the fair value of a reporting unit involves the use of valuation techniques that rely on significant estimates and assumptions. These estimates and assumptions may include forecasted revenue growth rates; forecasted operating margins; risk-adjusted discount rates; forecasted economic and market conditions; and industry multiples. We base our fair value estimates on assumptions we believe to be reasonable given the information that is available to us at the time of our assessment; however, actual future results may differ significantly from those estimates. Under certain favorable circumstances, goodwill may be reviewed qualitatively for indications of impairment without utilizing valuation techniques to estimate fair value. The qualitative assessment of goodwill may rely on significant assumptions about forecasts of revenue growth, operating margins and economic conditions as well as overall market and industry-specific trends. In addition, the carrying value of goodwill, as denominated in foreign currencies, is adjusted each reporting period as a result of movements in foreign currency exchange rates relative to the U.S. dollar. Such foreign currency translation adjustments are recorded in accumulated other comprehensive income (loss) within shareholders' equity.

We also review indefinite-lived intangible assets on a quarterly basis or more frequently when events and circumstances indicate that their carrying values may not be recoverable. Indefinite-lived intangible assets may be tested quantitatively for impairment by comparing their carrying values to their estimated fair values. Estimating the fair value of indefinite-lived intangible assets involves the use of valuation techniques that rely on significant estimates and assumptions. These estimates and assumptions may include forecasted revenue growth rates, forecasted allocations of expense and risk-adjusted discount rates. We base our fair value estimates on assumptions we believe to be reasonable given the information that is available to us at the time of our assessment; however, actual future results may differ significantly from those estimates. Similar to goodwill, under certain favorable circumstances, indefinite-lived intangible assets may be reviewed qualitatively for indications of impairment without utilizing valuation techniques to estimate fair value. The qualitative assessment of indefinite-lived intangible assets may rely on significant assumptions about forecasts of revenue growth, operating margins and economic conditions as well as overall market and industry-specific trends.

Intangible assets subject to amortization are also assessed for impairment on a quarterly basis or more frequently when indicated by a change in economic or operational circumstances. The impairment assessment of these assets requires management to first compare the carrying value of the amortizing asset to its undiscounted net cash flows. If the carrying value

exceeds the undiscounted net cash flows, management is then required to estimate the fair value of the assets and record an impairment loss for the excess of the carrying value over the fair value. In connection with this impairment assessment, management also challenges the useful lives of our definite-lived intangible assets.

Revenue recognition. A significant portion of our revenue is derived from the clearing and transaction fees we assess on each contract executed through our trading venues and cleared through our clearing house. Clearing and transaction fees are recognized as revenue when a buy and sell order are matched, novated and when the trade is cleared. On occasion, the customer's exchange trading privileges may not be properly entered by the clearing firm and incorrect fees are charged for the transactions in the affected accounts. When this information is corrected within the time period allowed by the exchange, a fee adjustment is provided to the clearing firm. A reserve is established for estimated fee adjustments to reflect corrections to customer exchange trading privileges. This reserve has historically been immaterial. The reserve is based on the historical pattern of adjustments processed as well as management's estimate of future adjustment activity.

Income taxes. Calculation of the income tax provision includes an estimate of the income taxes that will be paid for the current year, as well as an estimate of income tax liabilities or benefits deferred into future years. Deferred tax assets are reviewed to determine if they will be realized in future periods. To the extent it is determined that some deferred tax assets may not be fully realized, the assets are reduced to their realizable value by a valuation allowance. The calculation of our tax provision involves uncertainty in the application of complex tax regulations and we occasionally may consult with relevant tax authorities or engage third-party expertise where appropriate. We recognize potential liabilities for anticipated tax audit issues in the United States and other applicable foreign tax jurisdictions using a more-likely-than-not recognition threshold based on the technical merits of the tax position taken or expected to be taken. If the actual obligation of these amounts varies from our estimate, our income tax provision would be reduced or increased at the time that determination is made. This determination may not be known for several years. Past tax audits have not resulted in tax adjustments that resulted in a material change to the income tax provision in the year the audit was completed. The effective tax rate, defined as the income tax provision as a percentage of income before income taxes, will vary from year to year based on changes in tax jurisdictions, tax rates and regulations. In addition, the effective tax rate will vary with changes to income that are not subject to income tax and changes in expenses or losses that are not deductible, such as the utilization of foreign net operating losses.

Internal use software costs. Certain internal and external costs that are incurred in connection with developing or obtaining software for internal use are capitalized. We also enter into software hosting arrangements for software projects maintained or developed in the cloud. Software development costs incurred during the planning or maintenance stages of a software project are expensed as incurred, while certain costs incurred during the application development stage are capitalized and are amortized over the estimated useful life of the software, which is generally two to four years, but up to eight years for certain trading and clearing applications, depending upon expected useful lives. Amortization of capitalized costs begins only when the software becomes ready for its intended use. In addition, software assets are assessed for impairment when events or circumstances indicate that the carrying values may not be recoverable or that a reduction in the estimated useful lives is warranted.

RESULTS OF OPERATIONS

Financial Highlights

The following summarizes significant changes in our financial performance for the years presented. For a comparison of our results of operations for the fiscal years ended December 31, 2021 to December 31, 2020, see "Part II, Item 7 - Management's Discussion and Analysis of Financial Condition and Results of Operations" of our Annual Report on Form 10-K for the fiscal year ended December 31, 2021, filed with the SEC on February 25, 2022.

(dollars in millions, except per share data)			Year-over-Year Change	
	2022	2021	2022-2021	
Total revenues	\$ 5,019.4	\$ 4,689.7	7 %	
Total expenses	2,003.5	2,044.5	(2)	
Operating margin	60.1 %	56.4 %		
Non-operating income (expense)	\$ 474.4	\$ 728.4	(35)	
Effective tax expense rate	22.9 %	21.8 %		
Net income attributable to CME Group	\$ 2,691.0	\$ 2,636.4	2	
Diluted earnings per common share attributable to CME Group	7.40	7.29	2	
Cash flows from operating activities	3,056.0	2,402.4	27	

Revenues

(dollars in millions)	2022	2021	Year-over- Year Change 2022-2021
Clearing and transaction fees	\$ 4,142.7	\$ 3,765.1	10 %
Market data and information services	610.9	576.9	6
Other	265.8	347.7	(24)
Total Revenues	<u>\$ 5,019.4</u>	<u>\$ 4,689.7</u>	7

Clearing and Transaction Fees

Futures and Options

The following table summarizes our total contract volume, revenue and average rate per contract for futures and options. Total contract volume includes contracts that are traded on our exchange and cleared through our clearing house and certain cleared-only contracts. Volume is measured in round turns, which is considered a completed transaction that involves a purchase and an offsetting sale of a contract. Average rate per contract is determined by dividing total clearing and transaction fees by total contract volume. Contract volume and average rate per contract disclosures below exclude trading volume for the cash markets business as well as interest rate swaps.

	2022	2021	Year-over- Year Change 2022-2021
Total contract volume (in millions)	5,846.0	4,942.7	18 %
Clearing and transaction fees (in millions)	\$ 3,758.5	\$ 3,306.3	14
Average rate per contract	0.643	0.669	(4)

We estimate the following net increase in clearing and transaction fees based on a change in total contract volume and a change in average rate per contract during 2022 compared with 2021.

(in millions)	Year-over- Year Change 2022-2021
Increase due to change in total contract volume	\$ 580.7
Decrease due to change in average rate per contract	(128.5)
Net increase in clearing and transaction fees	<u>\$ 452.2</u>

Average rate per contract is impacted by our rate structure, including volume-based incentives, product mix, trading venue and the percentage of volume executed by customers who are members compared with non-member customers. Due to the relationship between average rate per contract and contract volume, the change in clearing and transaction fees attributable to changes in each is only an approximation.

Contract Volume

The following table summarizes average daily contract volume. Contract volume can be influenced by many factors, including political and economic factors, the regulatory environment and market competition.

(amounts in thousands)	2022	2021	Year-over- Year Change 2022-2021
Average Daily Volume by Product Line:			
Interest rates	10,818	9,200	18 %
Equity indexes	7,650	5,517	39
Foreign exchange	987	799	24
Agricultural commodities	1,289	1,362	(5)
Energy	2,026	2,188	(7)
Metals	521	548	(5)
Aggregate average daily volume	23,291	19,614	19
Average Daily Volume by Venue:			
CME Globex	21,712	18,318	19
Open outcry	800	679	18
Privately negotiated	779	617	26
Aggregate average daily volume	23,291	19,614	19
Electronic Volume as a Percentage of Total Volume	93 %	93 %	

Interest rate, equity, and foreign exchange volatility were higher in 2022 when compared with 2021 as result of a change in market expectations and uncertainty regarding the Federal Reserve's interest rate policy amid higher than expected inflation levels. The Federal Open Market Committee raised the Federal Funds rate by a total of 425 percentage points in 2022 and has indicated that it intends to further raise interest rates in the near future. The Federal Reserve also began quantitative tightening in the second half of 2022 by reducing its holdings of U.S. Treasury securities. However, the geopolitical uncertainty between Russia and Ukraine led to risk aversion and reduced trading by market participants within the agricultural commodity and energy markets due to global commodity trade uncertainty. We believe these factors led to the changes in contract volume during 2022, when compared with 2021.

Interest Rate Products

The following table summarizes average daily contract volume for our key interest rate products. Eurodollar front 8 contracts include contracts expiring within two years. Eurodollar back 32 contracts include contracts expiring within three to ten years.

(amounts in thousands)	2022	2021	Year-over- Year Change 2022-2021
Eurodollar futures and options:			
Futures expiring within two years	1,100	1,291	(15)%
Options	833	1,059	(21)
Futures expiring beyond two years	440	1,085	(59)
SOFR futures and options:			
Futures expiring within two years	1,479	145	n.m.
Futures expiring beyond two years	282	13	n.m.
Options	440	36	n.m.
U.S. Treasury futures and options:			
10-Year	2,497	2,495	—
5-Year	1,543	1,278	21
2-Year	682	459	48
Treasury Bond	503	580	(13)
Federal Funds futures and options	335	112	n.m.

n.m. not meaningful

In 2022 compared with 2021, overall interest rate contract volume increased as a result of higher overall volatility. We believe this was due to higher than expected inflation levels, the Federal Open Market Committee's decision to increase the Federal Funds rate multiple times in 2022 as well as the Federal Reserve's quantitative tightening in the second half of 2022. The increase in overall SOFR volume was also due to more market participants transitioning to the new reference rate away from LIBOR as well as incentive programs designed to encourage market participation in SOFR options trading.

Equity Index Products

The following table summarizes average daily contract volume for our key equity index products.

(amounts in thousands)	2022	2021	Year-over-Year Change 2022-2021
E-mini S&P 500 futures and options ⁽¹⁾	4,535	3,179	43 %
E-mini Nasdaq 100 futures and options ⁽¹⁾	2,208	1,536	44
E-mini Russell 2000 futures and options ⁽¹⁾	378	368	3

(1) Futures and options now include respective weekly Micro E-mini options that were previously separated under a unique product category. Prior period amounts have been revised to conform to the current period presentation.

Equity index contract volume increased due to higher overall volatility in 2022 when compared with 2021. Volatility within the equity indexes increased as a result of higher than expected inflation levels as well as the Federal Reserve's actions to increase the Federal Funds rate and quantitative tightening in 2022. We believe these factors led to the overall increases in equity contract volumes.

Foreign Exchange Products

The following table summarizes average daily contract volume for our key foreign exchange products.

(amounts in thousands)	2022	2021	Year-over-Year Change 2022-2021
Euro	263	210	25 %
Japanese yen	167	114	46
British pound	129	101	28
Australian dollar	106	102	3

Overall foreign exchange contract volume increased in 2022 when compared with 2021, which we believe is due to higher overall market volatility. Market volatility increased in 2022 due to the global central banks' interest rate policy decisions as a result of higher than expected inflation.

Agricultural Commodity Products

The following table summarizes average daily volume for our key agricultural commodity products.

(amounts in thousands)	2022	2021	Year-over-Year Change 2022-2021
Corn	418	458	(9)%
Soybean	268	281	(5)
Wheat	175	197	(11)

In 2022 when compared with 2021, overall commodity contract volume decreased, which we believe is largely due to risk aversion by market participants following price increases and global trade uncertainty resulting from the Russia and Ukraine conflict.

Energy Products

The following table summarizes average daily volume for our key energy products.

(amounts in thousands)	2022	2021	Year-over-Year Change 2022-2021
WTI crude oil	1,108	1,181	(6)%
Natural gas	492	530	(7)
Refined products	328	351	(6)

Overall energy contract volume decreased in 2022 when compared with 2021. Participant trading activity slowed down largely due to concerns regarding high inflation and an economic downturn. In addition, the sustained conflict between Russia and Ukraine continued to cause disruptions to the global energy markets. We believe these factors led to the overall decrease in energy contract volume.

Metal Products

The following table summarizes average daily volume for our key metal products.

(amounts in thousands)	2022	2021	Year-over-Year Change 2022-2021
Gold	318	330	(4)%
Copper	93	101	(8)
Silver	83	95	(12)

In 2022 when compared with 2021, overall metal contract volume decreased, which we believe was attributable to lower overall market volatility within the gold and silver markets. Volume was higher in 2021, as investors were using gold and other precious metals as safe-haven investments following the COVID-19 pandemic.

Average Rate per Contract

The average rate per contract was lower in 2022 when compared with 2021. The decrease in the average rate per contract was primarily due to a change in product mix. Equity index contract volume increased by 5 percentage points as a percent of total volume, while agricultural commodity, energy and metal contract volume collectively decreased by 5 percentage points. In general, equity index products have a lower rate per contract compared with the agricultural commodity, energy and metal contracts.

Cash Markets Business

Total clearing and transaction fees revenue in 2022 included \$318.8 million of transaction fees attributable to the cash markets business, compared with \$396.2 million in 2021. This revenue primarily includes BrokerTecs's fixed income volume and EBS foreign exchange volume. In September 2021, we contributed the net assets of our optimization business to OSTTRA, our joint venture with IHS Markit.

(amounts in millions)	2022	2021	Year-over-Year Change 2022-2021
BrokerTec fixed income transaction fees	\$ 164.7	\$ 172.0	(4)%
EBS foreign exchange transaction fees	154.1	164.3	(6)%
Optimization transaction fees	—	59.9	n.m.

n.m. not meaningful

The related average daily notional value for the years ended 2022 and 2021 for key cash markets products were as follows:

(amounts in billions)			Year-over-Year Change	
	2022	2021	2022-2021	
European Repo (in euros)	\$ 345.2	\$ 292.3		18 %
U.S. Treasury	126.1	115.0		10 %
Spot FX	65.7	61.2		7 %

Overall average daily notional value for the cash markets business increased in 2022 when compared with 2021. The increases in European Repo and U.S. Treasury transactions were largely due to increased volatility as a result of a change in market expectations regarding the Federal Reserve's interest rate policy, following higher than expected inflation levels in 2022. Despite the increase in average daily notional value, transaction revenue for BrokerTec and EBS decreased slightly due to the tiered pricing structure and incentive rate programs.

Concentration of Revenue

We bill a significant portion of our clearing and transaction fees to our clearing firms. The majority of clearing and transaction fees received from clearing firms represent charges for trades executed and cleared on behalf of their customers. One clearing firm represented at least approximately 10% of our clearing and transaction fees in 2022. Should a clearing firm withdraw, we believe that the customer portion of the firm's trading activity would likely transfer to another clearing firm of the exchange. Therefore, we do not believe we are exposed to significant risk from an ongoing loss of revenue received from or through a particular clearing firm.

Other Sources of Revenue

Market data and information services. In 2022 when compared with 2021, the increase in market data and information services revenue was largely attributable to price increases for certain products as well as an increase in usage for certain products.

The two largest resellers of our market data represented, in aggregate, approximately 33% of our market data and information services revenue in 2022. Despite this concentration, we consider exposure to significant risk of revenue loss to be minimal. In the event that one of these vendors no longer distributes our market data, we believe the majority of that vendor's customers would likely subscribe to our market data through another reseller. Additionally, several of our largest institutional customers that utilize services from our two largest resellers report usage and remit payment of their fees directly to us.

Other revenues. In 2022 when compared with 2021, the decrease in other revenue was largely attributable to the deconsolidation of the optimization business in September 2021 as part of the contribution of the business's net assets to OSTTRA, our joint venture with IHS Markit. In 2021, the optimization business generated \$115.1 million in other revenue.

Expenses

(dollars in millions)			Year-over-Year Change	
	2022	2021	2022-2021	
Compensation and benefits	\$ 753.1	\$ 837.0		(10)%
Technology	188.6	192.6		(2)
Professional fees and outside services	137.4	151.7		(9)
Amortization of purchased intangibles	227.7	237.6		(4)
Depreciation and amortization	134.9	147.8		(9)
Licensing and other fee agreements	320.0	236.9		35
Other	241.8	240.9		—
Total Expenses	<u>\$ 2,003.5</u>	<u>\$ 2,044.5</u>		(2)

2022 Compared With 2021

Operating expenses decreased by \$41.0 million in 2022 when compared with 2021. The following table shows the estimated impact of key factors resulting in the net decrease in operating expenses.

(dollars in millions)	Year-over-Year Change	Change as a Percentage of 2021 Expenses
Salaries, benefits and employer taxes	\$ (63.9)	(3)%
Non-qualified deferred compensation	(28.7)	(1)
Employee separation and retention costs	(25.0)	(1)
Professional fees and outside services	(14.3)	(1)
Currency fluctuation	(12.8)	(1)
Bonus	21.6	1
Licensing and other fee agreements	83.1	4
Other expenses, net	(1.0)	—
Total	<u>\$ (41.0)</u>	<u>(2)%</u>

Overall operating expenses decreased in 2022 when compared with 2021 due to the following reasons:

- Salaries, benefits and employer taxes were lower during 2022 when compared with 2021 due to a net decrease in average headcount, including the contribution of employees from CME Group's optimization businesses to the joint venture with IHS Markit in September 2021.
- A decrease in our non-qualified deferred compensation liability during 2022, the impact of which does not affect net income because of an equal and offsetting change in investment income, contributed to a decrease in compensation and benefits expense.
- Employee separation and retention costs were lower in 2022 compared with 2021 due to a lower reduction in workforce.
- Professional fees and outside services expense decreased due to one-time legal and other professional fees incurred in 2021 related to our joint venture with IHS Markit. The decrease in professional fees was partially offset by an increase in consulting fees attributable to CME Group's partnership with Google Cloud, which was signed in November 2021.
- In 2022, we recognized a net gain of \$13.2 million, compared to a net gain of \$0.4 million in 2021, due to currency exchange rate fluctuations. Gains and losses from exchange rate fluctuations are recognized in the consolidated statements of net income when subsidiaries with a U.S. dollar functional currency hold certain monetary assets and liabilities denominated in foreign currencies.

Increases in operating expenses in 2022 when compared with 2021 were as follows:

- Bonus expense increased in 2022 largely due to performance relative to our 2022 cash earnings target when compared with 2021 performance relative to our 2021 cash earnings target.
- Licensing and other fee agreements expense increased in 2022 due to higher volumes for certain equity products during 2022 compared with 2021.

Non-Operating Income (Expense)

(dollars in millions)	2022	2021	Year-over-Year Change 2022-2021
Investment income	\$ 2,198.4	\$ 306.9	n.m.
Interest and other borrowing costs	(162.7)	(166.9)	(2)
Equity in net earnings (losses) of unconsolidated subsidiaries	301.1	245.8	22
Other income (expense)	(1,862.4)	342.6	n.m.
Total Non-Operating	<u>\$ 474.4</u>	<u>\$ 728.4</u>	<u>(35)</u>

n.m. not meaningful

Investment income. In 2022 when compared with 2021, there was an increase in earnings from reinvested cash performance bond and guaranty fund contributions due to a higher rate of interest earned in the cash accounts at the Federal Reserve Bank of Chicago following interest rate hikes in 2022. In 2022 and 2021, earnings from cash performance bond and guaranty fund contributions were \$2,169.5 million and \$173.9 million, respectively. The increase in income was partially offset by a decrease in net realized and unrealized gains on investments as well as a decrease in earnings on our deferred compensation plan, the impact of which does not affect net income because of an equal and offsetting change in compensation and benefits expense.

Equity in net earnings (losses) of unconsolidated subsidiaries. Higher income generated from our S&P Dow Jones Indices LLC business venture contributed to an increase in equity in net earnings (losses) of unconsolidated subsidiaries in 2022 when compared with 2021. We also recognized our share of net earnings on our investment in OSTTRA, our joint venture with IHS Markit that was formed in September 2021.

Other income (expense). In 2022 when compared with 2021, we recognized higher expenses related to the distribution of interest earned on performance bond collateral reinvestments to the clearing firms in conjunction with higher interest income earned on our reinvestment during the period due to a higher Federal Funds rate in 2022. In 2022 and 2021, expenses related to the distribution of interest earned on collateral reinvestments were \$1,889.7 million and \$119.6 million, respectively. In 2021, we also recognized a net gain of \$400.7 million on the deconsolidation and contribution of our optimization business to OSTTRA.

Income Tax Provision

The following table summarizes the effective tax rate for the periods presented:

	2022	2021	Year-over-Year Change 2022-2021
Year ended December 31	22.9 %	21.8 %	1.1 %

The effective tax rate increased in 2022 when compared with 2021. In 2021, we recognized a gain on the deconsolidation and contribution of our optimization business to OSTTRA, which was not taxable. The impact of the gain in 2021 was partially offset by an increase to the statutory rate in the United Kingdom in 2021.

LIQUIDITY AND CAPITAL RESOURCES

Cash Requirements

We have historically met our funding requirements with cash generated by our ongoing operations. However, we have used our commercial paper program from time to time to fund large short-term funding needs. While our cost structure is generally fixed in the short term, our sources of operating cash are largely dependent on contract trading volume levels. In addition to using our existing cash, cash equivalents, marketable securities and cash generated from operations, we may continue to utilize our commercial paper program to meet our working capital needs, capital expenditures and other commitments. It is also possible that we may need to raise additional funds to finance our activities through future public debt offerings or by direct borrowings from financial institutions through our committed revolving credit facilities.

Cash will also be required for non-cancellable purchase obligations as at December 31, 2022. Commitments include material contractual purchase obligations that are non-cancellable. Purchase obligations relate to advertising, licensing, hardware, software and maintenance as well as telecommunication services. Aside from the table below, we have certain other arrangements that have a perpetual term for which we pay a minimum of \$5.0 million per year. At December 31, 2022, future minimum payments due under purchase obligations were payable as follows (in millions):

Year	
2023	\$ 92.6
2024-2025	184.0
2026-2027	215.1
Thereafter	733.0
Total	<u>\$ 1,224.7</u>

Future capital expenditures for technology are anticipated as we continue to support our growth through increased system capacity, performance improvements, integration of acquired platforms and improvements to some of our office spaces. Each year, capital expenditures are incurred for improvements to and modification of our offices, remote data centers, telecommunications network and other operating equipment. In 2023, we expect capital expenditures to total approximately \$100.0 million, net of any leasehold improvement allowances. We continue to monitor our capital needs and may revise our forecasted expenditures as necessary in the future.

We intend to continue to pay a regular quarterly dividend to our shareholders, with a target of between 50% to 60% of the prior year's cash earnings. The decision to pay a dividend and the amount of the dividend, however, remains within the discretion of our board of directors and may be affected by various factors, including our earnings, financial condition, capital requirements, levels of indebtedness and other considerations our board of directors deems relevant. We are also required to comply with restrictions contained in the general corporation laws of our state of incorporation, which could limit our ability to declare and pay dividends. On February 2, 2023, the company declared a regular quarterly dividend of \$1.10 per share for all outstanding

common and preferred shares. The dividend will be payable on March 27, 2023 to shareholders of record on March 10, 2023. Assuming no changes in the number of shares outstanding, the first quarter dividend payment will total approximately \$400.0 million. The board of directors also declared an additional, annual variable dividend of \$4.50 per share on December 8, 2022 paid on January 18, 2023 to the shareholders of record on December 28, 2022. In general, the amount of the annual variable dividend will be determined by the end of each year, and the level will increase or decrease from year to year based on operating results, capital expenditures, potential merger and acquisition activity and other forms of capital return, including regular dividends and share buybacks during the prior year.

Sources and Uses of Cash

The following is a summary of cash flows from operating, investing and financing activities.

(dollars in millions)	2022	2021	Year-over-Year Change
			2022-2021
Net cash provided by operating activities	\$ 3,056.0	\$ 2,402.4	27 %
Net cash provided by (used in) investing activities	(489.8)	58.4	n.m.
Net cash provided by financing activities	(25,381.7)	69,908.7	n.m.

n.m. not meaningful

Operating activities

Net cash provided by operating activities was higher in 2022 compared with 2021, largely due to an increase in clearing and transaction fee revenue. This was partially offset by income tax payments which were higher in 2022 compared with 2021.

Investing activities

The increase in cash used in investing activities in 2022 compared with 2021 was largely due to the additional investment in S&P Dow Jones Indices LLC of \$410.0 million. In addition, we received \$100.7 million from the OSTTRA joint venture transaction and additional proceeds from sales of investments in 2021.

Financing activities

Cash used in financing activities was higher in 2022 when compared with 2021 mainly due to a decrease in cash performance bonds and guaranty fund contributions. In addition, there was an increase in dividends paid in 2022. In 2021, we received proceeds of \$ 965.0 million from the issuance of preferred shares in connection with our partnership with Google Cloud.

Debt Instruments

The following table summarizes our debt outstanding as of December 31, 2022:

(in millions)	Par Value
Fixed rate notes due May 2023, stated rate of 4.30%	€ 15.0
Fixed rate notes due March 2025, stated rate of 3.00% ⁽¹⁾	\$ 750.0
Fixed rate notes due June 2028, stated rate of 3.75%	\$ 500.0
Fixed rate notes due March 2032, stated rate of 2.65%	\$ 750.0
Fixed rate notes due September 2043, stated rate of 5.30% ⁽²⁾	\$ 750.0
Fixed rate notes due June 2048, stated rate of 4.15%	\$ 700.0

(1) We maintained a forward-starting interest rate swap agreement that modified the interest obligation associated with these notes so that the interest payable on the notes effectively became fixed at a rate of 3.11%.

(2) We maintained a forward-starting interest rate swap agreement that modified the interest obligation associated with these notes so that the interest payable effectively became fixed at a rate of 4.73%.

We maintain a \$2.3 billion multi-currency revolving senior credit facility with various financial institutions, which matures in November 2026. The proceeds from this facility can be used for general corporate purposes, which includes providing liquidity for our clearing house in certain circumstances at CME Group's discretion and, if necessary, for maturities of commercial paper. As long as we are not in default under this facility, we have the option to increase it up to \$3.3 billion with the consent of the agent and lenders providing the additional funds. This facility is voluntarily pre-payable from time to time without premium or penalty. Under this facility, we are required to remain in compliance with a consolidated net worth test, which is defined as our consolidated shareholders' equity at September 30, 2021, giving effect to share repurchases made and special dividends paid

during the term of the agreements (and in no event greater than \$2.0 billion in aggregate), multiplied by 0.65. We currently do not have any borrowings outstanding under this facility, but any commercial paper balance if or when outstanding can be backstopped against this facility.

We maintain a 364-day multi-currency revolving secured credit facility with a consortium of domestic and international banks to be used in certain situations by the clearing house. The facility provides for borrowings of up to \$7.0 billion. We may use the proceeds to provide temporary liquidity in the unlikely event a clearing firm fails to promptly discharge an obligation to CME Clearing, in the event of a liquidity constraint or default by a depository (custodian for our collateral), in the event of a temporary disruption with the domestic payments system that would delay payment of settlement variation between us and our clearing firms, or in other cases as provided by the CME rulebook. Clearing firm guaranty fund contributions received in the form of cash or U.S. Treasury securities as well as the performance bond assets (pursuant to the CME rulebook) can be used to collateralize the facility. At December 31, 2022, guaranty fund contributions available to collateralize the facility totaled \$6.9 billion. We have the option to request an increase in the line from \$7.0 billion to \$10.0 billion. Our 364-day facility contains a requirement that CME remain in compliance with a consolidated tangible net worth test, defined as CME's consolidated shareholder's equity less intangible assets (as defined in the agreement), of not less than \$800.0 million. We currently do not have any borrowings outstanding under this facility.

The indentures governing our fixed rate notes, our \$2.3 billion multi-currency revolving senior credit facility and our 364-day multi-currency revolving secured credit facility for \$7.0 billion do not contain specific covenants that restrict the ability to pay dividends. These documents, however, do contain other customary financial and operating covenants that place restrictions on the operations of the company that could indirectly affect the ability to pay dividends.

At December 31, 2022, we have excess borrowing capacity for general corporate purposes of approximately \$2.3 billion under our multi-currency revolving senior credit facility.

At December 31, 2022, we were in compliance with the various covenant requirements of all our debt facilities.

CME Group, as a holding company, has no operations of its own. Instead, it relies on dividends declared and paid to it by its subsidiaries in order to provide the funds that it uses to pay dividends to its shareholders.

To satisfy our performance bond obligation with Singapore Exchange Limited, we may pledge irrevocable standby letters of credit. At December 31, 2022, the letters of credit totaled \$330.0 million. We also maintain a \$350.0 million line of credit to meet our obligations under this agreement.

The following table summarizes our credit ratings as of December 31, 2022:

Rating Agency	Short-Term Debt Rating	Long-Term Debt Rating	Outlook
Standard & Poor's	A1+	AA-	Stable
Moody's Investors Service	P1	Aa3	Stable

Given our cash flow generation, our ability to pay down debt levels and our ability to refinance existing debt facilities, if necessary, we expect to maintain an investment grade rating. If our ratings are downgraded below investment grade within certain specified time periods due to a change of control, we are required to make an offer to repurchase our fixed rate notes at a price equal to 101% of the principal amount, plus accrued and unpaid interest. No report of any rating agency is incorporated by reference herein.

Liquidity and Cash Management

Cash and cash equivalents, excluding restricted cash, totaled \$2.7 billion and \$2.8 billion at December 31, 2022 and December 31, 2021, respectively. The balance retained in cash and cash equivalents is a function of anticipated or possible short-term cash needs, prevailing interest rates, our corporate investment policy and alternative investment choices. A majority of our cash and cash equivalents balance is invested in money market mutual funds that invest only in U.S. Treasury securities, U.S. government agency securities and U.S. Treasury security reverse repurchase agreements and short-term bank deposits. Our exposure to credit and liquidity risk is minimal given the nature of the investments. Cash that is not available for general corporate purposes because of regulatory requirements or other restrictions is classified as restricted cash and is included in other current assets or other assets in the consolidated balance sheets.

Our practice is to have our pension plan 100% funded at each year end on a projected benefit obligation basis, while also satisfying any minimum required contribution and obtaining the maximum tax deduction. Based on our actuarial projections, we estimate that no additional contribution will be necessary in 2023 to meet our funding goal. However, the amount of the actual contribution is contingent on various factors, including the actual rate of return on our plan assets during 2023 and the December 31, 2023 discount rate.

Regulatory Requirements

CME is regulated by the CFTC as a Derivatives Clearing Organization (DCO). DCOs are required to maintain capital, as defined by the CFTC, in an amount at least equal to one year of projected operating expenses as well as cash, liquid securities, or a line of credit at least equal to six months of projected operating expenses. CME was designated by the Financial Stability Oversight Council as a systemically important financial market utility under Title VIII of the Dodd-Frank Wall Street Reform and Consumer Protection Act. As a result, CME must comply with CFTC regulations applicable to a systemically important DCO for financial resources and liquidity resources. CME is in compliance with all DCO financial requirements.

CME, CBOT, NYMEX and COMEX are regulated by the CFTC as Designated Contract Markets (DCM). DCMs are required to maintain capital, as defined by the CFTC, in an amount at least equal to one year of projected operating expenses as well as cash, liquid securities or a line of credit at least equal to six months of projected operating expenses. Our DCMs are in compliance with all DCM financial requirements.

BrokerTec Americas LLC is required to maintain sufficient net capital under Securities Exchange Act of 1934, as amended (Exchange Act), Rule 15c3-1 (the Net Capital Rule). The Net Capital Rule focuses on liquidity and is designed to protect securities customers, counterparties, and creditors by requiring that broker-dealers have sufficient liquid resources on hand at all times to satisfy claims promptly. Rule 15c3-3, or the customer protection rule, which complements Rule 15c3-1, is designed to ensure that customer property (securities and funds) in the custody of broker-dealers is adequately safeguarded. By law, both of these rules apply to the activities of registered broker-dealers, but not to unregistered affiliates. The firm began operating as a (k)(2)(i) broker-dealer in November 2017 following notification to the Financial Industry Regulatory Authority and the SEC. A company operating under the (k)(2)(i) exemption is not required to lock up customer funds as would otherwise be required under Exchange Act Rule 15c3-3.

ITEM 7A. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK

We are subject to various market risks, including those caused by changes in interest rates, credit and foreign currency exchange rates.

Interest Rate Risk

Debt outstanding at December 31, 2022 consisted of fixed-rate borrowings of \$3.4 billion (in U.S. dollar equivalent). Changes in interest rates impact the fair values of fixed-rate debt, but do not impact earnings or cash flows. We did not have any variable-rate borrowings at December 31, 2022.

Credit Risk

CME Clearing House

Our clearing house acts as the counterparty to all trades consummated on our exchanges as well as through third-party exchanges and swaps markets for which we provide clearing services. As a result, we are exposed to significant credit risk of third parties, including clearing firms. We are also exposed, indirectly, to the credit risk of customers of our clearing firms. These parties may default on their obligations due to bankruptcy, lack of liquidity, operational failure or other reasons.

In order to ensure performance, we establish and monitor financial requirements for our clearing firms. We set minimum performance bond requirements for exchange-traded and interest rate swaps products. For clearing firms, we establish performance bond requirements to cover at least 99% of expected price changes for a given product within a given historical period with further quantitative and qualitative considerations based on market risk. We establish haircuts applied to collateral deposited to meet performance bond requirements to cover at least 99% of expected price changes and foreign currency changes for a given asset within a given historical period with further quantitative and qualitative considerations. Haircuts vary depending on the type of collateral and maturity. We mark-to-market open positions of clearing firms at least once a day (twice a day for futures and options contracts) and require payment from clearing firms whose positions have lost value and make payments to clearing firms whose positions have gained value. We have the capability to mark-to-market more frequently as market conditions warrant. These practices allow our clearing house to quickly identify any clearing firms that may not be able to satisfy the financial obligations resulting from changes in the prices of their open positions before those financial obligations become exceptionally large and jeopardize the ability of our clearing house to ensure performance of their open positions.

Although we have policies and procedures to help ensure that our clearing firms can satisfy their obligations, these policies and procedures may not succeed in detecting problems or preventing defaults. We also have in place various measures intended to enable us to cover any default and maintain liquidity.

Despite our safeguards, we cannot guarantee that these measures will be sufficient to protect us from a default or that we will not be materially and adversely affected in the event of a significant default.

We maintain two separate financial safeguard packages:

- a financial safeguard package for all futures, options and over-the-counter swap contracts other than cleared interest rate swap contracts (base package); and
- a financial safeguard package for cleared interest rate swap contracts.

In the unlikely event of a payment default by a clearing firm, we would first apply assets of the defaulting clearing firm to satisfy its payment obligation. These assets include the defaulting firm's guaranty fund contributions, performance bonds and any other available assets, such as assets required for clearing membership and any associated trading rights. Thereafter, if the payment default remains unsatisfied, we would use our corporate contributions designated for the respective financial safeguard package. We would then use guaranty fund contributions of other clearing firms within the respective financial safeguard package and funds collected through an assessment against non-defaulting clearing firms within the respective financial safeguard package to satisfy the deficit.

We maintain a \$7.0 billion 364-day multi-currency line of credit with a consortium of domestic and international banks to be used in certain situations by our clearing house. We have the option to request an increase in the line from \$7.0 billion to \$10.0 billion. We may use the proceeds to provide temporary liquidity in the unlikely event of a clearing firm default, in the event of a liquidity constraint or default by a depository (custodian of the collateral) or in the event of a temporary disruption with the payments systems that would delay payment of settlement variation between us and our clearing firms. The credit agreement requires us to pledge certain assets to the line of credit custodian prior to drawing on the line of credit. Pledged assets may include clearing firm guaranty fund deposits held by us in the form of cash or U.S. Treasury securities. Performance bond collateral of a defaulting clearing firm may also be used to secure a draw on the line. In addition to the 364-day multi-currency line of credit, we also have the option to use our \$2.3 billion multi-currency revolving senior credit facility to provide liquidity for our clearing house in the unlikely event of default.

At December 31, 2022, aggregate performance bond deposits for clearing firms for both financial safeguard packages was \$231.5 billion, including cash performance bond deposits, non-cash deposits, Interest Earnings Facility funds and letters of credit. A defaulting firm's performance bond deposits can be used in the event of default of that clearing firm.

The following shows the available assets at December 31, 2022 in the event of a payment default by a clearing firm for the base financial safeguard package after first utilizing the defaulting firm's available assets:

(in millions)	Clearing House Available Assets
Designated corporate contributions for futures and options ⁽¹⁾	\$ 100.0
Guaranty fund contributions ⁽²⁾	4,404.5
Assessment powers ⁽³⁾	12,112.2

(1) Our clearing house designates \$100.0 million of corporate contributions to satisfy a clearing firm default in the event that the defaulting clearing firm's guaranty contributions and performance bonds do not satisfy the deficit.

(2) Guaranty fund contributions of clearing firms include guaranty fund contributions required of clearing firms, but do not include any excess deposits held by us at the direction of clearing firms.

(3) In the event of a clearing firm default, if a loss continues to exist after the utilization of the assets of the defaulted firm, our corporate contribution and the non-defaulting clearing firms' guaranty fund contributions, we would assess all non-defaulting clearing members as provided in the rules governing the guaranty fund. We could assess non-defaulting clearing members 275% of their existing guaranty fund requirements up to a maximum of 550% of their existing guaranty fund requirements as provided in the rules. Assessment powers are calculated to reflect the potential obligation that each clearing member could be called for in the event clearing member defaults exhaust the guaranty fund; however, the total amount available would be reduced by the defaulted clearing members' assessment obligations since they would no longer be able to satisfy their obligations.

The following shows the available assets for the interest rate swap financial safeguard package at December 31, 2022 in the event of a payment default by a clearing firm that clears interest rate swap contracts, after first utilizing the defaulting firm's available assets:

(in millions)	Clearing House Available Assets
Designated corporate contributions for interest rate swap contracts ⁽¹⁾	\$ 150.0
Guaranty fund contributions ⁽²⁾	2,508.2
Assessment powers ⁽³⁾	528.8

- (1) Our clearing house designates \$150.0 million of corporate contributions to satisfy a clearing firm default in the event that the defaulting clearing firm's guaranty contributions and performance bonds do not satisfy the deficit.
- (2) Guaranty fund contributions of clearing firms include guaranty fund contributions required of clearing firms, but do not include any excess deposits held by us at the direction of clearing firms.
- (3) In the event of a clearing firm default, if a loss continues to exist after the utilization of the assets of the defaulted firm, our corporate contribution and the non-defaulting firms' guaranty fund contributions, we would assess non-defaulting clearing members as provided in the rules governing the interest rate swap guaranty fund. Assessment powers are calculated to reflect the potential obligation that each clearing member could be called for based on potential failure of the third and fourth largest clearing member; however, the total amount available would be reduced by the defaulted clearing members' assessment obligations since they would no longer be able to satisfy their obligations.

BrokerTec Americas Matched Principal Business

BrokerTec Americas maintains a matched principal business, where it serves as a fully matched counterparty to offsetting positions entered into by clients on its electronic trading platform to facilitate anonymity and access to clearing and settlement. BrokerTec Americas uses Fixed Income Clearing Corporation (FICC), a third-party central clearing house as well as a third-party clearing bank for the settlement of transactions and is required to post short-term margin requirements twice a day that can vary based on the size of unsettled transactions and any adverse market changes. At December 31, 2022, the balance of the collateral at FICC was \$100.0 million, which was included in other current assets on the consolidated balance sheet.

Without sufficient funds to meet its obligations, BrokerTec Americas could be exposed to risk of breach of contract with the counterparties and the inability to continue as a member of the third-party central clearing house. Transactions with clearing house members are typically confirmed and novated shortly after execution, at which point the clearing house assumes the risk of settlement. For transactions with counterparties that are not members of the third-party clearing house, settlement typically occurs on the day following execution and, prior to settlement, BrokerTec Americas is exposed to the risk of loss in the event a counterparty fails to meet its obligations. If that were to occur, BrokerTec Americas would have the right to cover or liquidate the open position but could incur a loss as a result of market movements.

Foreign Currency Exchange Rate Risk

Foreign Currency Transaction Risk

We have foreign currency transaction risk related to changes in exchange rates on monetary assets, liabilities, revenues and expenses held at subsidiaries where those balances and activity are denominated in a currency other than the subsidiary's functional currency. Gains and losses on foreign currency transactions result primarily from cash, debt and other monetary assets, liabilities, revenues and expenses denominated in British pounds, euros and Japanese yen.

Aggregate transaction gains (losses) for 2022, 2021 and 2020 were \$13.2 million, \$0.4 million and \$(9.3) million, respectively. We expect the foreign currency gain/loss to continue to fluctuate as long as we continue to hold monetary assets and liabilities at those subsidiaries. Market uncertainty could potentially lead to significant volatility with foreign currency exchange rates, which could result in additional foreign currency gain/loss.

Foreign Currency Translation Risk

We have foreign currency translation risk related to the translation of our foreign consolidated and unconsolidated subsidiaries' assets, liabilities, revenues and expenses from their respective functional currencies to the U.S. dollar at each reporting date. Fluctuations in exchange rates may impact the amount of assets, liabilities, revenues and expenses we report on our consolidated balance sheets and consolidated statements of income. The financial statements of those foreign subsidiaries with functional currencies other than the U.S. dollar are translated into U.S. dollars using a current exchange rate. Gains and losses resulting from this translation are recognized as a foreign currency translation adjustment within accumulated other comprehensive income, which is a component of shareholders' equity and comprehensive income. Aggregate translation gains (losses), net of tax, for 2022, 2021 and 2020 were \$(195.4) million, \$(62.0) million and \$134.3 million, respectively.

Foreign Currency Exchange Risk Related to Customer Collateral

A portion of performance bond deposits is denominated in various foreign currencies. We mark-to-market all deposits daily and require payment from clearing firms whose collateral has lost value due to changes in foreign currency rates and price. Therefore, our exposure to foreign currency risk related to performance bond deposits is considered minimal and is not expected to be material to our financial condition or operating results.

ITEM 8. FINANCIAL STATEMENTS AND SUPPLEMENTARY DATA

CME GROUP INC. AND SUBSIDIARIES

CONSOLIDATED BALANCE SHEETS

(dollars in millions, except per share data; shares in thousands)

	December 31,	
	2022	2021
Assets		
Current Assets:		
Cash and cash equivalents	\$ 2,720.1	\$ 2,834.9
Marketable securities	96.0	115.0
Accounts receivable, net of allowance of \$8.1 and \$5.6	483.2	434.5
Other current assets (includes \$4.9 and \$4.8 in restricted cash)	529.8	427.8
Performance bonds and guaranty fund contributions	135,249.2	157,949.6
Total current assets	139,078.3	161,761.8
Property, net	455.5	505.3
Intangible assets—trading products	17,175.3	17,175.3
Intangible assets—other, net	3,269.7	3,532.0
Goodwill	10,482.5	10,528.0
Other assets (includes \$0.1 and \$0.5 in restricted cash)	3,714.4	3,277.9
Total Assets	\$ 174,175.7	\$ 196,780.3
Liabilities and Equity		
Current Liabilities:		
Accounts payable	\$ 121.4	\$ 48.8
Short-term debt	16.0	749.4
Other current liabilities	2,300.9	1,650.6
Performance bonds and guaranty fund contributions	135,249.2	157,949.6
Total current liabilities	137,687.5	160,398.4
Long-term debt	3,422.4	2,695.7
Deferred income tax liabilities, net	5,361.1	5,390.4
Other liabilities	826.0	896.5
Total Liabilities	147,297.0	169,381.0
Shareholders' Equity:		
Preferred stock, \$0.01 par value, 10,000 shares authorized as of December 31, 2022 and 2021; 4,584 issued and outstanding as of December 31, 2022 and 2021, respectively	—	—
Class A common stock, \$0.01 par value, 1,000,000 shares authorized as of December 31, 2022 and 2021, 358,929 and 358,599 shares issued and outstanding as of December 31, 2022 and 2021, respectively	3.6	3.6
Class B common stock, \$0.01 par value, 3 shares authorized, issued and outstanding as of December 31, 2022 and 2021	—	—
Additional paid-in capital	22,261.6	22,190.3
Retained earnings	4,746.8	5,151.9
Accumulated other comprehensive income (loss)	(133.3)	53.5
Total CME Group shareholders' equity	26,878.7	27,399.3
Total Liabilities and Equity	\$ 174,175.7	\$ 196,780.3

See accompanying notes to consolidated financial statements.

CME GROUP INC. AND SUBSIDIARIES

CONSOLIDATED STATEMENTS OF INCOME

(dollars in millions, except per share data; shares in thousands)

	Year Ended December 31,		
	2022	2021	2020
Revenues			
Clearing and transaction fees	\$ 4,142.7	\$ 3,765.1	\$ 3,897.4
Market data and information services	610.9	576.9	545.4
Other	265.8	347.7	440.8
Total Revenues	5,019.4	4,689.7	4,883.6
Expenses			
Compensation and benefits	753.1	837.0	856.5
Technology	188.6	192.6	198.5
Professional fees and outside services	137.4	151.7	191.3
Amortization of purchased intangibles	227.7	237.6	311.2
Depreciation and amortization	134.9	147.8	153.2
Licensing and other fee agreements	320.0	236.9	244.9
Other	241.8	240.9	290.6
Total Expenses	2,003.5	2,044.5	2,246.2
Operating Income	3,015.9	2,645.2	2,637.4
Non-Operating Income (Expense)			
Investment income	2,198.4	306.9	182.7
Interest and other borrowing costs	(162.7)	(166.9)	(166.2)
Equity in net earnings (losses) of unconsolidated subsidiaries	301.1	245.8	190.6
Other non-operating income (expense)	(1,862.4)	342.6	(122.4)
Total Non-Operating Income (Expense)	474.4	728.4	84.7
Income before Income Taxes	3,490.3	3,373.6	2,722.1
Income tax provision	799.3	736.7	615.7
Net Income	2,691.0	2,636.9	2,106.4
Less: net (income) loss attributable to non-controlling interests	—	(0.5)	(1.2)
Net Income Attributable to CME Group	2,691.0	2,636.4	2,105.2
Net Income Attributable to Common Shareholders of CME Group	\$ 2,657.2	\$ 2,617.1	\$ 2,105.2
Earnings per Share Attributable to Common Shareholders of CME Group:			
Basic	\$ 7.41	\$ 7.30	\$ 5.88
Diluted	7.40	7.29	5.87
Weighted Average Number of Common Shares:			
Basic	358,713	358,340	357,764
Diluted	359,181	358,929	358,524

See accompanying notes to consolidated financial statements.

CME GROUP INC. AND SUBSIDIARIES
CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME
(in millions)

	Year Ended December 31,		
	2022	2021	2020
Net income	\$ 2,691.0	\$ 2,636.9	\$ 2,106.4
Other comprehensive income, net of tax:			
Investment securities:			
Net unrealized holding gains (losses) arising during the period	(2.7)	(1.0)	1.1
Reclassification of gains (losses) on sale included in investment income	—	0.3	—
Income tax benefit (expense)	0.7	0.2	(0.3)
Investment securities, net	(2.0)	(0.5)	0.8
Defined benefit plans:			
Net change in defined benefit plans arising during the period	14.9	25.5	(7.4)
Amortization of net actuarial (gains) losses and prior service costs included in compensation and benefits expense	1.2	4.4	4.7
Income tax benefit (expense)	(4.1)	(7.6)	0.7
Defined benefit plans, net	12.0	22.3	(2.0)
Derivative investments:			
Amortization of effective portion of net (gains) losses on cash flow hedges included in interest expense	(1.9)	(1.2)	(2.7)
Income tax benefit (expense)	0.5	0.3	0.7
Derivative investments, net	(1.4)	(0.9)	(2.0)
Foreign currency translation:			
Foreign currency translation adjustments	(195.4)	(62.0)	134.3
Reclassification adjustment for loss included in other expense	—	(40.3)	0.4
Foreign currency translation, net	(195.4)	(102.3)	134.7
Other comprehensive income (loss), net of tax	(186.8)	(81.4)	131.5
Comprehensive income	2,504.2	2,555.5	2,237.9
Less: comprehensive (income) loss attributable to non-controlling interest	—	(0.5)	(1.2)
Comprehensive income attributable to CME Group	\$ 2,504.2	\$ 2,555.0	\$ 2,236.7

See accompanying notes to consolidated financial statements.

CME GROUP INC. AND SUBSIDIARIES
CONSOLIDATED STATEMENTS OF EQUITY

(dollars in millions, except per share data; shares in thousands)

	Class A Common Stock (Shares)	Class B Common Stock (Shares)	Common Stock and Additional Paid-in Capital	Retained Earnings	Accumulated Other Comprehensive Income (Loss)	Total CME Group Shareholders' Equity	Non- controlling Interest	Total Equity
Balance at December 31, 2019	357,469	3	\$ 21,116.8	\$ 5,008.7	\$ 3.4	\$ 26,128.9	\$ 30.4	26,159.3
Net income				2,105.2		2,105.2	1.2	2,106.4
Other comprehensive income					131.5	131.5		131.5
Dividends on common stock of \$5.90 per share				(2,117.7)		(2,117.7)		(2,117.7)
Impact of adoption of standards updates on credit losses				(0.3)		(0.3)		(0.3)
Exercise of stock options	123		6.9			6.9		6.9
Vesting of issued restricted Class A common stock	457		(41.4)			(41.4)		(41.4)
Shares issued to Board of Directors	17		2.9			2.9		2.9
Shares issued under Employee Stock Purchase Plan	44		7.9			7.9		7.9
Stock-based compensation			96.0			96.0		96.0
Balance at December 31, 2020	358,110	3	\$ 21,189.1	\$ 4,995.9	\$ 134.9	\$ 26,319.9	\$ 31.6	\$ 26,351.5

See accompanying notes to consolidated financial statements.

CME GROUP INC. AND SUBSIDIARIES

CONSOLIDATED STATEMENTS OF EQUITY (continued)

(dollars in millions, except per share data; shares in thousands)

	Preferred Stock (Shares)	Class A Common Stock (Shares)	Class B Common Stock (Shares)	Preferred Stock, Common Stock and Additional Paid-in Capital	Retained Earnings	Accumulated Other Comprehensive Income (Loss)	Total CME Group Shareholders' Equity	Non- controlling Interest	Total Equity
Balance at December 31, 2020	—	358,110	3	\$ 21,189.1	\$ 4,995.9	\$ 134.9	\$ 26,319.9	\$ 31.6	\$ 26,351.5
Net income					2,636.4		2,636.4	0.5	2,636.9
Other comprehensive income						(81.4)	(81.4)		(81.4)
Dividends of \$6.85 per common share and \$4.15 per preferred share					(2,480.4)		(2,480.4)		(2,480.4)
Issuance of preferred stock	4,584			965.0			965.0		965.0
Purchase of non- controlling interest				(20.5)			(20.5)	(32.1)	(52.6)
Exercise of stock options		101		5.5			5.5		5.5
Vesting of issued restricted Class A common stock		336		(31.7)			(31.7)		(31.7)
Shares issued to Board of Directors		14		2.9			2.9		2.9
Shares issued under Employee Stock Purchase Plan		38		8.4			8.4		8.4
Stock-based compensation				75.2			75.2		75.2
Balance at December 31, 2021	4,584	358,599	3	\$ 22,193.9	\$ 5,151.9	\$ 53.5	\$ 27,399.3	\$ —	\$ 27,399.3

See accompanying notes to consolidated financial statements.

CME GROUP INC. AND SUBSIDIARIES

CONSOLIDATED STATEMENTS OF EQUITY (continued)
(dollars in millions, except per share data; shares in thousands)

	Preferred Stock (Shares)	Class A Common Stock (Shares)	Class B Common Stock (Shares)	Preferred Stock, Common Stock and Additional Paid-in Capital	Retained Earnings	Accumulated Other Comprehensive Income (Loss)	Total CME Group Shareholders' Equity
Balance at December 31, 2021	4,584	358,599	3	\$ 22,193.9	\$ 5,151.9	\$ 53.5	\$ 27,399.3
Net income					2,691.0		2,691.0
Other comprehensive income						(186.8)	(186.8)
Dividends of \$8.50 per common share and preferred share					(3,096.1)		(3,096.1)
Exercise of stock options		1		0.1			0.1
Vesting of issued restricted Class A common stock		269		(24.8)			(24.8)
Shares issued to Board of Directors		19		4.0			4.0
Shares issued under Employee Stock Purchase Plan		41		7.7			7.7
Stock-based compensation				84.3			84.3
Balance at December 31, 2022	4,584	358,929	3	\$ 22,265.2	\$ 4,746.8	\$ (133.3)	\$ 26,878.7

See accompanying notes to consolidated financial statements.

CME GROUP INC. AND SUBSIDIARIES
CONSOLIDATED STATEMENTS OF CASH FLOWS
(in millions)

	Year Ended December 31,		
	2022	2021	2020
Cash Flows from Operating Activities			
Net income	\$ 2,691.0	\$ 2,636.9	\$ 2,106.4
Adjustments to reconcile net income to net cash provided by operating activities:			
Stock-based compensation	84.3	75.2	96.0
Amortization of purchased intangibles	227.7	237.6	311.2
Depreciation and amortization	134.9	147.8	153.2
Net losses on assets held for sale and impaired	—	—	26.3
Gain on sale of building	—	(30.4)	—
Gain on joint venture	—	(400.7)	—
(Gain)/Loss on derivative contracts	—	—	(1.5)
Net realized and unrealized (gains)/losses on investments	(4.8)	(117.0)	5.5
Deferred income taxes	(23.2)	34.8	(41.6)
Change in:			
Accounts receivable	(51.1)	(45.7)	28.2
Other current assets	(76.5)	(55.4)	30.4
Other assets	87.0	61.3	71.6
Accounts payable	72.5	(18.6)	7.4
Income taxes payable	(147.8)	(120.5)	4.7
Other current liabilities	88.1	61.9	(54.3)
Other liabilities	(67.4)	(44.8)	(28.8)
Other	41.3	(20.0)	0.9
Net Cash Provided by Operating Activities	3,056.0	2,402.4	2,715.6
Cash Flows from Investing Activities			
Proceeds from maturities and sales of available-for-sale marketable securities	6.3	9.4	12.3
Purchases of available-for-sale marketable securities	(4.4)	(7.8)	(11.1)
Purchases of property, net	(89.7)	(127.2)	(197.5)
Investments in business ventures	(3.1)	(4.5)	(5.5)
Proceeds from sale of business ventures	11.1	101.4	26.3
Payment for acquisition of subsidiary's interests from the non-controlling interest	—	(52.9)	—
Proceeds from the sale of building property	—	39.3	—
Net cash proceeds from OSTTRA joint venture transaction	—	100.7	—
Investment in S&P Dow Jones Indices LLC	(410.0)	—	—
Net Cash Provided by (Used in) Investing Activities	(489.8)	58.4	(175.5)

See accompanying notes to consolidated financial statements.

CME GROUP INC. AND SUBSIDIARIES
CONSOLIDATED STATEMENTS OF CASH FLOWS (continued)
(in millions)

	Year Ended December 31,		
	2022	2021	2020
Cash Flows from Financing Activities			
Repayment issuance of commercial paper, net	\$ —	\$ —	\$ (304.6)
Proceeds from debt, net of issuance costs	741.0	—	—
Repayment of other borrowings, including call premiums	(756.2)	—	—
Proceeds from preferred stock offering	—	965.0	—
Cash dividends	(2,633.5)	(2,189.3)	(2,110.0)
Change in performance bond and guaranty fund contributions	(22,700.3)	71,167.8	49,704.8
Employee taxes paid on restricted stock vesting	(24.8)	(31.7)	(41.4)
Other	(7.9)	(3.1)	(2.2)
Net Cash Provided by (Used in) Financing Activities	(25,381.7)	69,908.7	47,246.6
Net change in cash, cash equivalents, restricted cash and restricted cash equivalents	(22,815.5)	72,369.5	49,786.7
Cash, cash equivalents, restricted cash and restricted cash equivalents, beginning of period	160,789.8	88,420.3	38,633.6
Cash, Cash Equivalents, Restricted Cash and Restricted Cash Equivalents, End of Period	\$ 137,974.3	\$ 160,789.8	\$ 88,420.3
Reconciliation of cash, cash equivalents, restricted cash and restricted cash equivalents:			
Cash and cash equivalents	\$ 2,720.1	\$ 2,834.9	\$ 1,633.2
Short-term restricted cash (within other current assets)	4.9	4.8	4.7
Long-term restricted cash (within other assets)	0.1	0.5	0.6
Restricted cash and restricted cash equivalents (performance bonds and guaranty fund contributions)	135,249.2	157,949.6	86,781.8
Total	\$ 137,974.3	\$ 160,789.8	\$ 88,420.3
Supplemental Disclosure of Cash Flow Information			
Income taxes paid	\$ 973.4	\$ 755.0	\$ 652.7
Interest paid	133.2	133.3	133.3
Non-cash financing activities:			
Declaration of annual variable dividend, payable in January 2023, January 2022 and January 2021	1,635.7	1,183.8	895.2

See accompanying notes to consolidated financial statements.

CME GROUP INC. AND SUBSIDIARIES

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

1. ORGANIZATION AND BUSINESS

CME Group Inc. (CME Group) exchanges offer the widest range of global benchmark products across all major asset classes based on interest rates, equity indexes, foreign exchange (FX), agricultural, energy and metal commodities. We offer futures and options across asset classes as well as cash, repo fixed income and OTC FX trading through the CME Globex platform. In addition, it operates one of the world's leading central counterparty clearing houses. CME Group offers clearing, settlement and guarantees for all products cleared through the clearing house.

Chicago Mercantile Exchange Inc. (CME), the Board of Trade of the City of Chicago, Inc. (CBOT), New York Mercantile Exchange, Inc. (NYMEX) and Commodity Exchange, Inc. (COMEX), wholly-owned subsidiaries of CME Group, are designated contract markets for the trading of futures and options contracts.

In September 2021, the company and IHS Markit launched a new joint venture, OSTTRA, to combine their post-trade services. OSTTRA performs trade processing and risk mitigation services. The company contributed the net assets of its optimization business, which included Traiana, TriOptima and Reset, to the joint venture and deconsolidated the net assets of the optimization business. The financial statements and accompanying notes presented in this report exclude the assets, liabilities, revenues and expenses from the optimization business and include an investment in the joint venture and equity in net earnings from the joint venture after September 2021.

CME Group and its subsidiaries are referred to collectively as "the company" in the notes to the consolidated financial statements.

2. SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Basis of Presentation. The accompanying consolidated financial statements are prepared in accordance with accounting principles generally accepted in the U.S. and include the accounts of the company and its subsidiaries. All intercompany transactions and balances have been eliminated.

Use of Estimates. The preparation of consolidated financial statements requires management to make estimates and assumptions that affect the reported amounts and the disclosure of contingent amounts on the consolidated financial statements and accompanying notes. Estimates are based on historical experience, where applicable, and assumptions management believes are reasonable under the circumstances. Due to the inherent uncertainty involved with estimates, actual results may differ.

Cash and Cash Equivalents. Cash and cash equivalents consist of cash and highly liquid investments with a maturity of three months or less at the time of purchase.

Financial Investments. The company maintains short-term and long-term investments, classified as equity method investments, available-for-sale debt securities, equity investments in privately-held entities, and trading securities. Available-for-sale debt securities are carried at fair value, with unrealized gains and losses, net of deferred income taxes, reported as a component of accumulated other comprehensive income. Trading securities held in connection with non-qualified deferred compensation plans are recorded at fair value, with net realized and unrealized gains and losses and dividend income reported as investment income. For equity investments in privately-held entities that do not have a readily determinable fair value, our accounting policy is to utilize the measurement alternative for valuation of these investments, which permits the company to estimate fair value at cost minus impairment, plus or minus changes resulting from observable price movements. Additionally, the company maintains long-term investments accounted for under the equity method, which requires that the company recognize its share of net income (loss) and other comprehensive income (loss) in the investee as an adjustment to the carrying amount of the investment each reporting period.

The company reviews its investment portfolio at least quarterly, as well as whenever facts or circumstances exist which indicate that the carrying value of an investment is greater than its fair value. For investments not carried at fair value, the carrying value of the investment is reduced to its fair value and a corresponding impairment expense is charged to earnings, if events and circumstances indicate that a markdown to fair value is warranted. Declines in the fair value of available-for-sale debt securities that are deemed to represent indicators of impairment are charged to earnings as a realized loss.

Fair Value of Financial Instruments. The company uses a three-level classification hierarchy of fair value measurements that establishes the quality of inputs used to measure fair value. The fair value of a financial instrument is the amount that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. The fair value of financial instruments is determined using various techniques that involve some level of estimation and judgment, the degree of which is dependent on the price transparency and the complexity of the instruments.

Derivative Investments. The company occasionally uses derivative instruments to limit exposure to changes in interest rates and foreign currency exchange rates. Derivatives are recorded at fair value on the consolidated balance sheets. For those derivatives that meet the criteria for hedge accounting and are classified as effective cash flow hedges, changes in the fair value of derivative financial instruments are initially recorded in other comprehensive income and subsequently reclassified into earnings when the hedged item affects income. The company assesses, both at the inception of each hedge and on an ongoing basis, whether the derivative financial instruments that are designated as cash flow hedging transactions are highly effective in offsetting changes in cash flows of the hedged items. For any hedges no longer deemed effective or for which hedge accounting is not applied, changes in fair value of the derivative instruments are recognized in earnings within other non-operating income (expense). There were no outstanding derivative instruments at December 31, 2022.

Accounts Receivable. Accounts receivable are comprised of trade receivables and unbilled revenue. All accounts receivable are stated at net realizable value. Exposure to losses on receivables for clearing and transaction fees and other amounts owed by clearing and trading firms is dependent on each firm's financial condition. With respect to clearing firms, our credit loss exposure is mitigated by the memberships that collateralize fees owed to the company. The company retains the right to liquidate exchange memberships to satisfy an outstanding receivable. The allowance for doubtful accounts is calculated based on management's assessment of future expected losses over the life of the receivable, historical trends and the current economic environment within which we operate.

Performance Bonds and Guaranty Fund Contributions. Performance bonds and guaranty fund contributions held for clearing firms may be in the form of cash, securities or other non-cash deposits.

Performance bonds and guaranty fund contributions received in the form of cash held by CME may be invested in U.S. government securities, U.S. government agency securities and certain foreign government securities acquired through and held by a bank or broker-dealer subsidiary of a bank, a cash account at the Federal Reserve Bank of Chicago, reverse repurchase agreements secured with highly rated government securities, money market funds or through CME's Interest Earning Facility (IEF) program. Any interest earned on these investments accrues to CME and is included in investment income on the consolidated statements of income. CME may distribute any interest earned on its investments to the clearing firms at its discretion. Because CME has control of the cash collateral and the benefits and market risks of ownership accrue to CME, cash performance bonds and guaranty fund contributions are reflected on the consolidated balance sheets. The cash performance bonds and guaranty fund contributions are considered restricted cash as the cash deposits cannot be used for the company's operations or to satisfy any operational liabilities.

Securities and other non-cash deposits may include U.S. Treasury securities, U.S. government agency securities, Eurobonds, corporate bonds, other foreign government securities and gold bullion. Securities and other non-cash deposits are held in safekeeping by a custodian bank. Interest and gains or losses on securities deposited to satisfy performance bond and guaranty fund requirements accrue to the clearing firm. Because the benefits and risks of ownership accrue to the clearing firm, non-cash performance bonds and guaranty fund contributions are not reflected on the consolidated balance sheets.

Property. Property is stated at cost, less accumulated depreciation and amortization. Depreciation and amortization are calculated using the straight-line method, generally over two to twenty years. Property and equipment are depreciated over their estimated useful lives. Leasehold improvements are amortized over the shorter of the remaining term of the respective lease to which they relate or the remaining useful life of the leasehold improvement. Land is reported at cost. Internal and external costs incurred in developing, obtaining, or implementing computer software for internal use which meet the requirements for capitalization are amortized on a straight-line basis over the estimated useful life of the software, generally two to four years, but up to eight years for certain trading and clearing applications, depending upon expected useful lives.

Leases. The company accounts for our leases of office space as operating leases. Landlord allowances are recorded as a direct reduction to the capitalized lease asset, which is reported in other assets and amortized to rent expense over the term of the lease. Both lease and direct non-lease costs are accounted for as a single lease component for purposes of capitalization on the consolidated balance sheets. The associated lease liability represents the present value of lease payments remaining in the lease term and is recorded within current and other liabilities depending upon the balance sheet classification of the payment obligations as short-term or long-term. For sale leaseback transactions, the company evaluates the sale and the lease arrangement based on the company's conclusion as to whether control of the underlying asset has been transferred and recognizes the sale leaseback as either a sale transaction or under the financing method, which requires the asset to remain on the consolidated balance sheets throughout the term of the lease and the proceeds to be recognized as a financing obligation. A portion of the lease payments is recognized as a reduction of the financing obligation and a portion is recognized as interest expense based on an imputed interest rate.

Goodwill and Other Intangible Assets. Goodwill represents the excess of the purchase price over the fair value of the net assets acquired in a business combination. The company reviews goodwill for impairment at least quarterly and whenever events or circumstances indicate that the carrying value may not be recoverable. The company may test goodwill quantitatively for impairment by comparing the carrying value of a reporting unit to its estimated fair value. Estimating the fair value of a

reporting unit involves significant judgments inherent in the analysis, including estimating the amount and timing of future cash flows and the selection of appropriate discount rates and long-term growth rate assumptions. Changes in these estimates and assumptions could materially affect the determination of fair value for the reporting unit. If the carrying amount exceeds fair value, an impairment loss is recorded. In certain circumstances, goodwill may be reviewed qualitatively for indications of impairment without utilizing valuation techniques to estimate fair value.

The company performs an impairment assessment of indefinite-lived intangible assets at least quarterly or whenever events or circumstances indicate that their carrying values may not be recoverable. If the indefinite-lived intangible asset carrying value exceeds its fair value, an impairment loss is recognized in an amount equal to that excess. Estimating the fair value of indefinite-lived intangible assets involves the use of valuation techniques that rely on significant estimates and assumptions, including forecasted revenue growth rates, forecasted allocations of expense and risk-adjusted discount rates. Changes in these estimates and assumptions could materially affect the determination of fair value for indefinite-lived intangible assets. In certain circumstances, indefinite-lived intangible assets may be reviewed qualitatively for indications of impairment without utilizing valuation techniques to estimate fair value.

Intangible assets subject to amortization are also assessed for impairment at least quarterly or when indicated by a change in economic or operational circumstances. The impairment assessment of these assets requires management to first compare the carrying value of the amortizing asset to undiscounted net cash flows. If the carrying value exceeds the undiscounted net cash flows, management is then required to estimate the fair value of the assets and record an impairment loss for the excess of the carrying value over the fair value. In connection with this impairment assessment, management also challenges the useful lives of our amortizing intangible assets.

Business Combinations. The company accounts for business combinations using the acquisition method. The method requires the acquirer to recognize the assets acquired, liabilities assumed, and any non-controlling interest in the acquiree at the acquisition date, measured at their fair values as of that date. The company may use independent valuation services to assist in determining the estimated fair values.

Employee Benefit Plans. The company recognizes the funded status of defined benefit postretirement plans on its consolidated balance sheets. Changes in that funded status are recognized in the year of change in other comprehensive income (loss). Plan assets and obligations are measured at year end. The company recognizes future changes in actuarial gains and losses and prior service costs in the year in which the changes occur through accumulated other comprehensive income (loss).

Foreign Currency Translation . Foreign currency denominated monetary assets and liabilities are re-measured into the functional currency using period-end exchange rates. Gains and losses from foreign currency transactions are included in other expense on the accompanying consolidated statements of income. When the functional currency differs from the reporting currency, revenues and expenses of foreign subsidiaries are translated from their functional currencies into U.S. dollars using weighted-average exchange rates while their assets and liabilities are translated into U.S. dollars using period-end exchange rates. Gains and losses resulting from foreign currency translations are included in accumulated other comprehensive income (loss) within shareholders' equity.

Revenue Recognition. Revenue recognition policies for specific sources of revenue are discussed below.

Clearing and Transaction Fees. Clearing and transaction fees include per-contract charges for trade execution, clearing, trading on the company's electronic trading platforms, portfolio reconciliation and compression services, risk mitigation, and other fees. Fees are charged at various rates based on the product traded, the method of trade, the exchange trading privileges of the customer making the trade and the type of contract. The majority of our clearing and transaction fees are recognized as revenue upon successful execution of the trade. Therefore, unfilled or canceled buy and sell orders have no impact on revenue. On occasion, the customer's exchange trading privileges may not be properly entered by the clearing firm and incorrect fees are charged for the transactions. When this information is corrected within the time period allowed by the company, a fee adjustment is provided to the clearing firm. A reserve is established for estimated fee adjustments to reflect corrections to customer exchange trading privileges. The reserve is based on the historical pattern of adjustments processed as well as management's estimate of future adjustment activity. The company believes the reserve is adequate to cover estimated adjustments as of December 31, 2022 and 2021.

Market Data and Information Services. Market data and information services represent revenue earned for the dissemination of market information. Revenues are accrued each month based on the number of devices reported by vendors or over a straight line basis in accordance with the market data subscription contract term. The company conducts periodic examinations of the number of devices reported and assesses additional fees as necessary. On occasion, customers will pay for services in a lump sum payment; however, revenue is recognized as services are provided.

Other Revenues. Other revenues include access and communication fees, fees for collateral management, equity membership subscription fees and fees for trade order routing through agreements from various strategic relationships as well as other services to customers. Revenue is recognized as services are provided.

Concentration of Revenue. One clearing firm represented at least approximately 10 % of the company's clearing and transaction fee revenue in 2022, 2021 and 2020. Should a clearing firm withdraw from the company, management believes that the customer portion of that firm's trading activity would likely transfer to another clearing firm. Therefore, management does not believe that the company is exposed to significant risk from the ongoing loss of revenue received from a particular clearing firm.

The two largest resellers of market data represented approximately 33 % of market data and information services revenue in 2022, 34 % in 2021, and 35 % in 2020. Should one of these vendors no longer subscribe to the company's market data, management believes that the majority of that firm's customers would likely subscribe to the market data through another reseller. Therefore, management does not believe that the company is exposed to significant risk from a loss of revenue received from any particular market data reseller.

Share-Based Payments. The company accounts for share-based payments at fair value, which is based on the grant date price of the equity awards issued. The company recognizes expense relating to stock-based compensation on an accelerated basis. As a result, the expense associated with each vesting date within a stock grant is recognized over the period of time that each portion of that grant vests. Forfeitures are recognized in the period in which they occur.

Marketing Costs. Marketing costs are incurred for the production and communication of advertising as well as other marketing activities. These costs are expensed when incurred, except for costs related to the production of broadcast advertising, which are expensed when the first broadcast occurs.

Income Taxes. Deferred income taxes arise from temporary differences between the tax basis and book basis of assets and liabilities. A valuation allowance is recognized if it is anticipated that some or all of a deferred tax asset may not be realized. The company accounts for uncertainty in income taxes recognized in its consolidated financial statements by using a more-likely-than-not recognition threshold based on the technical merits of the tax position taken or expected to be taken. The company recognizes interest and penalties related to uncertain tax positions in income tax expense.

Segment Reporting. The company reports the results of its operations as one operating segment primarily comprised of the businesses of CME, CBOT, NYMEX, COMEX and our cash markets business. The individual operations of the company do not meet the thresholds for reporting separate segment information.

Newly Adopted Accounting Policies. The company adopted the following accounting policies during 2022:

In August 2020, FASB issued an accounting update that simplifies the accounting for convertible instruments and amends certain guidance on the computation of EPS for convertible instruments. This guidance reduces the number of accounting models used for the allocation of proceeds attributable to the issuance of a convertible instrument, thereby eliminating the beneficial conversion feature model. It is also noted that this guidance revises and eliminates certain criteria for achieving equity classification on the balance sheet. This accounting update requires entities to provide expanded disclosures about the terms and features of convertible instruments, including information about events, conditions and circumstances that can affect how to assess the amount or timing of an entity's future cash flows related to those instruments. The company adopted this guidance on January 1, 2022. Adoption of this guidance did not have an impact on the consolidated financial statements.

The company does not currently expect any pending accounting pronouncements to have a material impact on the consolidated financial statements.

3. REVENUE RECOGNITION

The company generates revenue from customers from the following sources:

Clearing and transaction fees. Clearing and transaction fees include electronic trading fees and brokerage commissions, surcharges for privately-negotiated transactions, portfolio reconciliation and compression services, risk mitigation and other volume-related charges for trade contracts. Clearing and transaction fees are assessed upfront at the time of trade execution. As such, the company recognizes the majority of the fee revenue upon successful execution of the trade. The minimal remaining portion of the fee revenue related to settlement activities performed after trade execution is recognized over the short-term period that the contract is outstanding, based on management's estimates of the average contract lifecycle. These estimates are based on various assumptions to approximate the amount of fee revenue to be attributed to services performed through contract settlement, expiration, or termination. For cleared trades, these assumptions include the average number of days that a contract remains in open interest, contract turnover, average revenue per day, and revenue remaining in open interest at the end of each period.

The nature of contracts gives rise to several types of variable consideration, including volume-based pricing tiers, customer incentives associated with market maker programs and other fee discounts. The company includes fee discounts and incentives in the estimated transaction price when there is a basis to reasonably estimate the amount of the fee reduction. These estimates are based on historical experience, anticipated performance, and best judgment at the time. Because of the company's certainty in estimating these amounts, they are included in the transaction price of contracts.

Market data and information services. Market data and information services represent revenue from the dissemination of market data to subscribers, distributors, and other third-party licensees of market data. Pricing for market data is primarily based on the number of reportable devices used as well as the number of subscribers enrolled under the arrangement. Fees for these services are generally billed monthly. Market data services are satisfied over time and revenue is recognized on a monthly basis as the customers receive and consume the benefit of the market data services. However, the company also maintains certain annual license arrangements with one-time upfront fees. The fees for annual licenses are initially recorded as a contract liability and recognized as revenue monthly over the term of the annual period.

Other. Other revenues include certain access and communication fees, fees for collateral management, equity membership subscription fees, and fees for trade order routing through agreements from various strategic relationships. Access and communication fees are charged to customers that utilize various telecommunications networks and communications services. Fees for these services are generally billed monthly and the associated fee revenue is recognized as billed. Collateral management fees are charged to clearing firms that have collateral on deposit with the clearing house to meet their minimum performance bond and guaranty fund obligations on the exchange. These fees are calculated based on daily collateral balances and are billed monthly. This fee revenue is recognized monthly as billed as the customers receive and consume the benefits of the services. The company also has an equity membership program which provides equity members the option to substitute a monthly subscription fee for their existing requirement to hold CME Group Class A common stock. Choosing to pay this fee in lieu of holding Class A shares is entirely voluntary and the client's choice. Fee revenue under this program is earned monthly as billed over the contractual term. Pricing for strategic relationships may be driven by customer levels and activity. There are fee arrangements which provide for monthly as well as quarterly payments in arrears. Revenue is recognized monthly for strategic relationship arrangements as the customers receive and consume the benefits of the services.

The following table represents a disaggregation of revenue from contracts with customers for the years ended December 31, 2022, 2021 and 2020:

(in millions)	2022	2021	2020
Interest rates	\$ 1,326.8	\$ 1,121.9	\$ 1,008.1
Equity indexes	1,016.3	752.1	803.7
Foreign exchange	188.3	159.2	163.3
Agricultural commodities	444.7	457.8	462.2
Energy	585.5	616.5	699.3
Metals	196.9	198.8	248.0
BrokerTec fixed income	164.7	172.0	173.3
EBS foreign exchange	154.1	164.3	179.3
Optimization	—	59.9	94.8
Interest rate swap	65.4	62.6	65.4
Total clearing and transaction fees	4,142.7	3,765.1	3,897.4
Market data and information services	610.9	576.9	545.4
Other	265.8	347.7	440.8
Total revenues	<u>\$ 5,019.4</u>	<u>\$ 4,689.7</u>	<u>\$ 4,883.6</u>
Timing of Revenue Recognition			
Services transferred at a point in time	4,044.3	3,656.6	3,785.6
Services transferred over time	955.3	1,021.5	1,091.8
One-time charges and miscellaneous revenues	19.8	11.6	6.2
Total revenues	<u>\$ 5,019.4</u>	<u>\$ 4,689.7</u>	<u>\$ 4,883.6</u>

The timing of revenue recognition, billings and cash collections results in billed accounts receivable, and customer advances and deposits (contract liabilities) on the consolidated balance sheets. Certain fees for transactions, annual licenses, and other revenue arrangements are billed upfront before revenue is recognized, which results in the recognition of contract liabilities. These liabilities are recognized on the consolidated balance sheets on a contract-by-contract basis upon commencement of services under the customer contract. These upfront customer payments are recognized as revenue over time as the obligations under the contracts are satisfied. Changes in the contract liability balances during 2022 were not materially impacted by any other factors. The balance of contract liabilities was \$ 12.7 million and \$ 15.2 million as of December 31, 2022 and 2021, respectively.

4. PERFORMANCE BONDS AND GUARANTY FUND CONTRIBUTIONS

The clearing house clears and guarantees the settlement of contracts traded in the futures and options and interest rate swap markets. In its guarantor role, the clearing house has precisely equal and offsetting claims to and from clearing firms on opposite sides of each contract, standing as an intermediary on every contract cleared. In the U.S., clearing firm funds are held according to Commodity and Futures Trading Commission (CFTC) regulatory account segregation standards. To the extent that funds are not otherwise available to satisfy an obligation under the applicable contract, the clearing house bears counterparty credit risk in the event that future market movements create conditions that could lead to clearing firms failing to meet their obligations to the clearing house. The clearing house reduces the exposure through risk management programs that include initial and ongoing financial standards for designation as a clearing firm, performance bond requirements, daily mark-to-market, mandatory guaranty fund contributions and intra-day monitoring.

Each clearing firm is required to deposit and maintain balances in the form of cash, U.S. government securities, certain foreign government securities, bank letters of credit or other approved collateral to satisfy performance bond and guaranty fund requirements. All non-cash deposits and certain cash deposits with foreign currency exposure are marked-to-market and haircut on a daily basis. Securities deposited by the clearing firms are not reflected on the consolidated financial statements and the clearing house does not earn any interest on these deposits. These balances may fluctuate significantly over time due to investment choices available to clearing firms and changes in the amount of contributions required.

The clearing house marks-to-market open positions at least once a day (twice a day for futures and options contracts), and requires payment from clearing firms whose positions have lost value and makes payments to clearing firms whose positions have gained value. The clearing house has the capability to mark-to-market more frequently as market conditions warrant.

Under the extremely unlikely scenario of simultaneous default by every clearing firm who has open positions with unrealized losses, the maximum exposure at the time of default related to positions other than interest rate swap contracts would be one half day of changes in fair value of all open positions, before considering the clearing house's ability to access defaulting clearing firms' collateral deposits. For cleared interest rate swap contracts, the maximum exposure at the time of default related to the clearing house's guarantee would be one full day of changes in fair value of all open positions, before considering the clearing house's ability to access defaulting clearing firms' collateral. The clearing firms' collateral requirements are sized to cover at least one day of anticipated price movements. During 2022, the clearing house transferred an average of approximately \$ 6.0 billion a day through the clearing system for settlement from clearing firms whose positions had lost value to clearing firms whose positions had gained value. The clearing house reduces its exposure through maintenance performance bond requirements and guaranty fund contributions. For futures and options products, the clearing firms' collateral requirements are sized to cover at least one day of anticipated price movements. For cleared swap products, the clearing firms' collateral requirements are sized to cover at least five days of anticipated price movements. Management has assessed the fair value of the company's settlement guarantee liability by taking the following factors into consideration: the design and operations of the clearing risk management process, the financial safeguard packages in place, historical evidence of default by a clearing member and the estimated probability of potential payouts by the clearing house. Based on the assessment performed, management estimates the guarantee liability to be nominal and therefore has not recorded any liability at December 31, 2022.

CME has been designated as a systemically important financial market utility by the Financial Stability Oversight Council and is authorized to maintain cash accounts at the Federal Reserve Bank of Chicago. At December 31, 2022 and 2021, the clearing house maintained \$ 124.9 billion and \$ 146.1 billion, respectively, within the cash accounts at the Federal Reserve Bank of Chicago. The cash deposited at the Federal Reserve Bank of Chicago is included within performance bonds and guaranty fund contributions on the consolidated balance sheets.

CME and The Options Clearing Corporation (OCC) have a perpetual cross-margin arrangement, whereby a clearing firm may maintain a cross-margin account in which a clearing firm's positions in certain equity index futures and options are combined with certain positions cleared by OCC for purposes of calculating performance bond requirements. The performance bond deposits are held jointly by CME and OCC. Cross-margin cash, securities and letters of credit jointly held with OCC under the cross-margin agreement are reflected at 50 % of the total, or CME's proportionate share per that agreement. If a participating firm defaults, the gain or loss on the liquidation of the firm's open position and the proceeds from the liquidation of the cross margin account would be allocated equally between CME and OCC. In the event of a remaining loss, CME would first apply assets of the defaulting clearing firm to satisfy its payment obligation. These assets include the defaulting firm's guaranty fund contributions, performance bonds and any other available assets, such as assets required for clearing membership and any associated trading rights. Thereafter, if the payment default remains unsatisfied, the clearing house would use its corporate contributions designated for the respective financial safeguard package. The clearing house would then use guaranty fund contributions of other clearing firms within the respective financial safeguard package and funds collected through an assessment against solvent clearing firms within the respective financial safeguard package to satisfy the deficit.

In addition, CME has a cross-margin arrangement with Fixed Income Clearing Corporation (FICC) whereby certain of the clearing firms' offsetting positions with CME and FICC are subject to reduced performance bond requirements.

maintain separate performance bond deposits with each clearing house, but based on the net offsetting positions between CME and FICC, each clearing house may reduce that firm's performance bond requirements. If a participating firm defaults, the gain or loss on the liquidation of the firm's open positions and the proceeds from the liquidation of the cross margin account would be allocated between CME and FICC pursuant to a publicly-available cross-margining agreement. In the event of a remaining loss, CME would first apply assets of the defaulting clearing firm to satisfy its payment obligation. These assets include the defaulting firm's guaranty fund contributions, performance bonds and any other available assets, such as assets required for clearing membership and any associated trading rights. Thereafter, if the payment default remains unsatisfied, the clearing house would use its corporate contributions designated for the respective financial safeguard package. The clearing house would then use guaranty fund contributions of other clearing firms within the respective financial safeguard package and funds collected through an assessment against solvent clearing firms within the respective financial safeguard package to satisfy the deficit.

Each clearing firm for futures and options is required to deposit and maintain specified guaranty fund contributions in the form of cash or U.S. Treasury securities (base guaranty fund). In the event that performance bonds, guaranty fund contributions and other assets required to support clearing membership of a defaulting clearing firm are inadequate to fulfill that clearing firm's outstanding financial obligation, the base guaranty fund for contracts other than interest rate swaps is available to cover potential losses after first utilizing \$ 100.0 million of corporate contributions designated by CME to be used in the event of a default of a clearing firm for the base guaranty fund.

The clearing house maintains a separate guaranty fund to support the clearing firms that clear interest rate swap products (cleared interest rate swaps contract guaranty fund). The funds for interest rate swaps are independent of the base guaranty fund and are isolated to clearing firms for products in the respective asset class. Each clearing firm for cleared interest rate swaps is required to deposit and maintain specified guaranty fund contributions in the form of cash or U.S. Treasury securities. In the event that performance bonds, guaranty fund contributions and other assets required to support clearing membership of a defaulting clearing firm for cleared interest rate swap contracts are inadequate to fulfill that clearing firm's outstanding financial obligation, the interest rate swaps contracts guaranty fund is available to cover potential losses after first utilizing \$ 150.0 million of corporate contributions designated by CME to be used in the event of a default of a cleared interest rate swap clearing firm.

CME maintains a 364 -day multi-currency line of credit with a consortium of domestic and international banks to be used in certain situations by the clearing house. CME may use the proceeds to provide temporary liquidity in the unlikely event of a clearing firm default, in the event of a liquidity constraint or default by a depository (custodian of the collateral), or in the event of a temporary disruption with the domestic payments system that would delay payment of settlement variation between CME and its clearing firms. Clearing firm guaranty fund contributions received in the form of cash or U.S. Treasury securities as well as the performance bond assets of a defaulting firm can be used to collateralize the facility. The line of credit provides for borrowings of up to \$ 7.0 billion. At December 31, 2022, guaranty fund contributions available to collateralize the facility were \$ 6.9 billion. CME has the option to request an increase in the line from \$ 7.0 billion to \$ 10.0 billion, subject to the approval of participating banks. In addition to the 364 -day fully secured, committed multi-currency line of credit, the company also has the option to use the \$ 2.3 billion multi-currency revolving senior credit facility to provide liquidity for the clearing house in the unlikely event of default.

The clearing house is required under the Commodity Exchange Act in the U.S. to segregate cash and securities deposited by clearing firms from its clearing member customers. In addition, the clearing house requires segregation of all funds deposited by its clearing firms from operating funds.

Cash and non-cash deposits held as performance bonds and guaranty fund contributions at fair value at December 31, 2022 and 2021 were as follows:

(in millions)	2022		2021	
	Cash	Non-Cash Deposits and IEF Funds ⁽¹⁾	Cash	Non-Cash Deposits and IEF Funds ⁽¹⁾
Performance bonds	\$ 132,653.7	\$ 94,127.2	\$ 151,094.8	\$ 70,005.3
Guaranty fund contributions	2,450.3	5,026.0	6,745.6	3,326.1
Cross-margin arrangements	142.6	561.1	83.6	—
Performance bond collateral for delivery	2.6	2.1	25.6	2.1
Total	<u>\$ 135,249.2</u>	<u>\$ 99,716.4</u>	<u>\$ 157,949.6</u>	<u>\$ 73,333.5</u>

(1) IEF funds include customer-directed investments in IEF funds that are not included on the consolidated balance sheets.

Cross-margin arrangements include collateral for the cross-margin accounts with OCC and FICC.

Cash performance bonds may include intraday settlement, if any, that is owed to the clearing firms and paid the following business day. The balance of intraday settlements was \$ 436.7 million and \$ 156.4 million at December 31, 2022 and 2021, respectively. Intraday settlements may be invested on an overnight basis and are offset by an equal liability owed to clearing firms.

In addition to cash, securities and other non-cash deposits, irrevocable letters of credit may be used as performance bond deposits for clearing firms. At December 31, 2022 and 2021, these letters of credit, which are not included in the accompanying consolidated balance sheets, were as follows:

(in millions)	2022	2021
Performance bonds	\$ 4,674.3	\$ 3,739.5
Performance bond collateral for delivery	3,445.0	2,603.7
Total Letters of Credit	<u>\$ 8,119.3</u>	<u>\$ 6,343.2</u>

All cash, securities and letters of credit posted as performance bonds are only available to meet the financial obligations of that clearing firm to the clearing house.

5. PROPERTY

A summary of the property accounts at December 31, 2022 and 2021 is presented below:

(in millions)	2022	2021	Estimated Useful Life
Building and building improvements	\$ 132.2	\$ 132.3	1 - 10 years
Leasehold improvements	224.8	232.3	3 - 19 years
Furniture, fixtures and equipment	551.3	519.1	2 - 7 years
Software and software development costs	692.4	661.1	2 - 4 years
Total property	<u>1,600.7</u>	<u>1,544.8</u>	
Less accumulated depreciation and amortization	<u>(1,145.2)</u>	<u>(1,039.5)</u>	
Property, net	<u>\$ 455.5</u>	<u>\$ 505.3</u>	

6. INTANGIBLE ASSETS AND GOODWILL

Intangible assets consisted of the following at December 31, 2022 and 2021:

(in millions)	2022			2021			
	Assigned Value	Accumulated Amortization	Net Book Value	Assigned Value	Accumulated Amortization	Deconsolidation ⁽²⁾	Net Book Value
Amortizable Intangible Assets:							
Clearing firm, market data and other customer relationships	\$ 4,685.8	\$ (1,909.7)	\$ 2,776.1	\$ 5,818.2	\$ (1,847.7)	\$ (950.0)	\$ 3,020.5
Technology-related intellectual property	62.5	(55.8)	6.7	175.3	(76.3)	(84.6)	14.4
Other	69.5	(32.6)	36.9	105.7	(35.5)	(23.1)	47.1
Total Amortizable Intangible Assets	<u>\$ 4,817.8</u>	<u>\$ (1,998.1)</u>	<u>\$ 2,819.7</u>	<u>\$ 6,099.2</u>	<u>\$ (1,959.5)</u>	<u>\$ (1,057.7)</u>	<u>\$ 3,082.0</u>
Indefinite-Lived Intangible Assets:							
Trade names			450.0				450.0
Total Intangible Assets—Other, Net			<u>\$ 3,269.7</u>				<u>\$ 3,532.0</u>
Trading products ⁽¹⁾			<u>\$ 17,175.3</u>				<u>\$ 17,175.3</u>

(1) Trading products represent futures and options products acquired in our business combinations with CBOT Holdings, Inc., NYMEX Holdings, Inc. and The Board of Trade of Kansas City, Missouri, Inc. Clearing and transaction fees are generated through the trading of these products. These trading products, most of which have traded for decades, require authorization from the CFTC. Product authorizations from the CFTC have no term limits.

(2) The activity from deconsolidation includes intangible assets as part of the contribution of the net assets of the optimization business to OSTTRA.

The originally assigned useful lives for the amortizable intangible assets as of December 31, 2022 are as follows:

Clearing firm, market data and other customer relationships	5 - 30 years
Technology-related intellectual property	5 - 9 years
Other	3 - 24.5 years

Total amortization expense for intangible assets was \$ 227.7 million, \$ 237.6 million and \$ 311.2 million for the years ended December 31, 2022, 2021 and 2020, respectively. As of December 31, 2022, the future estimated amortization expense related to amortizable intangible assets is expected to be as follows:

(in millions)	
2023	\$ 228.0
2024	221.3
2025	221.3
2026	221.3
2027	220.0
Thereafter	1,707.8

Goodwill activity consisted of the following for the years ended December 31, 2022 and 2021:

(in millions)	Balance at December 31, 2021	Deconsolidation ⁽¹⁾	Other Activity ⁽²⁾	Balance at December 31, 2022
CBOT Holdings	\$ 5,066.4	\$ —	\$ —	\$ 5,066.4
NYMEX Holdings	2,462.2	—	—	2,462.2
NEX	2,959.0	—	(45.5)	2,913.5
Other	40.4	—	—	40.4
Total Goodwill	<u>\$ 10,528.0</u>	<u>\$ —</u>	<u>\$ (45.5)</u>	<u>\$ 10,482.5</u>
(in millions)	Balance at December 31, 2020	Deconsolidation ⁽¹⁾	Other Activity ⁽²⁾	Balance at December 31, 2021
CBOT Holdings	\$ 5,066.4	\$ —	\$ —	\$ 5,066.4
NYMEX Holdings	2,462.2	—	—	2,462.2
NEX	3,229.8	(246.2)	(24.6)	2,959.0
Other	40.4	—	—	40.4
Total Goodwill	<u>\$ 10,798.8</u>	<u>\$ (246.2)</u>	<u>\$ (24.6)</u>	<u>\$ 10,528.0</u>

1) The activity from deconsolidation includes goodwill as part of the contribution of the net assets of the optimization business to OSTTRA.

2) Other activity includes currency translation adjustments.

7. LONG-TERM INVESTMENTS

The company maintains various long-term investments as described below. The investments are recorded in other assets on the consolidated balance sheets.

DME Holdings Limited. The company owns a 50 % interest in DME Holdings Limited (DME Holdings), and accounts for its investment in DME Holdings using the equity method of accounting. The carrying amount of the company's investment in DME Holdings was \$ 13.3 million at December 31, 2022. The company and DME Holdings maintain an agreement for Dubai Mercantile Exchange futures contracts to be exclusively traded on the CME Globex platform.

OSTTRA. In January 2021, the company announced that it agreed with IHS Markit to combine their post-trade services into a new joint venture. The joint venture, OSTTRA, was launched in September 2021. OSTTRA performs trade processing and risk mitigation services. The company contributed the net assets of its optimization business, which included Traiana, TriOptima and Reset, to the new joint venture in exchange for \$ 112.5 million in cash and a 50 % equity interest in OSTTRA. In September 2021, the company deconsolidated its optimization business. The company recognized a net gain of \$ 400.7 million on the transaction in other non-operating income on the consolidated statements of net income during 2021. The company accounts for its investment using the equity method of accounting. The carrying amount of the company's investment in OSTTRA was \$ 1.3 billion at December 31, 2022.

S&P Dow Jones Indices LLC. In June 2022, the company invested \$ 410.0 million in S&P Dow Jones Indices LLC, which S&P Dow Jones Indices LLC used as part of the consideration for its acquisition of the IHS Markit index business. The company continues to own a 27 % interest in S&P Dow Jones Indices LLC and accounts for its investment in S&P Dow Jones Indices LLC using the equity method of accounting. The carrying amount of the company's investment in S&P Dow Jones Indices LLC was \$ 1.4 billion at December 31, 2022. The company has long-term exclusive licensing agreements with S&P Dow Jones Indices LLC to list products based on the Standard & Poor's Indices and Dow Jones Indices.

Shanghai CFETS-NEX International Money Broking Co., Ltd. The company owns a 33 % interest in Shanghai CFETS-NEX International Money Broking Co., Ltd. (CFETS) and accounts for its investment in CFETS using the equity method of accounting. The carrying amount of the company's investment in CFETS was \$ 45.0 million at December 31, 2022.

8. DEBT

Short-term debt consisted of the following at December 31, 2022 and 2021 (in U.S. dollar equivalents):

(in millions)	2022	2021
\$750.0 million fixed rate notes due September 2022, stated rate of 3.00% ⁽¹⁾	\$ —	\$ 749.4
€15.0 million fixed rate notes due May 2023, stated rate of 4.30%	16.0	—
Total short-term debt	<u>\$ 16.0</u>	<u>\$ 749.4</u>

(1) The company maintained a forward-starting interest rate swap agreement that modified the interest obligation associated with these notes so that the interest payable on the notes effectively became fixed at a rate of 3.32 %.

Long-term debt outstanding consisted of the following at December 31, 2022 and 2021 (in U.S. dollar equivalents):

(in millions)	2022	2021
€15.0 million fixed rate notes due May 2023, stated rate of 4.30%	\$ —	\$ 16.8
\$750.0 million fixed rate notes due March 2025, stated rate of 3.00% ⁽¹⁾	748.4	747.7
\$500.0 million fixed rate notes due June 2028, stated rate of 3.75%	497.7	497.2
\$750.0 million fixed rate notes due March 2032, stated rate of 2.65%	741.7	—
\$750.0 million fixed rate notes due September 2043, stated rate of 5.30% ⁽²⁾	743.7	743.4
\$700.0 million fixed rate notes due June 2048, stated rate of 4.15%	690.9	690.6
Total long-term debt	<u>\$ 3,422.4</u>	<u>\$ 2,695.7</u>

(1) The company maintained a forward-starting interest rate swap agreement that modified the interest obligation associated with these notes so that the interest payable on the notes effectively became fixed at a rate of 3.11 %.

(2) The company maintained a forward-starting interest rate swap agreement that modified the interest obligation associated with these notes so that the interest payable on the notes effectively became fixed at a rate of 4.73 %.

Short term and long-term debt maturities, at par value (in U.S. dollar equivalents), were as follows as of December 31, 2022:

(in millions)	Par Value
2023	\$ 16.0
2024	—
2025	750.0
2026	—
2027	—
Thereafter	2,700.0

9. INCOME TAXES

The company is subject to regulation under a wide variety of U.S., federal, state and foreign tax laws and regulations. Income before income taxes and the income tax provision consisted of the following for the years ended December 31, 2022, 2021 and 2020:

(in millions)	2022	2021	2020
Income before income taxes:			
Domestic	\$ 3,291.7	\$ 2,728.5	\$ 2,640.7
Foreign	198.6	645.1	81.4
Total	<u>\$ 3,490.3</u>	<u>\$ 3,373.6</u>	<u>\$ 2,722.1</u>
Income tax provision:			
Current:			
Federal	\$ 620.5	\$ 509.2	\$ 488.4
State	177.1	173.7	140.1
Foreign	24.9	19.0	28.8
Total	<u>822.5</u>	<u>701.9</u>	<u>657.3</u>
Deferred:			
Federal	(16.3)	(4.6)	2.3
State	(7.3)	10.6	(36.8)
Foreign	0.4	28.8	(7.1)
Total	<u>(23.2)</u>	<u>34.8</u>	<u>(41.6)</u>
Total Income Tax Provision	<u>\$ 799.3</u>	<u>\$ 736.7</u>	<u>\$ 615.7</u>

Reconciliation of the U.S. federal income tax rate (statutory tax rate) to the effective tax rate is as follows:

	2022	2021	2020
Statutory tax rate	21.0 %	21.0 %	21.0 %
State taxes, net of federal benefit	3.9	4.3	3.0
Gain on formation of OSTTRA	—	(2.5)	—
Statutory rate change	—	1.1	—
Foreign-derived intangible income deduction	(1.5)	(1.6)	(2.0)
Other, net	(0.5)	(0.5)	0.6
Effective Tax Expense Benefit Rate	<u>22.9 %</u>	<u>21.8 %</u>	<u>22.6 %</u>

In 2022, the effective tax rate was higher than the statutory tax rate. The increase to the effective tax rate for the state taxes was partially offset by the foreign-derived intangible income (FDII) deduction.

In 2021, the effective tax rate was higher than the statutory tax rate. The increase to the effective tax rate for the state taxes and the impact of the statutory rate change in the United Kingdom was partially offset by the non-taxable gain on the formation of OSTTRA and the FDII deduction.

In 2020, the effective tax rate was higher than the statutory tax rate. The increase to the effective tax rate for the state taxes was partially offset by the FDII deduction.

At December 31, 2022 and 2021, deferred income tax assets (liabilities) consisted of the following:

(in millions)	2022	2021
Deferred Income Tax Assets:		
Net operating losses	\$ 3.7	\$ 21.0
Accrued expenses, compensation, leases and other	135.2	163.1
Subtotal	138.9	184.1
Valuation allowance	(0.4)	(0.6)
Total deferred income tax assets	138.5	183.5
Deferred Income Tax Liabilities:		
Purchased intangible assets	(5,358.8)	(5,405.8)
Other	(106.3)	(123.4)
Property	(30.4)	(40.5)
Total deferred income tax liabilities	(5,495.5)	(5,569.7)
Net Deferred Income Tax Liabilities	\$ (5,357.0)	\$ (5,386.2)
Reported as:		
Net non-current deferred tax assets	\$ 4.1	\$ 4.2
Net non-current deferred tax liabilities	(5,361.1)	(5,390.4)
Net Deferred Income Tax Liabilities	\$ (5,357.0)	\$ (5,386.2)

A valuation allowance is recorded when it is more-likely-than-not that some portion or all of the deferred income tax assets may not be realized. The ultimate realization of the deferred income tax assets depends on the ability to generate sufficient taxable income of the appropriate character in the future and in the appropriate taxing jurisdictions.

At December 31, 2022 and 2021, the company had domestic and foreign income tax loss carry forwards of \$ 17.6 million and \$ 88.6 million, respectively. These amounts primarily related to losses from the acquisition of NEX Group plc, the acquisition of Pivot, Inc., and losses incurred in the operation of various foreign entities. At December 31, 2022 and 2021, the company determined that it was not more-likely-than-not that certain foreign deferred income tax assets will be fully realized.

As a result, valuation allowances of \$ 0.4 million and \$ 0.6 million were recorded at December 31, 2022 and 2021, respectively.

The following is a summary of the company's unrecognized tax benefits at December 31, 2022, 2021 and 2020:

(in millions)	2022	2021	2020
Gross unrecognized tax benefits	\$ 280.3	\$ 316.4	\$ 328.2
Unrecognized tax benefits, net of tax impacts in other jurisdictions	264.4	293.1	302.4
Interest and penalties related to uncertain tax positions	28.0	42.8	43.6
Interest and penalties recognized on the consolidated statements of income	(3.8)	5.3	7.7

The company does not believe it is reasonably possible that within the next twelve months, unrecognized tax benefits will change by a significant amount.

A reconciliation of the beginning and ending amounts of gross unrecognized tax benefits is as follows:

(in millions)	2022	2021	2020
Balance at January 1	\$ 316.4	\$ 328.2	\$ 388.5
Additions based on tax positions related to the current year	8.5	10.2	20.2
Additions for tax positions of prior years	2.7	9.6	3.2
Reductions for tax positions of prior years	(9.5)	(5.1)	(10.8)
Reductions resulting from the lapse of statutes of limitations	(5.5)	(0.3)	—
Settlements with taxing authorities	(32.3)	(26.2)	(72.9)
Balance at December 31	\$ 280.3	\$ 316.4	\$ 328.2

The company is subject to U.S. federal income tax as well as income taxes in Illinois and multiple other state, local and foreign jurisdictions. As of December 31, 2022, substantially all federal, state and United Kingdom income tax matters had been concluded through 2013.

10. EMPLOYEE BENEFIT PLANS

Pension Plans. CME maintains a non-contributory defined benefit cash balance pension plan for eligible employees. CME's plan provides for a pay-based credit added to the cash balance account based on age and earnings and includes salary and cash bonuses in the definition of earnings. Employees who have completed a continuous 12-month period of employment and have reached the age of 21 are eligible to participate. Participant cash balance accounts receive an interest credit equal to the greater of the one-year constant maturity yield for U.S. Treasury notes or 4.0 %. Participants become vested in their accounts after three years of service. The measurement date used for the plan is December 31.

The following is a summary of the change in projected benefit obligation:

(in millions)	2022	2021
Balance at January 1	\$ 386.0	\$ 380.3
Service cost	25.7	27.8
Interest cost	12.0	10.7
Actuarial (gain) loss	(86.7)	(12.9)
Benefits paid	(20.6)	(19.9)
Balance at December 31	<u>\$ 316.4</u>	<u>\$ 386.0</u>

The aggregate accumulated benefit obligation was \$ 294.4 million and \$ 358.7 million at December 31, 2022 and 2021, respectively.

The following is a summary of the change in fair value of plan assets:

(in millions)	2022	2021	2020
Balance at January 1	\$ 402.3	\$ 388.2	\$ 356.9
Actual return on plan assets	(50.0)	34.0	38.8
Benefits paid	(20.6)	(19.9)	(7.5)
Balance at December 31	<u>\$ 331.7</u>	<u>\$ 402.3</u>	<u>\$ 388.2</u>

The plan assets are classified into a fair value hierarchy in their entirety based on the lowest level of input that is significant to each asset or liability's fair value measurement. Valuation techniques for level 2 assets use significant observable inputs such as quoted prices for similar assets, quoted market prices in inactive markets and other inputs that are observable or can be supported by observable market data.

The fair value of each major category of plan assets as of December 31, 2022 and 2021 is indicated below:

(in millions)	2022	2021
Level 2:		
Money market funds	\$ 16.6	\$ 19.8
Mutual funds:		
Fixed income	131.6	158.2
U.S. equity	129.8	142.8
Foreign equity	53.7	81.5
Total	<u>\$ 331.7</u>	<u>\$ 402.3</u>

At December 31, 2022 and 2021, the fair value of pension plan assets exceeded the projected benefit obligation by \$ 15.3 million and \$ 16.3 million, respectively, and the excess was recorded as a non-current pension asset in other assets.

CME's funding goal is to have its pension plan 100 % funded at each year-end on a projected benefit obligation basis, while also satisfying any minimum required contribution and obtaining the maximum tax deduction. Year-end 2022 assumptions have been used to project the assets and liabilities from December 31, 2022 to December 31, 2023. The company anticipates based on this projection that no additional contribution in 2023 will be necessary for it to meet its funding goal. However, the amount of the actual contribution is contingent on various factors, including the actual rate of return on the plan assets during 2023 and the December 31, 2023 discount rate.

The components of net pension expense and the assumptions used to determine the end-of-year projected benefit obligation and net pension expense in aggregate at December 31, 2022, 2021 and 2020 are indicated below:

(in millions)	2022	2021	2020
Components of Net Pension Expense:			
Service cost	\$ 25.7	\$ 27.8	\$ 26.7
Interest cost	12.0	10.7	11.7
Expected return on plan assets	(22.3)	(21.7)	(21.0)
Recognized net actuarial loss	1.4	4.5	4.8
Net Pension Expense	<u>\$ 16.8</u>	<u>\$ 21.3</u>	<u>\$ 22.2</u>
Assumptions Used to Determine End-of-Year Benefit Obligation:			
Discount rate	5.60 %	3.00 %	2.70 %
Rate of compensation increase	4.00	4.00	4.00
Cash balance interest crediting rate	4.75	4.00	4.00
Assumptions Used to Determine Net Pension Expense:			
Discount rate	3.00 %	2.70 %	3.40 %
Rate of compensation increase	4.00	4.00	5.00
Expected return on plan assets	5.75	5.75	6.00
Interest crediting rate	4.00	4.00	4.00

The discount rate for the plan was determined based on the market value of a theoretical settlement bond portfolio. This portfolio consisted of U.S. dollar denominated Aa-rated corporate bonds across the full maturity spectrum. A single equivalent discount rate was determined to align the present value of the required cash flow with that settlement value. The resulting discount rate was reflective of both the current interest rate environment and the plan's distinct liability characteristics.

The basis for determining the expected rate of return on plan assets for the plan is comprised of three components: historical returns, industry peers and forecasted return. The plan's total return is expected to equal the composite performance of the security markets over the long term. The security markets are represented by the returns on various domestic and international stock, bond and commodity indexes. These returns are weighted according to the allocation of plan assets to each market and measured individually.

The overall objective of the plan is to achieve required long-term rates of return in order to meet future benefit payments. The component of the investment policy for the plan that has the most significant impact on returns is the asset mix. The asset mix has a minimum and maximum range depending on asset class. The plan assets are diversified to minimize the risk of large losses by any one or more individual assets. Such diversification is accomplished, in part, through the selection of asset mix and investment management. The asset allocation for the plan, by asset category, at December 31, 2022 and 2021 was as follows:

	2022	2021
Fixed income	39.7 %	39.3 %
Money market funds	5.0	4.9
U.S. equity	39.1	35.5
Foreign equity	16.2	20.3

For 2023, management expects the fixed income asset class to be approximately 50 % of the portfolio. The target allocation for the U.S. equity asset class is expected to range from 15 % to 45 % of the portfolio and the target allocation for the foreign equity asset class is expected to range from approximately 10 % to 30 % of the portfolio.

At times, the company may determine that it is necessary to place some assets in cash equivalent investments in order to pay expected plan liabilities. Given this, the actual asset allocation for the plan may not fall within the target allocation ranges from time to time.

According to the plan's investment policy, the plan is not allowed to invest in securities that compromise independence, short sales of securities directly owned by the plan, securities purchased on margin or other uses of borrowed funds, derivatives not used for hedging purposes, restricted stock or illiquid securities or any other transaction prohibited by employment laws. If the plan directly invests in short-term and long-term debt obligations, the investments are limited to obligations rated at the highest rating category by Standard & Poor's or Moody's.

The pre-tax balance and activity of actuarial losses for the pension plan, which are included in other comprehensive income (loss), for 2022 are as follows:

(in millions)	Actuarial Loss
Balance at January 1	\$ 48.0
Unrecognized net loss	(14.4)
Recognized as a component of net pension expense	(1.4)
Balance at December 31	<u>\$ 32.2</u>

At December 31, 2022, anticipated benefit payments from the plan in future years are as follows:

(in millions)	
2023	\$ 29.0
2024	29.8
2025	30.7
2026	31.8
2027	32.4
2028-2032	169.5

Savings Plans. CME maintains a defined contribution savings plan pursuant to Section 401(k) of the Internal Revenue Code, whereby all U.S. employees are participants and have the option to contribute to this plan. CME matches employee contributions up to 3 % of the employee's base salary and may make additional discretionary contributions.

In addition to the plan for U.S. employees, the company maintains defined contribution savings plans for employees in international locations.

Aggregate expense for all of the defined contribution savings plans amounted to \$ 18.3 million, \$ 24.7 million and \$ 27.7 million in 2022, 2021 and 2020, respectively.

CME Non-Qualified Plans. CME maintains non-qualified plans, under which participants may make assumed investment choices with respect to amounts contributed on their behalf. Although not required to do so, CME invests such contributions in assets that mirror the assumed investment choices. The balances in these plans are subject to the claims of general creditors of the company and totaled \$ 84.5 million and \$ 98.6 million at December 31, 2022 and 2021, respectively. Although the value of the plans is recorded as an asset in marketable securities on the consolidated balance sheets, there is an equal and offsetting liability. The investment results of these plans have no impact on net income as the investment results are recorded in equal amounts to both investment income and compensation and benefits expense. The non-qualified plans include the following:

Supplemental Savings Plan. CME maintains a supplemental plan to provide benefits for employees who have been impacted by statutory limits under the provisions of the qualified pension and savings plan. Employees in this plan are subject to the vesting requirements of the underlying qualified plans.

Deferred Compensation Plan. A deferred compensation plan is maintained by CME, under which eligible employees and members of the board of directors may contribute a percentage of their compensation and defer income taxes thereon until the time of distribution.

COMEX Members' Retirement Plan and Benefits. COMEX maintains a non-qualified retirement and benefit plan under the COMEX Members' Retirement Plan and Benefits plan (MRRP). This plan provides benefits to certain members of the COMEX division based on long-term membership, and participation is limited to individuals who were COMEX division members prior to NYMEX's acquisition of COMEX in 1994. No new participants were permitted into the plan after the date of this acquisition. All benefits to be paid under the MRRP are based on reasonable actuarial assumptions, which are based upon the amounts that are available and are expected to be available to pay benefits. There were no contributions to the plan in 2022, 2021 and 2020. At December 31, 2022 and 2021, the obligation for the MRRP totaled \$ 10.3 million and \$ 13.5 million, respectively. Assets with a fair value of \$ 12.0 million and \$ 16.6 million have been allocated to this plan at December 31, 2022 and 2021, respectively, and are included in marketable securities and cash and cash equivalents on the consolidated balance sheets. The balances in this plan are subject to the claims of general creditors of COMEX.

11. LEASES

Leases. The company has operating leases for datacenters and corporate offices. The operating leases have remaining lease terms of up to 15 years, some of which include options to extend or renew the leases for up to an additional five years, and some of which include options to early terminate the leases in less than 12 months. Management evaluates the exercisability of

these options at least quarterly in order to determine whether the contract term must be reassessed. For a small number of the leases, primarily the international locations, management's approach is to enter into short-term leases for a lease term of 12 months or less in order to provide for greater flexibility in the local environment. For certain office spaces, the company has entered into arrangements to sublease excess space to third parties, while the original lease contract remains in effect with the landlord.

The company also has one finance lease, which is related to the sale of our datacenter in March 2016. In connection with the sale, the company leased back a portion of the property. The sale leaseback transaction was recognized under the financing method and not as a sale leaseback arrangement. In November 2021, the company sold a building in Chicago and subsequently entered into a leaseback arrangement for this property. This lease is classified as an operating lease.

The right-of-use lease asset is recorded within other assets, and the present value of the lease liability is recorded within other liabilities (segregated between short-term and long-term) on the consolidated balance sheets. The discount rate applied to the lease payments represents the company's incremental borrowing rate. The company has elected to utilize the short-term lease exception as prescribed in the leasing standard, such that the company has not capitalized on the balance sheet a lease asset or lease liability associated with leases with terms of 12 months or less from the commencement date.

The components of lease costs were as follows for the years ended December 31, 2022 and 2021:

(in millions)	2022	2021
Operating lease expense:		
Operating lease cost	\$ 56.9	\$ 63.2
Short-term lease cost	0.4	0.7
Total operating lease expense included in other expense	<u>\$ 57.3</u>	<u>\$ 63.9</u>
Finance lease expense:		
Interest expense	\$ 2.8	\$ 3.1
Depreciation expense	8.7	8.7
Total finance lease expense	<u>\$ 11.5</u>	<u>\$ 11.8</u>
Sublease revenue included in other revenue	\$ 10.6	\$ 10.4

Supplemental cash flow information related to leases was as follows for years ended December 31, 2022 and 2021:

(in millions)	2022	2021
Cash outflows for operating leases	\$ 65.4	\$ 64.2
Cash outflows for finance leases	17.1	17.0

Supplemental balance sheet information related to leases was as follows as of December 31, 2022 and 2021:

Operating leases

(in millions)	2022	2021
Operating lease right-of-use assets	\$ 310.6	\$ 345.3
Operating lease liabilities:		
Other current liabilities	\$ 49.9	\$ 47.3
Other liabilities	383.5	449.4
Total operating lease liabilities	<u>\$ 433.4</u>	<u>\$ 496.7</u>
Weighted average remaining lease term (in months)	121	132
Weighted average discount rate	3.8 %	3.9 %

Finance leases

(in millions)	2022	2021
Finance lease right-of-use assets	\$ 71.5	\$ 80.2
Finance lease liabilities:		
Other current liabilities	\$ 8.2	\$ 7.9
Other liabilities	67.8	75.9
Total finance lease liabilities	<u>\$ 76.0</u>	<u>\$ 83.8</u>
Weighted average remaining lease term (in months)	99	111
Weighted average discount rate	3.5 %	3.5 %

Future minimum lease payments were as follows as of December 31, 2022 for operating and finance leases:

(in millions)	Operating Leases
2023	\$ 65.5
2024	59.4
2025	56.4
2026	52.3
2027	50.0
Thereafter	239.2
Total lease payments	<u>522.8</u>
Less: imputed interest	(89.4)
Present value of lease liability	<u>\$ 433.4</u>

(in millions)	Finance Lease
2023	\$ 17.2
2024	17.4
2025	17.5
2026	17.6
2027	17.8
Thereafter	58.9
Total lease payments	<u>146.4</u>
Less: imputed interest	(70.4)
Present value of lease liability	<u>\$ 76.0</u>

12. CONTINGENCIES

Legal and Regulatory Matters. In the normal course of business, the company discusses matters with its regulators raised during regulatory examinations or otherwise subject to their inquiry and oversight. These matters could result in censures, fines, penalties or other sanctions. Management believes the outcome of any resulting actions will not have a material impact on the company's consolidated financial position or results of operations. However, the company is unable to predict the outcome or the timing of the ultimate resolution of these matters, or the potential fines, penalties or injunctive or other equitable relief, if any, that may result from these matters.

A putative class action complaint was filed January 15, 2014 in the Circuit Court of Cook County, Chancery Division, against CME Group Inc. and the Board of Trade of the City of Chicago, Inc. The plaintiffs, certain Class B shareholders of CME Group and Class B members of CBOT, allege breach of contract and breach of the implied covenant of good faith and fair dealing for violations of their core rights granted in the defendants' respective Certificates of Incorporation. On December 2, 2021, the court granted the plaintiffs' motion for certification of a damages-only class. No trial date has been set. Given the uncertainty of factors that may potentially affect the resolution of the matter, at this time the company is unable to estimate the

reasonably possible loss or range of reasonably possible losses in the unlikely event it were found to be liable at trial. Based on its investigation to date, the company believes that it has strong factual and legal defenses to the claims.

In addition, the company is a defendant in, and has potential for, various other legal proceedings arising from its regular business activities. While the ultimate results of such proceedings against the company cannot be predicted with certainty, the company believes that the resolution of any of these matters on an individual or aggregate basis will not have a material impact on its consolidated financial position or results of operations.

No accrual was required for contingent legal and regulatory matters as none were probable and estimable as of December 31, 2022 and 2021.

Intellectual Property Indemnifications. Certain agreements with customers and other third parties related to accessing the CME Group platforms, utilizing market data services and licensing CME SPAN software may contain indemnifications from intellectual property claims that may be made against them as a result of their use of the applicable products and/or services. The potential future claims relating to these indemnifications cannot be estimated and therefore no liability has been recorded.

13. GUARANTEES

Mutual Offset Agreement. CME and Singapore Exchange Limited (SGX) maintain a mutual offset agreement with a current term through May 2023. This agreement enables market participants to open a futures position on one exchange and liquidate it on the other. The term of the agreement will automatically renew for a one-year period after May 2023 unless either party provides advance notice of its intent to terminate. CME can maintain collateral in the form of irrevocable, standby letters of credit. At December 31, 2022, CME was contingently liable to SGX on irrevocable letters of credit totaling \$ 330.0 million. CME also maintains a \$ 350.0 million line of credit to meet its obligations under this agreement. Regardless of the collateral, CME guarantees all cleared transactions submitted through SGX and would initiate procedures designed to satisfy these financial obligations in the event of a default, such as the use of performance bonds and guaranty fund contributions of the defaulting clearing firm. Management has assessed the fair value of the company's guarantee liability under this mutual offset agreement by taking the following factors into consideration: the design and operations of the clearing risk management process, the financial safeguard packages in place, historical evidence of default by a clearing member and the estimated probability of potential payouts by the clearing house. Based on the assessment performed, management estimates the guarantee liability to be nominal and therefore has not recorded any liability at December 31, 2022.

Family Farmer and Rancher Protection Fund. In 2012, the company established the Family Farmer and Rancher Protection Fund (the Fund). The Fund is designed to provide payments, up to certain maximum levels, to family farmers, ranchers and other agricultural industry participants who use the company's agricultural products and who suffer losses to their segregated account balances due to their CME clearing member becoming insolvent. Under the terms of the Fund, farmers and ranchers are eligible for up to \$ 25,000 per participant. Farming and ranching cooperatives are eligible for up to \$ 100,000 per cooperative. The Fund has an aggregate maximum payment amount of \$ 100.0 million. Since its establishment, the Fund has made payments of approximately \$ 2.0 million, which leaves \$ 98.0 million available for future claims. If payments to participants were to exceed this amount, payments would be pro-rated. Clearing members and customers must register in advance with the company and provide certain documentation in order to substantiate their eligibility. The company believes that its guarantee liability is nominal and therefore has not recorded any liability at December 31, 2022.

14. CAPITAL STOCK

Shares Outstanding. The following table presents information regarding capital stock:

(in thousands)	December 31,	
	2022	2021
Preferred stock authorized	10,000	10,000
Preferred stock issued and outstanding	4,584	4,584
Class A common stock authorized	1,000,000	1,000,000
Class A common stock issued and outstanding	358,929	358,599
Class B-1 common stock authorized, issued and outstanding	0.6	0.6
Class B-2 common stock authorized, issued and outstanding	0.8	0.8
Class B-3 common stock authorized, issued and outstanding	1.3	1.3
Class B-4 common stock authorized, issued and outstanding	0.4	0.4

Preferred Stock. CME Group has approximately 4.6 million shares of Series G Non-Voting Convertible Preferred Stock (Series G preferred stock) outstanding. The Series G preferred stock is non-voting and is convertible into Class A common stock at a specified conversion rate, which is initially 1:1. The Series G preferred stock ranks on a parity basis with the Class A

common stock with respect to dividend and liquidation rights and therefore participates in the earnings and losses of CME Group on the same basis as Class A common stock.

Associated Trading Rights. Members of CME, CBOT, NYMEX and COMEX own or lease trading rights which entitle them access to open outcry trading, discounts on trading fees and the right to vote on certain matters as provided for by the rules of the particular exchange and CME Group's or the subsidiary's organizational documents. Each class of CME Group Class B common stock is associated with a membership in a specific division for trading at CME. A CME trading right is a separate asset that is not part of or evidenced by the associated share of Class B common stock of CME Group. The Class B common stock of CME Group is intended only to ensure that the Class B shareholders of CME Group retain rights with respect to the election of six members to the board of directors and approval rights with respect to the core rights described below.

Trading rights at CBOT are evidenced by Class B memberships in CBOT, at NYMEX by Class A memberships in NYMEX and at COMEX by COMEX Division Memberships. Members of CBOT, NYMEX and COMEX do not have any rights to elect members of the board of directors and are not entitled to receive dividends or other distributions on their memberships or trading permits.

Core Rights. Holders of CME Group Class B common shares have the right to approve changes in specified rights relating to the trading privileges at CME associated with those shares. These core rights relate primarily to trading right protections, certain trading fee protections and certain membership benefit protections. Votes on changes to these core rights are weighted by class. Each class of Class B common stock has the following number of votes on matters relating to core rights: Class B-1, six votes per share; Class B-2, two votes per share; Class B-3, one vote per share; and Class B-4, 1/6th of one vote per share. The approval of a majority of the votes cast by the holders of shares of Class B common stock is required in order to approve any changes to core rights. Holders of shares of Class A common stock do not have the right to vote on changes to core rights.

Voting Rights. With the exception of the matters reserved to holders of CME Group Class B common stock, holders of CME Group common stock vote together on all matters for which a vote of common shareholders is required. In these votes, each holder of shares of Class A or Class B common stock of CME Group has one vote per share. The holder of Series G preferred stock does not have any voting rights.

Transfer Restrictions. Each class of CME Group Class B common stock is subject to transfer restrictions contained in the Certificate of Incorporation of CME Group. These transfer restrictions prohibit the sale or transfer of any shares of Class B common stock separate from the sale of the associated trading rights.

Election of Directors. The CME Group board of directors is currently comprised of 23 members. Holders of Class B-1, Class B-2 and Class B-3 common stock have the right to elect six directors, of which three are elected by Class B-1 shareholders, two are elected by Class B-2 shareholders and one is elected by Class B-3 shareholders. The remaining directors are elected by the Class A and Class B shareholders voting as a single class.

Dividends. Holders of Class A and Class B common stock and Series G preferred stock of CME Group are entitled to receive proportionately such dividends, if any, as may be declared by the CME Group board of directors.

CME Group Omnibus Stock Plan. CME Group has adopted an Omnibus Stock Plan under which stock-based awards may be made to employees. A total of 40.2 million Class A common stock shares have been reserved for awards under the plan. Awards totaling 25.4 million shares have been granted and are outstanding or have been exercised under this plan at December 31, 2022 (See note 15 for further discussion).

Director Stock Plan. CME Group has adopted a Director Stock Plan under which awards are made to non-executive directors as part of their annual compensation. Effective May 4, 2022, the number of Class A available shares reserved under the plan was increased from 625,000 to 725,000 , and approximately 449,000 shares have been awarded through December 31, 2022.

Employee Stock Purchase Plan. CME Group has adopted an Employee Stock Purchase Plan (ESPP) under which employees may purchase Class A shares at 90 % of the market value of the shares using after-tax payroll deductions. Effective May 4, 2022, the number of Class A shares reserved under the plan was increased from 500,000 to 800,000 , of which approximately 432,000 shares have been purchased through December 31, 2022 (See note 15 for further discussion).

15. STOCK-BASED PAYMENTS

CME Group adopted an Omnibus Stock Plan under which stock-based awards may be made to employees. A total of 40.2 million Class A shares have been reserved for awards under the plan. Awards totaling 25.4 million shares have been granted and are outstanding or have been exercised under the plan as of December 31, 2022. Awards granted generally vest over a four-year period, with 25 % vesting one year after the grant date and on that same date in each of the following three years.

Total compensation expense for all stock-related awards (including ESPP) and total income tax benefit recognized on the consolidated statements of income for these awards at December 31, 2022, 2021 and 2020 were as follows:

(in millions)	2022	2021	2020
Compensation expense	\$ 84.8	\$ 76.4	\$ 96.9
Income tax benefit recognized	13.2	20.6	23.6

At December 31, 2022, there was \$ 134.5 million of total unrecognized compensation expense related to employee stock-based compensation arrangements that had not yet vested. The total unrecognized expense is expected to be recognized over a weighted average period of 2.2 years.

Stock options have not been granted since 2012. The following table summarizes stock option activity for 2022. Aggregate intrinsic value is in millions.

	Number of Shares	Weighted Average Exercise Price	Weighted Average Remaining Contractual Life (in years)	Aggregate Intrinsic Value
Outstanding at December 31, 2021	1,020	\$ 56	0.5	\$ 0.2
Exercised	(1,020)	56	—	—
Cancelled	—	—	—	—
Outstanding at December 31, 2022	—	—	0.0	—
Exercisable at December 31, 2022	—	—	0.0	—

The total intrinsic value of options exercised during 2022, 2021 and 2020 was \$ 0.1 million, \$ 15.0 million and \$ 16.7 million, respectively.

In 2022, the company granted 388,423 shares of restricted Class A common stock and restricted stock units with respect to 11,920 shares of Class A common stock. Restricted common stock and restricted stock units generally have a vesting period of two to four years. The fair value related to these grants was \$ 76.7 million, which is recognized as compensation expense on an accelerated basis over the vesting period. Dividends are accrued on restricted Class A common stock and restricted stock units and are paid once the restricted stock vests. In 2022, the company also granted 91,964 performance shares. The fair value related to these grants was \$ 19.5 million, which is recognized as compensation expense on a straight-lined basis over the vesting period. The vesting of these shares is contingent on meeting stated performance or market conditions, generally measured over a three-year period.

The following table summarizes restricted stock, restricted stock units and performance shares activity for 2022:

	Number of Shares	Weighted Average Grant Date Fair Value
Outstanding at December 31, 2021	1,115,055	\$ 205
Granted	492,307	195
Vested	(269,120)	194
Cancelled	(220,783)	204
Outstanding at December 31, 2022	1,117,459	204

The total fair value of restricted stock, restricted stock units and performance shares that vested during 2022, 2021 and 2020 was \$ 52.2 million, \$ 65.7 million and \$ 79.4 million, respectively.

Under the ESPP, eligible employees may acquire shares of Class A common stock using after-tax payroll deductions made during consecutive offering periods of approximately six months in duration. Shares are purchased at the end of each offering period at a price of 90 % of the closing price of the Class A common stock as reported on the Nasdaq Global Select Market. Compensation expense is recognized on the dates of purchase for the discount from the closing price. In 2022, 2021 and 2020, a total of 41,722 , 37,861 and 44,029 shares, respectively, of Class A common stock were issued to participating employees. These shares are subject to a six-month holding period. Annual expense of \$ 0.8 million for the purchase discount was recognized in 2022, 2021 and 2020.

Non-executive directors receive an annual award of Class A common stock with a value equal to \$ 145,000 . Non-executive directors could also elect to receive some or all of the cash portion of their annual stipend, up to \$ 95,000 , in shares of stock based on the closing price at the date of distribution. As a result, 18,836 shares, 13,769 shares and 17,322 shares of Class A

common stock were issued to non-executive directors during 2022, 2021 and 2020, respectively. These shares are not subject to any vesting restrictions. Expense of \$ 3.6 million, \$ 2.9 million and \$ 3.1 million related to these stock-based payments was recognized for the years ended December 31, 2022, 2021 and 2020, respectively.

16. ACCUMULATED OTHER COMPREHENSIVE INCOME (LOSS)

The following tables present changes in the accumulated balances for each component of other comprehensive income (loss), including current period other comprehensive income and reclassifications out of accumulated other comprehensive income (loss):

(in millions)	Investment Securities	Defined Benefit Plans	Derivative Investments	Foreign Currency Translation	Total
Balance at December 31, 2021	\$ 1.1	\$ (34.8)	\$ 66.1	\$ 21.1	\$ 53.5
Other comprehensive income before reclassifications and income tax benefit (expense)	(2.7)	14.9	—	(195.4)	(183.2)
Amounts reclassified from accumulated other comprehensive income	—	1.2	(1.9)	—	(0.7)
Income tax benefit (expense)	0.7	(4.1)	0.5	—	(2.9)
Net current period other comprehensive income	(2.0)	12.0	(1.4)	(195.4)	(186.8)
Balance at December 31, 2022	<u>\$ (0.9)</u>	<u>\$ (22.8)</u>	<u>\$ 64.7</u>	<u>\$ (174.3)</u>	<u>\$ (133.3)</u>

(in millions)	Investment Securities	Defined Benefit Plans	Derivative Investments	Foreign Currency Translation	Total
Balance at December 31, 2020	\$ 1.6	\$ (57.1)	\$ 67.0	\$ 123.4	\$ 134.9
Other comprehensive income before reclassifications and income tax benefit (expense)	(1.0)	25.5	—	(62.0)	(37.5)
Amounts reclassified from accumulated other comprehensive income	0.3	4.4	(1.2)	(40.3)	(36.8)
Income tax benefit (expense)	0.2	(7.6)	0.3	—	(7.1)
Net current period other comprehensive income	(0.5)	22.3	(0.9)	(102.3)	(81.4)
Balance at December 31, 2021	<u>\$ 1.1</u>	<u>\$ (34.8)</u>	<u>\$ 66.1</u>	<u>\$ 21.1</u>	<u>\$ 53.5</u>

(in millions)	Investment Securities	Defined Benefit Plans	Derivative Investments	Foreign Currency Translation	Total
Balance at December 31, 2019	\$ 0.8	\$ (55.1)	\$ 69.0	\$ (11.3)	\$ 3.4
Other comprehensive income before reclassifications and income tax benefit (expense)	1.1	(7.4)	—	134.3	128.0
Amounts reclassified from accumulated other comprehensive income	—	4.7	(2.7)	0.4	2.4
Income tax benefit (expense)	(0.3)	0.7	0.7	—	1.1
Net current period other comprehensive income	0.8	(2.0)	(2.0)	134.7	131.5
Balance at December 31, 2020	<u>\$ 1.6</u>	<u>\$ (57.1)</u>	<u>\$ 67.0</u>	<u>\$ 123.4</u>	<u>\$ 134.9</u>

17. FAIR VALUE MEASUREMENTS

The company uses a three-level classification hierarchy of fair value measurements for disclosure purposes:

- Level 1 inputs, which are considered the most reliable evidence of fair value, consist of quoted prices (unadjusted) for identical assets or liabilities in active markets.
- Level 2 inputs consist of observable market data, other than level 1 inputs, such as quoted prices for similar assets and liabilities in active markets or inputs other than quoted prices that are directly observable.
- Level 3 inputs consist of unobservable inputs, which are derived and cannot be corroborated by market data or other entity-specific inputs.

Level 1 assets generally include investments in publicly traded mutual funds, equity securities and corporate debt securities with quoted market prices. In general, the company uses quoted prices in active markets for identical assets to determine the fair value of marketable securities.

Level 2 liabilities generally consist of long-term debt notes. The fair values of the long-term debt notes were based on quoted market prices in an inactive market.

Level 3 assets include certain investments that were adjusted to fair value.

Recurring Fair Value Measurements. Financial assets recorded at fair value on the consolidated balance sheets as of December 31, 2022 and 2021 were classified in their entirety based on the lowest level of input that was significant to each asset's fair value measurement.

Financial Instruments Measured at Fair Value on a Recurring Basis:

(in millions)	December 31, 2022			
	Level 1	Level 2	Level 3	Total
Assets at Fair Value:				
Marketable securities:				
Corporate debt securities	\$ 11.3	\$ —	\$ —	\$ 11.3
Mutual funds	84.5	—	—	84.5
Equity securities	0.2	—	—	0.2
Total Marketable Securities	96.0	—	—	96.0
Total Assets at Fair Value	\$ 96.0	\$ —	\$ —	\$ 96.0

(in millions)	December 31, 2021			
	Level 1	Level 2	Level 3	Total
Assets at Fair Value:				
Marketable securities:				
Corporate debt securities	\$ 16.2	\$ —	\$ —	\$ 16.2
Mutual funds	98.6	—	—	98.6
Equity securities	0.2	—	—	0.2
Total Marketable Securities	115.0	—	—	115.0
Total Assets at Fair Value	\$ 115.0	\$ —	\$ —	\$ 115.0

Non-Recurring Fair Value Measurements. During 2022, the company recognized net unrealized losses on certain investments of \$ 8.5 million. The combined fair values of these investments were estimated to be \$ 51.9 million at December 31, 2022. These fair value assessments were based on quantitative factors, including observable price changes. The fair value measurements of the investments are considered level 3 and non-recurring. These investments are included within other assets on the consolidated balance sheets.

Fair Values of Debt Notes. The following presents the estimated fair values of long-term debt notes, which are carried at amortized cost on the consolidated balance sheets. The fair values below that are classified as level 2 under the fair value hierarchy were estimated using quoted market prices in inactive markets.

At December 31, 2022, the fair values (in U.S. dollar equivalents) were as follows:

(in millions)	Fair Value	Level
€15.0 million fixed rate notes due May 2023	16.1	Level 2
\$750.0 million fixed rate notes due March 2025	726.6	Level 2
\$500.0 million fixed rate notes due June 2028	490.9	Level 2
\$750.0 million fixed rate notes due March 2032	633.2	Level 2
\$750.0 million fixed rate notes due September 2043	786.6	Level 2
\$700.0 million fixed rate notes due June 2048	633.0	Level 2

18. EARNINGS PER SHARE

The company uses the two-class method to calculate basic and diluted earnings per common share because its Series G preferred stock are participating securities. Under the two-class method, undistributed earnings are allocated to common stock and participating securities according to their respective rights in undistributed earnings, as if all of the earnings for the period had been distributed. Basic earnings per common share is computed by dividing the net income attributable to common shareholders by the weighted average number of common shares outstanding during the period. Net income attributable to common shareholders is reduced for preferred stock dividends earned during the period. Series G preferred stock also receives a proportionate allocation of undistributed or overdistributed earnings for the period because Series G preferred stock has a contractual obligation to share in profits and losses of the company. Diluted earnings per share is computed by dividing the net income attributable to common shareholders by the weighted average number of common shares outstanding plus potentially dilutive common shares.

Anti-dilutive stock awards were as follows for the years presented:

(in thousands)	2022	2021	2020
Stock awards	158	86	87
Total	158	86	87

The following table presents the earnings per share calculation for the years presented:

	2022	2021	2020
Net Income Attributable to CME Group (in millions)	\$ 2,691.0	\$ 2,636.4	\$ 2,105.2
Less: Preferred stock dividends	(38.9)	(19.0)	—
Less: (Undistributed earnings) overdistributed earnings allocated to preferred stock	5.1	(0.3)	—
Net Income Attributable to Common Shareholders of CME Group	<u>\$ 2,657.2</u>	<u>\$ 2,617.1</u>	<u>\$ 2,105.2</u>
Weighted Average Common Shares Outstanding (in thousands):			
Basic	358,713	358,340	357,764
Effect of stock options and stock awards	468	589	760
Diluted	<u>359,181</u>	<u>358,929</u>	<u>358,524</u>
Earnings per Common Share Attributable to Common Shareholders of CME Group:			
Basic	\$ 7.41	\$ 7.30	\$ 5.88
Diluted	7.40	7.29	5.87

19. SUBSEQUENT EVENTS

The company has evaluated subsequent events through the date the financial statements were issued. The company has determined that there were no subsequent events that require disclosure.

ITEM 9. CHANGES IN AND DISAGREEMENTS WITH ACCOUNTANTS ON ACCOUNTING AND FINANCIAL DISCLOSURE

Not applicable.

ITEM 9A. CONTROLS AND PROCEDURES

Evaluation of Disclosure Controls and Procedures

Our management, with the participation of our Chief Executive Officer and Chief Financial Officer, has evaluated the effectiveness of our disclosure controls and procedures (as such term is defined in Rules 13a-15(e) and 15d-15(e) under the Securities Exchange Act of 1934, as amended (Exchange Act)) as of the end of the period covered by this Annual Report on Form 10-K. Based on such evaluation, our Chief Executive Officer and Chief Financial Officer have concluded that, as of the end of such period, our disclosure controls and procedures are effective.

Changes in Internal Control over Financial Reporting

As required by Rule 13a-15(d) under the Exchange Act, the company's management, including the company's Chief Executive Officer and Chief Financial Officer, have evaluated the company's internal control over financial reporting (as such term is defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act) to determine whether any changes occurred during the period covered by this report that have materially affected, or are reasonably likely to materially affect, the company's internal control over financial reporting. There were no changes in the company's internal control over financial reporting which occurred during the fourth quarter of 2022, that have materially affected, or are reasonably likely to materially affect, the company's internal control over financial reporting.

Management's Annual Report on Internal Control over Financial Reporting

Management is responsible for establishing and maintaining adequate internal control over financial reporting. Our internal control system has been designed to provide reasonable assurance to management and the board of directors regarding the preparation and fair presentation of published financial statements.

Management assessed the effectiveness of the company's internal control over financial reporting as of December 31, 2022. Management based its assessment on criteria for effective internal control over financial reporting described in Internal Control-Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework). Management's assessment included evaluating the design of our internal control over financial reporting and testing the operational effectiveness of our internal control over financial reporting. The results of its assessment were reviewed with the audit committee of the board of directors.

Based on this assessment, management believes that, as of December 31, 2022, our internal control over financial reporting is effective. The effectiveness of our internal control over financial reporting as of December 31, 2022 has been audited by Ernst & Young LLP (PCAOB ID 42), an independent registered public accounting firm, as stated in the report on page 82.

Report of Independent Registered Public Accounting Firm

To the Shareholders and the Board of Directors of CME Group Inc. and Subsidiaries

Opinion on the Financial Statements

We have audited the accompanying consolidated balance sheets of CME Group Inc. and subsidiaries (the Company) as of December 31, 2022 and 2021, the related consolidated statements of income, comprehensive income, equity, and cash flows for each of the three years in the period ended December 31, 2022, and the related notes and financial statement schedule listed in the Index at Item 15(a) (collectively referred to as the “consolidated financial statements”). In our opinion, the consolidated financial statements present fairly, in all material respects, the financial position of the Company at December 31, 2022 and 2021, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2022, in conformity with U.S. generally accepted accounting principles.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the Company’s internal control over financial reporting as of December 31, 2022, based on criteria established in Internal Control-Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework) and our report dated February 27, 2023 expressed an unqualified opinion thereon.

Basis for Opinion

These financial statements are the responsibility of the Company’s management. Our responsibility is to express an opinion on the Company’s financial statements based on our audits. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. Our audits included performing procedures to assess the risks of material misstatement of the financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that our audits provide a reasonable basis for our opinion.

Critical Audit Matter

The critical audit matter communicated below is a matter arising from the current period audit of the financial statements that was communicated or required to be communicated to the audit committee and that: (1) relates to accounts or disclosures that are material to the financial statements and (2) involved our especially challenging, subjective, or complex judgments. The communication of the critical audit matter does not alter in any way our opinion on the consolidated financial statements, taken as a whole, and we are not, by communicating the critical audit matter below, providing a separate opinion on the critical audit matter or on the account or disclosure to which it relates.

Uncertain Tax Positions

Description of the Matter As discussed in Note 9 to the consolidated financial statements, the Company had unrecognized income tax benefits of \$280.3 million related to uncertain tax positions as of December 31, 2022. Uncertainty in a tax position may arise due to the application of complex tax regulations. The Company uses significant judgment to (1) determine whether, based on the technical merits, the tax position is more likely than not to be sustained upon examination and (2) measure the amount of the tax benefit that qualifies for recognition.

Auditing management's estimate of the Company's uncertain tax positions that qualified for recognition and the related unrecognized income tax benefits was especially challenging because management's estimate involved significant judgment in evaluating the technical merits of the positions, including interpretations of applicable tax laws and regulations.

How we Addressed the Matter in Our Audit We tested the Company's controls that address the risk of material misstatement relating to the recognition and measurement of uncertain tax positions. For example, we tested controls over the Company's assessment of the technical merits of tax positions and management's process to measure the benefit of those tax positions that qualified for recognition, including management's review of the inputs used in the calculations.

We involved our tax professionals to evaluate the technical merits of the Company's tax positions. Our audit procedures included, among others, evaluating the assumptions the Company used to develop its uncertain tax positions and related unrecognized income tax benefit amount by jurisdiction. We also tested the completeness and accuracy of the underlying data used by the Company to calculate its uncertain tax positions, inspected correspondence with relevant tax authorities, and evaluated third-party advice obtained and used by the Company in assessing the technical merits of its tax positions.

/s/ Ernst & Young LLP

We have served as the Company's auditor since 2002.

Chicago, Illinois
February 27, 2023

Report of Independent Registered Public Accounting Firm

To the Shareholders and the Board of Directors of CME Group Inc. and Subsidiaries

Opinion on Internal Control over Financial Reporting

We have audited CME Group Inc. and subsidiaries' internal control over financial reporting as of December 31, 2022, based on criteria established in Internal Control—Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework) (the COSO criteria). In our opinion, CME Group Inc. and subsidiaries (the Company) maintained, in all material respects, effective internal control over financial reporting as of December 31, 2022, based on the COSO criteria.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the consolidated balance sheets of CME Group Inc. and subsidiaries as of December 31, 2022 and 2021, the related consolidated statements of income, comprehensive income, equity and cash flows for each of the three years in the period ended December 31, 2022, and the related notes and financial statement schedule listed in the Index at Item 15(a) and our report dated February 27, 2023 expressed an unqualified opinion thereon.

Basis for Opinion

The Company's management is responsible for maintaining effective internal control over financial reporting and for its assessment of the effectiveness of internal control over financial reporting included in the accompanying Management's Annual Report on Internal Control over Financial Reporting. Our responsibility is to express an opinion on the Company's internal control over financial reporting based on our audit. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audit in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects.

Our audit included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, testing and evaluating the design and operating effectiveness of internal control based on the assessed risk, and performing such other procedures as we considered necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinion.

Definition and Limitations of Internal Control Over Financial Reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

/s/ Ernst & Young LLP
Chicago, Illinois
February 27, 2023

ITEM 9B. OTHER INFORMATION

Not applicable.

ITEM 9C. DISCLOSURE REGARDING FOREIGN JURISDICTIONS THAT PREVENT INSPECTIONS

Not applicable.

PART III

ITEM 10. DIRECTORS, EXECUTIVE OFFICERS AND CORPORATE GOVERNANCE

We have adopted written codes of conduct applicable to all of our employees, including our Chairman and Chief Executive Officer, Chief Financial Officer, Chief Accounting Officer and other senior financial officers. In accordance with SEC rules and regulations, copies of these codes of conduct are available on our website at www.cmegroup.com under the "Investor Relations — Corporate Governance" link. In accordance with SEC rules and regulations and the listing requirements of Nasdaq, we intend to disclose promptly on the website and location specified above any substantive amendments to these codes of conduct and any waivers granted to our executive officers or Board members. In addition, we have adopted Corporate Governance Principles which govern the practices of our board of directors. You may also obtain a copy of our codes of conduct and our Corporate Governance Principles by following the instructions in the section of this Annual Report on Form 10-K entitled "Item 1 - Business - Available Information."

Certain of the information called for by this item is hereby incorporated herein by reference to the relevant portions of CME Group's definitive proxy statement for the Annual Meeting of Shareholders to be held on May 4, 2023, to be filed by CME Group with the SEC pursuant to Regulation 14A within 120 days after December 31, 2022 (Proxy Statement). Additional information called for by this item is contained in Item 1 of this Annual Report on Form 10-K under the caption "Information about our Executive Officers."

ITEM 11. EXECUTIVE COMPENSATION

Certain of the information called for by this item is hereby incorporated herein by reference to the relevant portions of the Proxy Statement.

ITEM 12. SECURITY OWNERSHIP OF CERTAIN BENEFICIAL OWNERS AND MANAGEMENT AND RELATED SHAREHOLDER MATTERS

Certain of the information called for by this item relating to the security ownership of certain beneficial owners and management is hereby incorporated herein by reference to the relevant portions of the Proxy Statement.

EQUITY COMPENSATION PLAN INFORMATION

We currently maintain the following equity compensation plans: CME Group Inc. Amended and Restated Omnibus Stock Plan, CME Group Inc. Director Stock Plan and CME Group Inc. Amended and Restated Employee Stock Purchase Plan. We do not maintain any equity compensation plans not approved by shareholders. A description of each of these plans and the number of shares authorized and available for future awards is included in note 15 of the notes to consolidated financial statements. The numbers in the following table are as of December 31, 2022.

Plan Category	Number of Securities to be Issued Upon Exercise of Outstanding Options (a)	Weighted-Average Exercise Price of Outstanding Options	Number of Securities Remaining Available for Future Issuance Under Equity Compensation Plans (excluding securities reflected in column (a))
Equity compensation plans approved by security holders	—	\$ —	15,457,703
Equity compensation plans not approved by security holders	—	—	—
Total	—		15,457,703

ITEM 13. CERTAIN RELATIONSHIPS, RELATED TRANSACTIONS AND DIRECTOR INDEPENDENCE

Certain of the information called for by this item is hereby incorporated herein by reference to the relevant portions of the Proxy Statement.

ITEM 14. PRINCIPAL ACCOUNTANT FEES AND SERVICES

Certain of the information called for by this item is hereby incorporated herein by reference to the relevant portions of the Proxy Statement.

PART IV

ITEM 15. EXHIBITS AND FINANCIAL STATEMENT SCHEDULES

(a) Financial Statements, Financial Statement Schedules and Exhibits

(1) Financial Statements

The following Consolidated Financial Statements and related Notes included within Item 8, together with the Reports of Independent Registered Public Accounting Firm with respect thereto and included within Item 9A, are hereby incorporated by reference:

Reports of Independent Registered Public Accounting Firm
Consolidated Balance Sheets at December 31, 2022 and 2021
Consolidated Statements of Income for the Years Ended December 31, 2022, 2021 and 2020
Consolidated Statements of Comprehensive Income for the Years Ended December 31, 2022, 2021 and 2020
Consolidated Statements of Equity for the Years Ended December 31, 2022, 2021 and 2020
Consolidated Statements of Cash Flows for the Years Ended December 31, 2022, 2021 and 2020
Notes to Consolidated Financial Statements

(2) Financial Statement Schedules

The following Financial Statement Schedule is filed as part of this Annual Report on Form 10-K:

CME Group Inc. and Subsidiaries

Schedule II—Valuation and Qualifying Accounts For the Years Ended December 31, 2022, 2021 and 2020 (dollars in millions)

	Balance at beginning of year	Charged (credited) to costs and expenses	Other ⁽¹⁾	Balance at end of year
Year Ended December 31, 2022				
Allowance for doubtful accounts	\$ 5.6	\$ 3.9	\$ (1.4)	\$ 8.1
Allowance for deferred tax assets	0.6	—	(0.2)	0.4
Year Ended December 31, 2021				
Allowance for doubtful accounts	\$ 5.4	\$ 1.9	\$ (1.7)	\$ 5.6
Allowance for deferred tax assets	11.3	—	(10.7)	0.6
Year Ended December 31, 2020				
Allowance for doubtful accounts	\$ 3.4	\$ 1.7	\$ 0.3	\$ 5.4
Allowance for deferred tax assets	10.0	1.3	—	11.3

(1) Includes write-offs of doubtful accounts, foreign currency and write-offs of fully reserved deferred tax assets. Other activity for the allowance for doubtful accounts also includes the impact of the adoption of new guidance on credit losses in 2020.

All other schedules have been omitted because the information required to be set forth in those schedules is not applicable or is shown on the consolidated financial statements or notes thereto.

(3) Exhibits

See (b) Exhibits below

(b) Exhibits

3. Articles of Incorporation and Bylaws

- 3.1 [Fourth Amended and Restated Certificate of Incorporation of CME Group Inc., as amended \(incorporated by reference to Exhibit 3.2 to CME Group Inc.'s Current Report on Form 8-K, filed with the SEC on November 4, 2021\).](#)
- 3.2 [Seventeenth Amended and Restated Bylaws of CME Group Inc. \(incorporated by reference to Exhibit 3.1 to CME Group Inc.'s Current Report on Form 8-K, filed with the SEC on December 9, 2022\).](#)
- 3.3 [Certificate of Designations of Series G Non-Voting Convertible Preferred Stock \(incorporated by reference to Exhibit 3.1 to CME Group Inc.'s Current Report on Form 8-K, filed with the SEC on November 4, 2021\).](#)

4. Instruments Defining the Rights of Security Holders

- 4.1 [Amended and Restated Commercial Paper Dealer Agreement, dated as of October 20, 2014, among CME Group Inc., as Issuer, and Barclays Capital Inc., as Dealer \(incorporated by reference to Exhibit 4.1 to CME Group Inc.'s Form 10-K, filed with the SEC on February 26, 2015\).](#)
- 4.2 [Amended and Restated Commercial Paper Dealer Agreement, dated as of October 20, 2014, between CME Group Inc., as Issuer, and Merrill Lynch, Pierce, Fenner & Smith Incorporated, as Dealer \(incorporated by reference to Exhibit 4.3 to CME Group Inc.'s 10-K, filed with the SEC on February 26, 2015\).](#)
- 4.3 [Amended and Restated Commercial Paper Dealer Agreement, dated as of October 20, 2014, between CME Group Inc., as Issuer, and Goldman, Sachs & Co., as Dealer \(incorporated by reference to Exhibit 4.4 to CME Group Inc.'s Form 10-K, filed with the SEC on February 26, 2015\).](#)
- 4.4 [Indenture, dated August 12, 2008, between CME Group Inc. and U.S. Bank National Association \(incorporated by reference to Exhibit 4.1 to CME Group Inc.'s Current Report on Form 8-K, filed with the SEC on August 13, 2008\).](#)
- 4.5 [Sixth Supplemental Indenture \(including the form of 5.300% note due 2043\), dated as of September 9, 2013, between CME Group Inc. and U.S. Bank National Association \(incorporated by reference to Exhibit 4.2 to CME Group Inc.'s Current Report on Form 8-K, filed with the SEC on September 9, 2013\).](#)
- 4.6 [Seventh Supplemental Indenture \(including the form of 3.000% note due 2025\), dated as of March 9, 2015, between CME Group Inc. and U.S. Bank National Association \(incorporated by reference to Exhibit 4.2 to CME Group Inc.'s Current Report on Form 8-K, filed with the SEC on March 9, 2015\).](#)
- 4.7 [Eighth Supplemental Indenture \(including the form of 3.750% note due 2028\), dated as of June 21, 2018, between CME Group Inc. and U.S. Bank National Association \(incorporated by reference to Exhibit 4.2 to CME Group Inc.'s Current Report on Form 8-K, filed with the SEC on June 21, 2018\).](#)
- 4.8 [Ninth Supplemental Indenture \(including the form of 4.150% note due 2048\), dated as of June 21, 2018, between CME Group Inc. and U.S. Bank National Association \(incorporated by reference to Exhibit 4.3 to CME Group Inc.'s Current Report on Form 8-K, filed with the SEC on June 21, 2018\).](#)
- 4.9 [Tenth Supplemental Indenture \(including the form of 2.650% Notes due 2032\), dated as of March 8, 2022, between CME Group Inc. and U.S. Bank Trust Company, National Association \(incorporated by reference to Exhibit 4.2 to CME Group Inc.'s Current Report on Form 8-K filed with the SEC on March 8, 2022\).](#)
- 4.10 [Description of securities \(incorporated by reference to Exhibit 4.11 to CME Group Inc.'s Form 10-K, filed with the SEC on February 2, 2022\).](#)

10. Material Contracts

- 10.1(1) [CME Group Inc. Third Amended and Restated Omnibus Stock Plan, amended and restated as of May 4, 2022 \(incorporated by reference to Exhibit 10.1 to CME Group Inc.'s Form 10-Q, filed with the SEC on August 3, 2022\).](#)
- 10.2(1) [CME Group Inc. Director Stock Plan, amended and restated as of May 4, 2022 \(incorporated by reference to Exhibit 99.1 to CME Group Inc.'s Form S-8, filed with the SEC on June 9, 2022\).](#)
- 10.3(1) [Form of Equity Stipend Grant Letter for Non-Executive Directors \(incorporated by reference to Exhibit 10.5 to CME Group Inc.'s Form 10-K, filed with the SEC on March 1, 2018\).](#)
- 10.4(1) [CME Group Inc. Employee Stock Purchase Plan, amended and restated as of May 4, 2022 \(incorporated by reference to Exhibit 99.2 to CME Group Inc.'s Form S-8, filed with the SEC on June 9, 2022\).](#)

Exhibit Number	Description of Exhibit
10.5(1)	<u>Chicago Mercantile Exchange Inc. Senior Management Supplemental Deferred Savings Plan (SMSDSP), Amended and Restated as of January 1, 2017 (incorporated by reference to Exhibit 10.1 to CME Group Inc.'s Form 10-Q, filed with the SEC on August 2, 2017).</u>
10.6(1)	<u>Chicago Mercantile Exchange Inc. Directors' Deferred Compensation Plan, amended and restated as of January 1, 2009 (incorporated by reference to Exhibit 10.9 to CME Group Inc.'s Form 10-K, filed with the SEC on March 2, 2009).</u>
10.7(1)	<u>Chicago Mercantile Exchange Inc. Supplemental Executive Retirement Plan consisting of the Grandfathered Supplemental Retirement Plan, amended and restated as of January 1, 2008, and the Amended and Restated 409A Supplemental Executive Retirement Plan, amended and restated as of January 1, 2008 (incorporated by reference to Exhibit 10.9 to CME Group Inc.'s Form 10-K, filed with the SEC on February 28, 2008).</u>
10.8(1)	<u>Chicago Mercantile Exchange Inc. Supplemental Executive Retirement Trust; First Amendment thereto, dated September 7, 1993 (incorporated by reference to Exhibit 10.5 to Chicago Mercantile Exchange Inc.'s Form S-4, filed with the SEC on February 24, 2000).</u>
10.9(1)	<u>Recognition and Retention Plan for Members of the COMEX Division of New York Mercantile Exchange (incorporated by reference to Exhibit 10.11 to NYMEX Holdings, Inc.'s Form 10-K, filed with the SEC on March 29, 2001); Amendment to the Recognition and Retention Plan for Members of the COMEX Division of the New York Mercantile Exchange, dated October 22, 2015 (incorporated by reference to Exhibit 10.1 to CME Group Inc.'s Form 10-Q, filed with the SEC on November 6, 2015).</u>
10.10(1)	<u>Second Amended and Restated CME Group Inc. Incentive Plan for Named Executive Officers (Amended and Restated as of May 24, 2017) (incorporated by reference to Exhibit 10.1 to CME Group Inc.'s Current Report on Form 8-K, filed with the SEC on May 30, 2017).</u>
10.11(1)	<u>CME Group Inc. Severance Plan for Eligible Executives, amended and restated effective January 1, 2013 (incorporated by reference to Exhibit 10.16 to CME Group Inc.'s Form 10-K, filed with the SEC on February 28, 2014); First Amendment to CME Group Inc. Severance Plan for Eligible Executives, effective as of October 13, 2014 (incorporated by reference to Exhibit 10.16 to CME Group Inc.'s Form 10-K, filed with the SEC on February 26, 2015).</u>
10.12(1)	<u>CME Group Inc. Severance Plan, amended and restated effective January 1, 2013 (incorporated by reference to Exhibit 10.17 to CME Group Inc.'s Form 10-K, filed with the SEC on February 28, 2014); First Amendment to the Amended and Restated CME Group Inc. Severance Plan, effective October 13, 2014 (incorporated by reference to Exhibit 10.17 to CME Group Inc.'s Form 10-K, filed with the SEC on February 26, 2015).</u>
10.13	<u>Amended and Restated Commercial Paper Dealer Agreement, dated as of October 20, 2014, among CME Group Inc., as Issuer, and Barclays Capital Inc., as Dealer (incorporated by reference to Exhibit 4.1 above).</u>
10.14	<u>Amended and Restated Commercial Paper Dealer Agreement, dated as of October 20, 2014, between CME Group Inc., as Issuer, and Merrill Lynch, Pierce, Fenner & Smith Incorporated, as Dealer (incorporated by reference to Exhibit 4.2 above).</u>
10.15	<u>Amended and Restated Commercial Paper Dealer Agreement, dated as of October 20, 2014, between CME Group Inc., as Issuer, and Goldman, Sachs & Co., as Dealer (incorporated by reference to Exhibit 4.3 above).</u>
10.16	<u>Amendment No. 5 to Credit Agreement, dated as of April 28, 2021, among Chicago Mercantile Exchange Inc., certain lenders, Bank of America, N.A., as Administrative Agent, and Citibank, N.A., as Collateral Agent and Collateral Monitoring Agent. The Amended Credit Agreement, as amended through Amendment No. 5, among Chicago Mercantile Exchange Inc., certain lenders, Bank of America, N.A., as Administrative Agent, and Citibank, N.A., as Collateral Agent and Collateral Monitoring Agent, is attached as Annex A to Amendment No. 5 (incorporated by reference to Exhibit 10.1 to CME Group Inc.'s Current Report on Form 8-K, filed with the SEC on April 29, 2021).</u>
10.17	<u>Amendment No. 6 to Credit Agreement, dated as of April 27, 2022, among Chicago Mercantile Exchange Inc., Bank of America, N.A., in its capacity as administrative agent, Citibank, N.A., in its capacity as collateral agent and collateral monitoring agent, and the banks party thereto. The Amended Credit Agreement, as amended through Amendment No. 6, among Chicago Mercantile Exchange Inc., each of the banks party thereto, Bank of America, N.A., in its capacity as administrative agent, and Citibank, N.A., in its capacity as collateral agent and collateral monitoring agent, is attached as Annex A to Amendment No. 6 (incorporated by reference to Exhibit 10.1 to CME Group Inc.'s Current Report on Form 8-K, filed with the SEC on April 28, 2022).</u>
10.18(1)	<u>Form of Equity Grant Letter for Restricted Shares (incorporated by reference to Exhibit 10.1 to CME Group Inc.'s Form 10-Q, filed with the SEC on November 3, 2021).</u>

Exhibit Number	Description of Exhibit
10.19(1)	Form of Equity Grant Letter for Annual Grant of Performance Shares (incorporated by reference to Exhibit 10.2 to CME Group Inc.'s Form 10-Q, filed with the SEC on November 3, 2021).
10.20	Credit Agreement, dated as of November 12, 2021, among CME Group Inc., certain lenders, agents, arrangers, bookrunners, and Bank of America, N.A., as Administrative Agent (incorporated by reference to Exhibit 10.1 to CME Group Inc.'s Current Report on Form 8-K, filed with the SEC on November 16, 2021).
10.21(1)	Amended and Restated Agreement, effective as of February 2, 2022, by and between CME Group Inc. and Terrence A. Duffy (incorporated by reference to Exhibit 10.1 to CME Group Inc.'s Current Report on Form 8-K, filed with the SEC on February 3, 2022).
10.22(1)	Retirement Agreement, dated as of April 12, 2022, between Chicago Mercantile Exchange Inc. and Kevin Kometer (incorporated by reference to Exhibit 10.1 to CME Group Inc.'s Current Report on Form 8-K filed with the SEC on April 14, 2022).
10.23(2)	License Agreement, dated June 29, 2012, between Standard & Poor's Financial Services LLC and Chicago Mercantile Exchange Inc. (incorporated by reference to Exhibit 10.5 to CME Group Inc.'s Form 10-Q, filed with the SEC on August 3, 2022).
21.1*	List of Subsidiaries of CME Group Inc.
23.1*	Consent of Ernst & Young LLP.
31.1*	Section 302—Certification of Terrence A. Duffy.
31.2*	Section 302—Certification of John W. Pietrowicz.
32.1*	Certification Pursuant to 18 U.S.C. Section 1350, as Adopted Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
101	The following materials from CME Group Inc.'s Annual Report on Form 10-K for the year ended December 31, 2022, formatted in Inline XBRL (Extensible Business Reporting Language): (i) the Consolidated Balance Sheets, (ii) the Consolidated Statements of Income, (iii) the Consolidated Statements of Comprehensive Income, (iv) the Consolidated Statements of Equity, (v) the Consolidated Statements of Cash Flows and (vi) the Notes to Consolidated Financial Statements, tagged as blocks of text.
104	The cover page from CME Group Inc.'s Annual Report on Form 10-K for the year ended December 31, 2022, formatted in Inline XBRL.
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*	Filed herewith.
(1)	Management contract or compensatory plan or arrangement.
(2)	Portions of this exhibit have been redacted in compliance with Item 601(b)(10) of Regulation S-K.

ITEM 16. FORM 10-K SUMMARY

None.

/s/ PHYLLIS M. LOCKETT Phyllis M. Lockett	Director
/s/ DEBORAH J. LUCAS Deborah J. Lucas	Director
/S/ PATRICK W. MALONEY Patrick W. Maloney	Director
/S/ PATRICK J. MULCHRONE Patrick J. Mulchrone	Director
/S/ TERRY L. SAVAGE Terry L. Savage	Director
/s/ RAHAEL SEIFU Rahael Seifu	Director
/s/ WILLIAM R. SHEPARD William R. Shepard	Director
/s/ HOWARD J. SIEGEL Howard J. Siegel	Director
/s/ DENNIS A. SUSKIND Dennis A. Suskind	Director
/s/ ROBERT J. TIERNEY JR. Robert J. Tierney Jr.	Director