

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, 2019

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 emerging growth company. See 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	<input checked="" type="checkbox"/>	Accelerated filer	<input type="checkbox"/>
Non-accelerated filer	<input type="checkbox"/>	Smaller reporting company	<input type="checkbox"/>
		Emerging growth company	<input type="checkbox"/>

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 is a shell company (as defined in Rule 12b-2 of the Exchange Act). Yes ☐ No ☒

The aggregate market value of the voting stock held by non-affiliates of the registrant as of June 30, 2019, was approximately \$68.5 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 12, 2020 was as follows: 358,402,226 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

Portions of the CME Group Inc.'s Proxy Statement for the 2020 Annual Meeting of Shareholders

Form 10-K Reference

Part III

CME GROUP INC.
ANNUAL REPORT ON FORM 10-K
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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 exclude our interest rate swaps and credit default swaps as well as volume data for NEX unless otherwise noted. In March 2018, we exited the credit default swaps business.

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. NEX, BrokerTec, EBS, TriOptima, and Traiana are trademarks of various entities of NEX Group Limited (NEX). 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. 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, including our ability to provide effective services to the swaps market;
- 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 policy 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 methods 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;
- 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;
- 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 acquisition of NEX;
- our ability to continue to generate funds and/or manage our indebtedness to allow us to continue to invest in our business;
- industry 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 14.

ITEM 1. BUSINESS

CME Group enables clients to trade futures, options, cash and over-the-counter (OTC) markets, optimize portfolios, and analyze data - empowering market participants worldwide to efficiently manage risk and capture opportunities.

GENERAL DEVELOPMENT OF BUSINESS

CME was founded in 1898 as a not-for-profit corporation. It established CME Clearing as a division of CME in 1919. CME demutualized in 2000, and in 2002 its parent company completed its initial public offering of its Class A common stock (NASDAQ: CME). We subsequently acquired CBOT Holdings, Inc. in 2007, NYMEX and COMEX in 2008, the Kansas City Board of Trade in 2012 and NEX Group plc (NEX) in November 2018. Our combination with NEX expands 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 creates 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, and our telephone number is 312-930-1000.

NARRATIVE DESCRIPTION OF BUSINESS

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 on futures trading across asset classes through the CME Globex platform, 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, a division of CME. With a range of pre- and post-trade products and services underpinning the entire lifecycle of a trade, CME Group offers optimization, reconciliation and processing services through TriOptima, Traiana and Reset.

Derivatives Exchange Business: Through our derivatives exchanges and clearing house, we believe our customers choose to trade on our centralized market due to its liquidity, diversity of products, 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 CME Group 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 and interest rate products, including contracts for Eurodollars, Secured Overnight Financing Rate (SOFR) and contracts based on the S&P, NASDAQ-100 and FTSE Russell Indexes.
- **CBOT's** product slate consists of agricultural, equities, energy and interest rate products, including contracts for United States (U.S.) Treasury futures, corn and other grains 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 and gasoline.
- **COMEX's** product slate consists of metals products, including contracts for gold, silver and copper.

We believe the breadth and diversity of our product lines and the variety of their underlying contracts 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 achieve operational and capital efficiencies by accessing our diverse products through our platforms and our clearing house.

Our CME Group products are traded primarily through CME Globex and other electronic trading platforms, by open outcry auction markets in Chicago, and through privately negotiated transactions. We strive to provide the most flexible and scalable platforms to support the operational and capacity needs of the 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 privately negotiated markets, we offer brokers and customers the CME Direct platform for arranging, executing, recording and risk-managing trades. CME Direct includes CME One for mobile access and CME Straight-Through Processing, which enables direct connectivity for trade information directly with customer order management and risk management systems and is designed to reduce errors and improve efficiency.

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; 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 reduced rates and 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 2019, 85% of our contract volume was from trades by our members.

CME Clearing Business: Through our clearing house, CME Clearing, which is a division of CME, provides clearing services for all of our exchange-traded contracts, for certain cleared-only products and for certain contracts traded on other exchanges. Our integrated clearing function is designed to ensure the safety and the soundness of our exchange markets by serving as the counterparty to every futures and options trade, becoming the buyer to each seller and the seller to each buyer, and limiting counterparty credit risk. The clearing house is responsible for settling trading accounts, clearing trades, collecting and maintaining performance bond funds, regulating delivery and reporting trading data. CME Clearing marks open positions to market at least twice a day, requires payments from clearing firms whose positions have lost value and makes 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 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. No individual firm represented at least 10% of our clearing and transaction fees revenue for 2019. 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 contracts are cleared at third-party clearing houses.

- **BrokerTec** is a global electronic platform for the trading of fixed income products, with a leading position in cash U.S. Treasuries, as well as activity in European government bonds and E.U. and U.S. repo fixed income instruments. It facilitates trading principally for banks and non-bank professional trading firms.
- **EBS** is a global electronic platform for the trading of FX products across major and emerging market currencies. EBS offers anonymous and disclosed trading venues, which gives clients multiple execution and distribution options and the benefit of an established and far-reaching distribution network of liquidity providers and consumers. It also offers execution of non-deliverable forwards through a CFTC-registered Swap Execution Facility (SEF).

Optimization Business: Our optimization services, which includes Traiana, TriOptima and Reset, delivers transaction lifecycle management services to help our clients simplify their workflow, optimize their capital and resources, mitigate their risk, increase efficiency, reduce their operational costs and streamline complex processes.

- **Trade and portfolio management** comprises portfolio and margin reconciliation, monitoring pre-trade risk and automating post-trade processing of financial transactions.
- **Financial resource optimization** comprises portfolio compression, basis risk mitigation, portfolio balancing and derivative pricing and risk analytics.

- **Regulatory reporting** comprises trade and position reporting (including licensed MiFID agent reporting to national regulators and the public), end-to-end multi-regime regulatory reporting, data normalization, enrichment, reconciliation, validation and cross-jurisdictional matching.
- **Trade Processing** comprises end-to-end automation, from trade execution notification to trade confirmation of post-trade processing, in real-time to reduce operational risks and costs.

Market Data Business: We offer a variety of market data services for the futures, equities, OTC, cash and cleared swaps markets. Our market data platforms provide real-time and historical market data related to CME Group exchanges and our cash markets business. We also deliver independent market intelligence and pricing information for cash and OTC data to financial market participants using intelligence from our businesses and third parties.

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. During this decade, our key product launches have included the Ultra U.S. Treasury Bond futures and options, short-dated options across asset classes, new base metal products, expanded crude oil grades, Basis Trade at Index Close (BTIC) transactions, S&P Dividend futures, E-mini Russell 1000 and 2000 futures, a cash-settled bitcoin futures contract, and SOFR futures contracts. We continued to introduce new products in 2019, including Micro E-mini S&P 500 Equity Index futures, E-mini S&P 500 Environmental, Social and Governance (ESG) index futures, Shanghai Gold futures, physical Liquefied Natural Gas (LNG) futures and expanded our SOFR futures listings. In continuing our commitment to expanding our international presence, we launched an interactive CME Liquidity Tool to help market participants analyze liquidity across CME Group products during U.S., London or Singapore trading hours. We also launched bitcoin options and options on SOFR in January 2020. During 2019, we experienced overall average daily volume of 19.2 million contracts, along with volume records in both interest rates and metals. We also had record volume in overall options, with electronic options representing 64% of total options volume in 2019. We continued to deepen liquidity and add diverse participation as evidenced by the growth in large open interest holders with records achieved across several product lines in 2019.

We continue to expand and deepen our customer base worldwide and offer customers around the world with the most broad diversified portfolio of benchmark products. We believe we have 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 United States, and we believe that there is room for significant growth and development of these financial markets. In 2019, approximately 28% of our electronic futures and options volume was from transactions reported as outside the United States and approximately 58% of our market data revenue was derived from outside the United States. We also achieved 20% growth in trading volume during Asian trading hours and 7% growth during European trading hours in 2019 compared to the 2018.

We have increased our customer base and continue to target cross-asset sales across client segments, driving international 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 well position us to help our customers adapt 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 front-end capabilities.

Diversify our Business and Revenue - Our acquisition of NEX strengthened our role in the global market infrastructure, adding complementary cash and OTC businesses and scale to our listed interest rate and FX products, while enabling new efficiencies for the derivatives marketplace. We are positioned to take direct advantage of growth in treasury issuance, liquid treasury holdings and the trading of treasury instruments, as well as growing repo activity. The transaction expanded CME Group's position in the large, highly competitive, and highly fragmented, \$6 trillion plus per trading day global FX marketplace, offering both order book trading and relationship 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 post-trade and trade-processing services and market data solutions beyond futures and options into cash and OTC offerings.

Our joint venture with S&P Global, Inc., S&P/DJI 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 ventures' licensing agent and distribution services provider.

Deliver Unparalleled Customer Efficiencies and Operational Excellence - With changing regulatory capital requirements for many of our customers and the need for greater efficiencies, we have added tools to enable customers to build and manage trading and 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 capital efficiencies and centralized clearing 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 interest rate swaps, FX forwards and commodity swaps. In May 2019, we announced the launch of our next generation Standard Portfolio Analysis of Risk (SPAN) margin framework – CME SPAN 2. The new framework will provide enhanced risk management capabilities in a single, unified interface by maintaining SPAN's current calculations and functions while incorporating several new modeling, reporting and margin replication enhancements. CME SPAN 2 will be launched in a phased, multi-year approach and in compliance with regulatory responsibilities, beginning with energy products. We plan to begin the roll-out in the first half of 2020, subject to receipt of final approvals.

In addition to providing trade reporting services in the United States, Europe, Canada and Australia, CME Group provides various tools and services to assist customers with capital and operational efficiencies. For example:

- 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.
- triReduce provides multilateral portfolio compression, which reduces notional outstanding exposure and line items in order to reduce operational resources and risks, minimize regulatory capital costs, and manage counterparty exposures.
- Traiana provides various operational efficiencies and risk mitigation solutions to clients through bilateral and tri-party pre- and post-trade processing and credit risk management.
- Reset provides risk mitigation services to clients looking to hedge short-term interest rate and options expiry exposure.

Patents, Trademarks and Licenses

We own the rights to a large number of trademarks, service marks, domain names and trade names in the United States, Europe and other parts of the world. We have registered many of our most important trademarks in the United States 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 on-line 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 and the FTSE Russell 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 our joint venture with S&P Global, Inc., we have a license agreement (S&P License Agreement), which superseded our prior licensing arrangements and was assigned to the joint venture. CME's 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 five percent (accounting for dilution) of the outstanding joint venture interests. Upon the occurrence of certain events, including certain terminations of the joint venture, the term may be extended up to an additional ten years. CBOT has an exclusive license agreement (Dow Jones License Agreement) with CME Group Index Services LLC (CME Indexes) for certain Dow Jones indexes, which has also been assigned to the joint venture. The initial term of the agreement is through June 30, 2026. Following the initial term, the Dow Jones License Agreement shall 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 CME Indexes may terminate the agreement. We also have an exclusive license agreement for certain NASDAQ indexes, which was extended for an additional ten years in 2018 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 arrangement has been filed as a material contract. We also have a multi-year non-exclusive licensing arrangement with ICE Benchmark Administration for the use of LIBOR to settle several of our interest rate products, including our Eurodollar contract.

We cannot assure you that 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 assure you that others will not succeed in creating stock index futures based on information similar to that which we 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 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 jurisdictional reach and/or our licensors.

Competition

The industry in which we operate is highly competitive 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 (CRD IV), Market Abuse Regulation, Benchmarks Regulation, Basel III, and various other laws and regulations.

Please also refer to the discussion below and in the “Risk Factors” section beginning on page 14 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;
- 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 that 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. 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 internalization of trade flows. New emerging competitors have targeted different segments of our industry, and emerging technologies may offer 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 the past few 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 Options Clearing Corporation, Depository Trust & Clearing Corporation and Deutsche Börse AG. In light of the implementation of regulatory requirements and other reforms of the financial services industry, we believe that other exchanges and infrastructure providers also may undertake to provide clearing and other related post-trade services.

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 array of venues. In the FX space, 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, and they are often owned by many 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, 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 Optimization Services Business

The optimization services business faces substantial competition across each of the segments in which CME Group operates. There are multiple providers of compression services, reconciliation services, trade processing, analytics, and regulatory reporting services. In addition, there is considerable innovation occurring in this business, with new entrants and new technologies being developed to serve customers and differentiate offerings.

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 distribution capabilities that could serve as alternative means for receiving open market data feeds instead of connecting directly to our exchange. Distributors and consumers of our market data may also use our market data as an input into a product that competes against one of 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 institutions or individuals. Developments in the regulatory environment have the potential to significantly affect our businesses. As such, we are subject to extensive regulation primarily in the United States and Europe.

In June 2016, the United Kingdom held a referendum in which the electorate voted in favor of withdrawal from the European Union (Brexit), which continues to create a number of uncertainties for the financial services sector. The United Kingdom's Withdrawal Agreement Bill was signed into law on January 24, 2020 and the United Kingdom formally left the European Union on January 31, 2020. Under the terms of the Withdrawal Agreement, there will be an 11-month transition period due to expire on December 31, 2020. As a result of Brexit, we have established certain businesses in Amsterdam, a European Union jurisdiction, which will allow us to continue to provide services to European Union clients. Also, on January 1, 2020, amendments to the European Market Infrastructure Regulation (EMIR 2.2) became effective and made changes to the European Union equivalence and recognition regime for non-European Union clearing houses, including CME Clearing, as further discussed below.

Please also refer to the discussion below and in the “Risk Factors” section beginning on page 14 for a description of regulatory and legislative risks and uncertainties.

Regulation of our Derivatives Business, CME Clearing and NEX SEF

Our operation of U.S. futures exchanges, CME Clearing and the NEX SEF is subject to extensive regulation by the Commodity Futures Trading Commission (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, 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) and the United Kingdom Financial Conduct Authority (FCA).

Regulation of our Cash Markets Business

The operation of our BrokerTec platform 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 is also subject to regulation by authorities in the European Union 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 and FCA 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 Corp. (FICC) through which it clears U.S. Treasury, agency and repo products for its client base and is subject to its rules and regulations.

Regulation of our Optimization Services Business

Certain areas of our optimization services, which enable clients to mitigate their risk, reduce operational costs, optimize their capital, and fulfill trade reporting obligations, are subject to regulatory oversight of regulators in those jurisdictions in which we conduct business, including the Swedish Financial Supervisory Authority, the FCA, CFTC and the National Futures Association, ESMA and the Australian Securities and Investments Commission.

Regulation of our Market Data Business

A portion of our market data business, offered by CME Group Benchmark Administration, is subject to regulation by the European Union Benchmarks Regulation, which regulates our RepoFunds Rate suite of daily euro repo indices.

Key Areas of Focus

We actively monitor and participate in the domestic and international rulemaking processes for our industry, including providing government testimony, commenting on proposed rulemakings and educating our regulators on potential impacts to the marketplace.

Our key areas of focus in the regulatory environment are:

- The potential impact of the adoption of EMIR 2.2 allowing for the direct regulation by the European Union of non-European Union clearing houses, like us, and resulting changes to the European Union equivalence and recognition regime on non-European Union clearing houses and exchanges with customers based in Europe. EMIR 2.2 became effective on January 1, 2020, and we are awaiting implementing regulations to determine its impact on our business and whether we will need to make any significant changes to how our clearing house operates. These potential changes could have negative implications for the markets we clear and our market participants by subjecting our clearing business to regulations that would conflict with the regulation imposed by U.S. law and the CFTC, prevent us from deploying our capital efficiently and increasing our regulatory costs. Further, ESMA could impose significant fines for non-compliance with their local European regulations, and we may have to consider material changes to certain of our risk management policies in order to reduce the risk of fines imposed under EMIR 2.2. A failure of our clearing house to retain its recognition may result in our clearing members and certain customers in Europe being subject to higher capital costs for participating in our markets, thus creating a disincentive to use our markets. The

European Union equivalence and recognition regime also has the potential to impact the cost and ease or difficulty for certain of our OTC execution platforms to provide access to customers on a global basis.

- The adoption and implementation of position limit rules, which could have a significant impact on our commodities business if federal rules for position limit management differ significantly from current exchange-administered rules.
- Rules respecting capital charges under Basel III with respect to clearing members of central counterparties may have negative implications for the cleared derivatives markets. Additional risks could arise through inconsistent adoption of the Basel III capital charges globally, potentially leading to disparate impacts on our customers.
- The potential for further regulation stemming from industry performance disruptions and residual concerns around electronic trading activity and, in particular, "high frequency trading."
- The potential elimination of 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.
- The implementation of a transaction tax or user fee in the United States, U.K. or European Union, or in the State of Illinois, which could discourage institutions and individuals from using our markets or products or encourage them to trade in another less costly jurisdiction. From time to time, the proposed Presidential budget request, including the currently proposed budget, has included a proposal to impose a user fee to fund the CFTC. Legislation to impose a financial transaction tax has again been proposed in both the U.S. Congress and Illinois General Assembly, as it has in previous sessions of Congress and the General Assembly.
- The implementation of legislation in the European Union impacting how benchmark index prices are formed, including new requirements for price submitters, price aggregators and markets that list contracts that reference index prices.
- 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 FCA has indicated that it will no longer require banks to participate in the LIBOR panel after December 31, 2021. The possibility exists that the FCA may find LIBOR to not be representative of the underlying short-term interest rate pricing or unfit for such purpose, and thus may unfavorably impact our ability to list our existing suite of Eurodollar futures and options products.
- 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 implementation of the final phases of uncleared margin rules across jurisdictions and implications on customers management of exposures.

Employees

As of December 31, 2019, we had approximately 4,360 employees. We consider relations with our employees to be good.

Information about our Executive Officers

The following are CME Group's executive officers. Ages are as of February 10, 2020.

Terrence A. Duffy, 61. Mr. Duffy has served as our Chairman and Chief Executive Officer since November 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.

Kathleen M. Cronin, 56. Ms. Cronin has served as our Senior Managing Director, General Counsel and Corporate Secretary since 2003. Prior to joining us, Ms. Cronin was a corporate attorney at Skadden, Arps, Slate, Meagher & Flom LLP from 1989 through 1995 and from 1997 through 2002. Ms. Cronin also serves as a director of Kemper Corporation.

Sunil Cutinho, 48. Mr. Cutinho has served as President of CME Clearing since September 2014. He joined CME Group in 2002 and since then has held various positions of increasing responsibility within the organization and, most recently served as Managing Director, Deputy Head of CME Clearing from April 2014 through September 2014.

Bryan T. Durkin, 59. Mr. Durkin has served as President since November 2016 and will step down in May of 2020. At that time, Mr. Durkin will begin serving as a special advisor to the company. Mr. Durkin previously served as Senior Managing Director, Chief Commercial Officer since 2014 and as our Chief Operating Officer since 2007, and also held the title of Managing Director, Products and Services from 2010 to July 2012. Mr. Durkin joined us in connection with the CBOT merger and he previously held a variety of leadership roles with CBOT from 1982 to 2007, most recently as Executive Vice President and Chief Operating Officer.

Julie Holzrichter, 51. Ms. Holzrichter has served as our Senior Managing Director, Chief Operating Officer since September 2014. 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.

Kevin Kometer, 55. Mr. Kometer has served as Senior Managing Director and Chief Information Officer since 2008. He previously served as Managing Director and Deputy Chief Information Officer from 2007 to 2008. Since joining the company most recently in 1998, he has held senior leadership positions in the Technology Division, including Managing Director, Trading Execution Systems and Director, Advanced Technology. Mr. Kometer was also with the company from 1994 to 1996.

Hilda Harris Piell, 52. Ms. Piell has served as Senior Managing Director and Chief Human Resources Officer since 2007. Previously she served as Managing Director and Senior Associate General Counsel, as Director and Associate General Counsel and as Associate Director and Assistant General Counsel since joining us in 2000.

John W. Pietrowicz, 55. Mr. Pietrowicz has served as our Chief Financial Officer since December 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.

Derek Sammann, 51. Mr. Sammann has served as our Senior Managing Director, Commodities and Options Products since September 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.

Jack Tobin, 56. Mr. Tobin has served as our Chief Accounting Officer since February 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, Inc. 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, 56. Mr. Tully has served as Senior Managing Director, Financial and OTC Products of CME Group since September 2014. He previously served as Senior Managing Director, Interest Rates and OTC Products since February 2014. Previously, he served as Managing Director, Interest Rate and OTC Products since October 2013 and as our Managing Director, Interest 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, 48. Mr. Vroman has served as our Senior Managing Director, International and Optimization Services since February 2020. He previously served as our Senior Managing Director, Cash Markets and Optimization Services. 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, 45. Ms. Winkler has served as our Senior Managing Director, Chief Commercial Officer since December 2016. 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 U.S. Securities and Exchange Commission (SEC). Our corporate governance materials, including our Corporate Governance Principles, Director Conflict of Interest Policy, Board of Directors Code of Ethics, Categorical Independence Standards, Employee Code of Conduct and the charters for all the standing committees of our board, also may be found on our website. Copies of these materials also are available to shareholders free of charge upon written request to Shareholder Relations, Attention Ms. Beth Hausoul, CME Group Inc., 20 South Wacker Drive, Chicago, Illinois 60606.

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;
- 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 OTC markets and in their underlying markets;
- shifts in demand or supply in commodities underlying our products;
- competition;
- changes in government monetary policies, especially central bank decisions related to quantitative easing;
- availability of capital to our market participants and their appetite for risk-taking;
- levels of assets under 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 difficult 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.

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.

We are primarily subject to the jurisdiction of the regulatory agencies in the United States, United Kingdom and Europe. As a result of our global operations, we are also subject to the rules and regulations of the local jurisdictions in which we conduct business and offer our products and services, as appropriate.

Due to the global financial crisis that began in 2008, the United States and numerous other governments have undertaken reviews of the legal framework governing financial markets and have either enacted new laws, rules and regulations, or are in the process of enacting new laws, rules and regulations that will impact our business. We have incurred and expect to continue to incur significant additional costs to comply with the extensive regulations that apply to our business. Additionally, regulation imposed on financial institutions or market participants generally, such as enhanced capital requirements, may adversely impact their trading activity in our markets. Also, on January 1, 2020, amendments to the European Market Infrastructure Regulation (EMIR 2.2) became effective. The implementation of the regulations under this legislation may increase our regulatory costs, including substantial new authority to impose fines, and/or create a disincentive for certain clients to use our products. The European Union equivalence and recognition regime also has the potential to impact the cost and ease or difficulty for certain of our OTC execution platforms to provide access to customers on a global basis. There is also the risk that new laws or regulations or changes in enforcement practices applicable to our businesses or those of our clients could be imposed in other jurisdictions. 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.

Our broker-dealer and multilateral trading facility businesses, BrokerTec and EBS, are extensively regulated. 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 meet these compliance and regulatory obligations include potential liability, 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 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.

To the extent the regulatory environment is less beneficial for us or our customers, our business, financial condition and operating results could be negatively affected.

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 or broker-dealer, or other regulatory penalties.

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.

Legislative or regulatory changes could be adopted that would change the structure of our business, its current governance structure or impose significant costs on us by, for example, requiring more of our funds to be set aside for the guaranty fund. Further, other jurisdictions could assert significant changes to our governance, business practices and costs in order to continue to make our services available in those jurisdictions.

Please see "Item 1 - Business - Regulatory Matters" beginning on page 10 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 is to operate an efficient and transparent vertically integrated transaction execution, clearing and settlement business for our futures and options 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 revenues and profits 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.

The industry in which we operate 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, 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, 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 9 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 our 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 our 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 people and those of our third-party service providers may be vulnerable to cyber security threats, which could result in wrongful use of our information or our customers' information 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 our systems and/or investigate any alleged attack.

We regard the secure storage and transmission of confidential information and the ability to continuously transact and clear on our electronic trading platforms as critical elements of our operations. Our technology, our people and those of our third-party service providers and our customers may be vulnerable to targeted attacks, unauthorized access, fraud, computer viruses, denial of service attacks, terrorism, "ransom" attacks, firewall or encryption failures or other security problems. Criminal groups, political activist groups and nation-state actors have targeted the financial services industry 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. We have designed our cyber defense program to mitigate such attacks by preventative, detective, and responsive measures. Our usage of mobile and cloud technologies may increase our risk for a cyber attack. Our security measures may also be 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. As the regulatory environment related to information security, data collection and use, and privacy becomes increasingly rigorous and complex, any failure to comply may carry significant penalties and reputational damage.

As part of our global information security and privacy programs, we employ resources to monitor and protect our technology infrastructure and employees against such cyber attacks, including the rapid response to zero-day vulnerabilities, and the potential misappropriation of our intellectual property assets. However, our security measures or those of our third-party providers, including any cloud-based technologies, 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 some 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 involve 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, 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 attack may result in harm to our personnel,

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 received, or we may not be able to insure against such damage at a reasonable price or at all. The threat of terrorist attacks may also 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

Damage to our reputation could damage our business.

Maintaining our reputation and brand is critical to attracting and retaining customers and investors and to maintaining our relationships with our regulators. Negative publicity regarding our company or actual, alleged or perceived issues regarding our products or services, including social and environmental concerns relating to certain commodity products and increased impact from climate change, 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 systems that have the functionality, performance, 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, capacity, security and speed to attract and retain customers. In 2019, 90% of our overall contract volume was generated through electronic trading on our CME Globex electronic platform and we generated \$383.3 million in revenue attributable to the BrokerTec and EBS trading platforms. We plan to migrate the BrokerTec and EBS platforms to CME Globex in 2020 and 2021, respectively.

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.

If we do not successfully enhance our electronic trading systems and technology offerings, if we are unable to develop them to include other products and markets, or if they do not have the required functionality, performance, capacity, security and speed desired by our customers, our ability to successfully compete and our revenues and profits will be adversely affected. While we are focused on the migration of the BrokerTec and EBS platforms to CME Globex from both a technology and a customer experience perspective, we cannot guarantee that we will not experience any client attrition and to the extent any such client attrition is significant, it could have an impact on our revenues.

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 systems failures from power or telecommunications failure, acts of God, war or terrorism, human error on our part or on the part of our vendors, 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. 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, on-line 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.

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

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 assure you 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 derivatives clearing firm member becomes insolvent.

Our Three-Month Eurodollar futures contracts are based on the three-month U.S. dollar London Interbank Offered Rate (LIBOR) underlying rate. To the extent trading in Eurodollar contracts decreases or is discontinued and 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 contract is based on the three-month U.S. dollar ICE LIBOR underlying rate. In 2019, average trading volume in our Eurodollar contracts was 4.4 million contracts and open interest was 55.4 million contracts. LIBOR is the subject of national and international proposals for reform which advocate for the transition of survey based interbank offered rates to alternative transaction-based reference rates. A transition from the widespread use of LIBOR to alternative benchmark rates is likely to occur over the next several years. In July 2017, the UK FCA, which regulates LIBOR, announced the desire to phase out the use of LIBOR by the end of 2021. 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 U.S. Dollar LIBOR with other benchmark alternatives, such as SOFR. It is unknown whether these alternative reference rates will attain market acceptance as replacements for LIBOR. Any 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. In November 2019, we shared via a public webinar details of improved fallback plans to convert Eurodollar futures and options into 3-month SOFR futures and options. However, there is no guarantee that a transition to such contracts would be successful and would replace the revenue we derive from our Eurodollar contracts if the 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 sell our market data to individuals, trading institutions and other organizations that use our information services to participate in our markets and/or monitor general economic conditions. Revenues from our market data and information services represented 11% and 10% of our total revenues during the years ended December 31, 2019 and December 31, 2018, respectively. A decrease in overall trading volume may lead to a decreased demand for our market data. The level of trading activity by our customers may be affected by their profitability and capital constraints and may lead to a decreased demand for our market data. For example, in recent years, we experienced a decrease in the average number of market data connections due to continued economic uncertainty, high unemployment levels in the financial services sector and aggressive cost cutting initiatives at customer firms and the continued impact of legacy incentive programs tied to trading terminals. We could also become subject to regulatory actions, which could have the potential to restrict how we charge for our market data. We also license our market data to be used in the creation of derivative financial products, and changes to regulation, including the impact of any changes in laws or government policy, may impact the demand of our market data for such derivative works.

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

We continue to focus on strategic initiatives to grow our business, including our 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. Our growth strategy also may subject us to increased legal, compliance and regulatory obligations. Unless our growth results in an increase in our 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 finance future transactions by issuing additional equity and/or debt. 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. Our acquisition of NEX 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 and the integration of NEX with our operations may not be successful or may be delayed or 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 regulations and oversight;
- 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 ultimate impact of Brexit is contingent upon the final terms of withdrawal and the ongoing relationship between the UK and the European Union, following a transition period which is scheduled to end in December 2020. Brexit may result in legal uncertainty and potentially divergent national laws and regulations as the withdrawal process progresses. As a result of Brexit, we have established certain of our businesses in Amsterdam, a European Union jurisdiction, which have resulted in, and may continue to result in increased legal, compliance and operational costs.

Our compliance and risk management 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 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 comply with applicable laws and regulations is largely dependent on our establishment and maintenance of effective 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 compliance policies, procedures and programs which are designed to deter, detect, prevent, monitor and manage our risks, but such policies, procedures and programs may not be fully effective. 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 assure you 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 have been a number of highly publicized cases involving fraud or other misconduct or manipulative activity by employees of financial services firms and other market participants in the past. 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 improper use or unauthorized disclosure of confidential information. 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, financial penalties, restrictions on our activities for failure to properly identify, monitor and respond to potentially problematic activity and 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 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 which 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 United States, Europe and other parts of the world. We have registered many of our most important trademarks in the United States 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 third parties may copy, misappropriate or otherwise obtain and use our proprietary technology without authorization or otherwise infringe on our rights. For example, one of our former employees pleaded guilty to theft of our trade secrets. 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 assure you 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 United States 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 against. 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, 2019, we had approximately \$3.7 billion of total indebtedness and we had excess borrowing capacity for general corporate purposes under our existing facilities of approximately \$2.1 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 could increase the risks described above to the extent that we incur additional debt. Our U.S. exchanges, swap execution facility and clearing house also are required to maintain minimum capital levels as defined by the CFTC, and BrokerTec Americas is required to meet minimum capital requirements set by the SEC. Under EMIR 2.2, our clearing house could be subject to enhanced minimum capital standards as well.

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, 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, you may not be able to rely on our average rate per contract in any particular period as an 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.

Eleven 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.

Eleven 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 2019, 85% 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 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 income 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. In 2018, we held a special meeting of shareholders to eliminate all or some of these director election rights. While the proposal received majority support, it failed to achieve the required support under Delaware law from a majority of the outstanding owners of the Class B common stock. 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 540,000 square feet of general office space. This lease expires in 2032. Our European headquarters are located at the London Fruit & Wool Exchange (LFWE) at 1 Duval Square, London, where we lease approximately 125,000 square feet of general office space. This lease expires in 2038. Our integration of NEX includes the consolidation of office space where we have shared locations, including the consolidation of our European headquarters to the LFWE.

Our trading floor is located at 333 S. LaSalle Street, Chicago, IL, which we own. The building is approximately 300,000 square feet, of which the trading floor occupies a portion of such space.

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

In addition to 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 7. Property and note 13. Leases and Other Commitments to the Consolidated Financial Statements for more information.

ITEM 3. LEGAL PROCEEDINGS

See "Legal and Regulatory Matters" in note 14. Contingencies to the Consolidated Financial Statements beginning on page 77 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 STOCKHOLDER 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 12, 2020, there were approximately 6,310 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 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 12, 2020, there were approximately 1,560 holders of record of our Class B common stock.

PERFORMANCE GRAPH

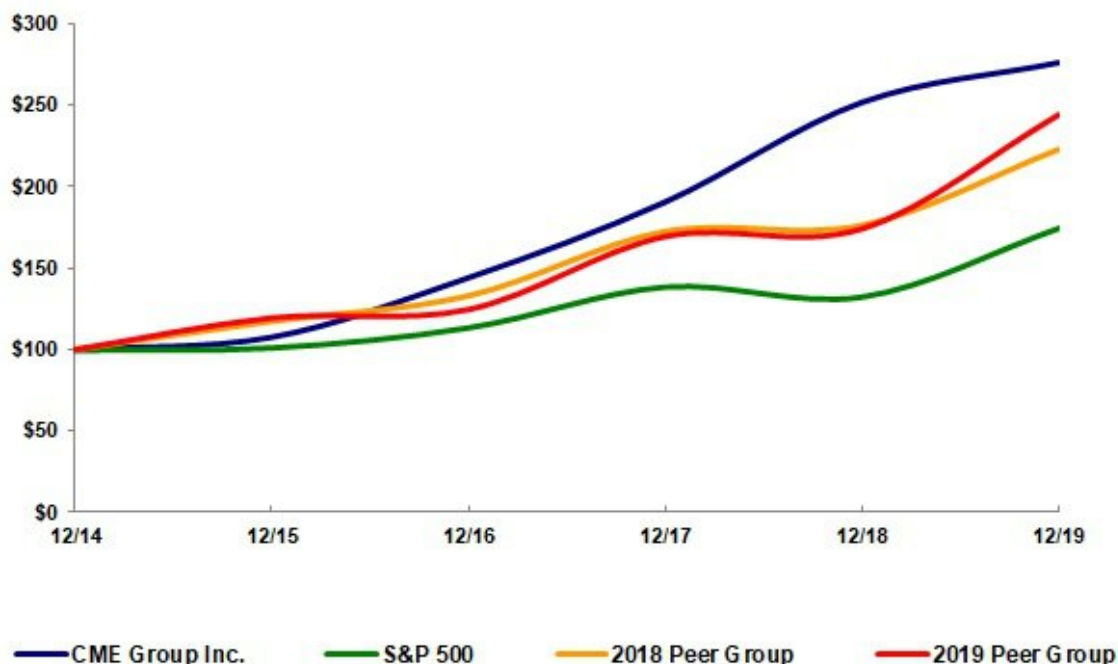
The graph below compares the cumulative five-year total return provided shareholders on CME Group Inc.'s Class A common stock relative to the cumulative total returns of the S&P 500 index and two customized peer groups of three companies and five companies respectively, whose individual companies are listed in footnotes 1 and 2 below. An investment of \$100 (with reinvestment of all dividends) is assumed to have been made in our Class A common stock, in each index and in each of the peer groups on December 31, 2014 and its relative performance is tracked through December 31, 2019.

(1) There are three companies included in the company's 2018 customized peer group which are: Cboe Global Markets Inc, Intercontinental Exchange Inc and Nasdaq Inc.

(2) The five companies included in the company's 2019 customized peer group are: Cboe Global Markets Inc, Deutsche Boerse Ag, Intercontinental Exchange Inc, London Stock Exchange Group Plc and Nasdaq Inc. We compiled this revised peer group to more closely reflect our competitors in our industry. We believe the new peer group provides a more meaningful basis for comparison to our stock performance.

COMPARISON OF 5 YEAR CUMULATIVE TOTAL RETURN*

Among CME Group Inc., the S&P 500 Index,
2018 Peer Group and 2019 Peer Group



*\$100 invested on 12/31/14 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.

	2015	2016	2017	2018	2019
CME Group Inc.	\$ 107.68	\$ 144.21	\$ 190.83	\$ 252.13	\$ 276.52
S&P 500	101.38	113.51	138.29	132.23	173.86
2018 Peer Group	117.34	132.98	172.32	176.08	222.54
2019 Peer Group	119.52	124.64	169.37	174.13	244.04

Unregistered Sales of Equity Securities

None.

Issuer Purchases of Equity Securities

Period in 2019	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	112	\$ 210.07	—	\$ —
November 1 to November 30	—	—	—	—
December 1 to December 31	20	205.96	—	—
Total	132		—	

- (1) Shares purchased consist of an aggregate of 132 shares of Class A common stock surrendered to satisfy employee tax obligations upon the vesting of restricted stock.

ITEM 6. SELECTED FINANCIAL DATA

On November 2, 2018, CME Group completed its acquisition of NEX Group plc (NEX). The following data includes the financial results of NEX beginning November 3, 2018.

(in millions, except per share data)	Year Ended or At December 31				
	2019	2018	2017	2016	2015
Income Statement Data:					
Total revenues	\$ 4,868.0	\$ 4,309.4	\$ 3,644.7	\$ 3,595.2	\$ 3,326.8
Operating income	2,587.8	2,607.6	2,310.6	2,200.5	1,984.9
Non-operating income (expense)	101.8	170.2	215.7	87.1	(28.1)
Income before income taxes	2,689.6	2,777.8	2,526.3	2,287.6	1,956.8
Net income attributable to CME Group	2,116.5	1,962.2	4,063.4	1,534.1	1,247.0
Earnings per common share attributable to CME Group:					
Basic	\$ 5.93	\$ 5.73	\$ 12.00	\$ 4.55	\$ 3.71
Diluted	5.91	5.71	11.94	4.53	3.69
Cash dividends per share	5.50	4.55	6.14	5.65	4.90
Balance Sheet Data:					
Total assets	\$ 75,215.3	\$ 77,475.7	\$ 75,791.2	\$ 69,369.4	\$ 67,359.4
Short-term debt	—	574.2	—	—	—
Long-term debt	3,743.2	3,826.8	2,233.1	2,231.2	2,229.3
CME Group shareholders' equity	26,128.9	25,918.5	22,411.8	20,340.7	20,551.8

The following table presents key statistical information on the volume of contracts traded, expressed in round turn trades. All amounts exclude our interest rate swaps and credit default swaps contracts as well as volume data for our cash markets business.

(in thousands)	Year Ended or At December 31				
	2019	2018	2017	2016	2015
Average Daily Volume:					
Product Lines:					
Interest rates	10,349	9,951	8,189	7,517	6,720
Equity indexes	3,459	3,589	2,682	3,061	2,792
Foreign exchange	862	1,004	922	858	872
Agricultural commodities	1,454	1,480	1,353	1,321	1,265
Energy	2,375	2,561	2,578	2,432	1,970
Metals	668	639	568	460	344
Total Average Daily Volume	19,167	19,224	16,292	15,649	13,963
Method of Trade:					
CME Globex	17,182	17,371	14,513	13,766	12,185
Open outcry	1,205	1,168	1,107	1,149	1,139
Privately negotiated	780	685	672	734	639
Total Average Daily Volume	19,167	19,224	16,292	15,649	13,963
Other Data:					
Total Contract Volume (round turn trades)	4,830,043	4,844,406	4,089,175	3,943,670	3,532,521
Open Interest at Year End (contracts)	113,330	115,669	108,043	102,930	91,369

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 which may have a significant impact on our financial results and the estimates, assumptions and risks associated with those policies.
- **Recent Accounting Pronouncements:** Includes an evaluation of recent accounting pronouncements and the potential impact of their future adoption on our financial results.
- **Results of Operations:** Includes an analysis of our 2019 and 2018 financial results and a discussion of any known events or trends which 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.

On November 2, 2018, we completed our acquisition of NEX Group plc (NEX). The following Management's Discussion and Analysis of Financial Condition and Results of Operations includes the financial results of NEX beginning on November 3, 2018.

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.

We also provide optimization services that deliver transaction lifecycle management and information services to help our customers optimize their capital, mitigate their risk and reduce operational costs. Optimization services includes Traiana, TriOptima and Reset.

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 and EBS 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 caused by the United States and European credit crises, 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; 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 face competition from other futures, securities and securities option exchanges; clearing organizations; swap execution facilities; alternative trade execution facilities; technology firms, including market data distributors and electronic trading system developers; and others. 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" on page 9.

Regulatory Environment. Exchange-traded derivatives have historically been subject to extensive regulation. 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" on page 10.

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. 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" 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 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. Through our acquisition of NEX, 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 CME electronic platforms. Open outcry trading is conducted exclusively by our members, who may execute trades on behalf of customers or for themselves.

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. The cash markets business also includes BrokerTec Americas, which generates revenue from a matched principal business. This business 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. 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.

Other revenues include revenues from our optimization services, which include fees for risk management and information services for the over-the-counter markets, including portfolio reconciliation and post-trade processing. Revenue earned from these services is typically generated through subscriptions or transaction fees.

Other revenues also include fees for post-trade services, 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 as well as the majority of our employee bonuses vary directly with overall contract volume.

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 inflation or 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, 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 United States 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 United Kingdom, 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 as well as 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 (S&P/DJI), Dubai Mercantile Exchange and Bursa Malaysia Derivatives Berhad.
- 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 as well as 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 United States, 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 are unadjusted, quoted prices in active markets for identical assets or liabilities at the measurement date.
- 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 are unobservable and reflect management's best estimate of what market participants would use in pricing the asset or liability. Assets and liabilities carried at level 3 fair value generally include assets and liabilities with inputs that require management's judgment.

For further discussion regarding the fair value of financial assets and liabilities, see note 19 of the notes 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.

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 book value of the amortizing asset to undiscounted cash flows. If the book value exceeds the undiscounted 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 and annually challenge the useful lives.

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 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. An accrual is established for estimated fee adjustments to reflect corrections to customer exchange trading privileges. The accrual is based on the historical pattern of adjustments processed as well as specific adjustment requests.

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 computer software for internal use are capitalized. We also enter into software hosting arrangements for software projects maintained in the cloud. Software development costs incurred during the planning or maintenance stages of a software project are expensed as incurred, while costs incurred during the application development stage are capitalized and are amortized over the estimated useful life of the software, generally two to four years. Amortization of capitalized costs begins only when the software becomes ready for its intended use.

RECENT ACCOUNTING PRONOUNCEMENTS

Refer to note 2 in our notes to the consolidated financial statements for information on newly adopted and recently issued accounting pronouncements that are applicable to us.

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, 2018 and December 2017, 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, 2018 filed with the SEC on February 28, 2019.

(dollars in millions, except per share data)	2019	2018	Year-over- Year Change 2019-2018
Total revenues	\$ 4,868.0	\$ 4,309.4	13%
Total expenses	2,280.2	1,701.8	34
Operating margin	53%	61%	
Non-operating income (expense)	\$ 101.8	\$ 170.2	(40)
Effective tax expense rate	21%	29%	
Net income attributable to CME Group	\$ 2,116.5	\$ 1,962.2	8
Diluted earnings per common share attributable to CME Group	5.91	5.71	4
Cash flows from operating activities	2,672.8	2,440.8	10

Revenues

(dollars in millions)	2019	2018	Year-over- Year Change 2019-2018
Clearing and transaction fees	\$ 3,946.1	\$ 3,667.0	8%
Market data and information services	518.5	449.6	15
Other	403.4	192.8	109
Total Revenues	<u>\$ 4,868.0</u>	<u>\$ 4,309.4</u>	13

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.

	2019	2018	Year-over- Year Change 2019-2018
Total contract volume (in millions)	4,830.0	4,844.4	— %
Clearing and transaction fees (in millions)	\$ 3,396.3	\$ 3,513.9	(3)
Average rate per contract	0.703	0.725	(3)

We estimate the following decreases in clearing and transaction fees based on a change in total contract volume and a change in average rate per contract during 2019 compared with 2018.

(in millions)	Year-over- Year Change 2019-2018
Decrease due to change in total contract volume	\$ (10.1)
Decrease due to change in average rate per contract	(107.5)
Net decrease in clearing and transaction fees	<u>\$ (117.6)</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)	2019	2018	Year-over- Year Change 2019-2018
Average Daily Volume by Product Line:			
Interest rates	10,349	9,951	4%
Equity indexes	3,459	3,589	(4)
Foreign exchange	862	1,004	(14)
Agricultural commodities	1,454	1,480	(2)
Energy	2,375	2,561	(7)
Metals	668	639	5
Aggregate average daily volume	19,167	19,224	—
Average Daily Volume by Venue:			
CME Globex	17,182	17,371	(1)
Open outcry	1,205	1,168	3
Privately negotiated	780	685	14
Aggregate average daily volume	19,167	19,224	—
Electronic Volume as a Percentage of Total Volume	90%	90%	

During 2019, volatility spiked in mid-2019 following a shift in expectations surrounding the Federal Reserve's interest rate policies. In mid-2019, the Federal Reserve began cutting interest rates following earlier indications that it intended to continue to slowly increase interest rates throughout 2019. Uncertainty surrounding the United States' foreign trade policy also increased mid-2019 following the threat of additional tariffs. By the fourth quarter, market volatility generally declined as uncertainty surrounding the Federal Reserve's interest rate policy subsided. Uncertainty surrounding the foreign trade policy also diminished following a preliminary trade agreement between the United States and China at the end of 2019. We believe the net result of these factors lead to overall volume remaining relatively flat in 2019 when compared with 2018.

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)	2019	2018	Year-over- Year Change 2019-2018
Eurodollar futures and options:			
Front 8 futures	1,997	2,131	(6)%
Back 32 futures	661	839	(21)
Options	1,685	1,416	19
U.S. Treasury futures and options:			
10-Year	2,324	2,363	(2)
5-Year	1,358	1,285	6
2-Year	749	560	34
Treasury bond	467	484	(4)
Federal Funds futures and options	356	259	37

In 2019 compared with 2018, overall interest rate contract volume increased slightly, particularly for short term contracts, due to volatility caused by continued uncertainty surrounding the Federal Reserve's interest rate policy. We believe volatility increased in the middle of 2019 due to a shift in market expectations at that time following the Federal Reserve's decision to initiate interest rate cuts as well as uncertainty surrounding the United State's future economic growth.

Equity Index Products

The following table summarizes average daily contract volume for our key equity index products. Volume below for the year ended 2019 includes Micro-E-mini contract volumes for each index beginning on May 6, 2019, which was the date the contracts were launched.

(amounts in thousands)	2019	2018	Year-over-Year Change 2019-2018
E-mini S&P 500 futures and options	2,338	2,527	(7)%
E-mini NASDAQ 100 futures and options	592	504	17
E-mini Russell 2000 futures and options	168	153	10

In 2019 compared with 2018, equity index contract volume decreased slightly due to lower overall volatility in the equity market in 2019, particularly in the fourth quarter. Volatility levels were higher in 2018 due to uncertainty surrounding the United States' foreign trade and other economic policies; however, the volatility leveled off at the end of 2019. The overall decrease in volume was partially offset by additional volume generated from the launch of Micro-E-mini equity index contracts in the second quarter of 2019, which have a notional size of one-tenth of the traditional E-mini contracts. Average daily contract volume in 2019 included approximately 317,000 in Micro-E-mini equity index contracts.

Foreign Exchange Products

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

(amounts in thousands)	2019	2018	Year-over-Year Change 2019-2018
Euro	232	308	(25)%
Japanese yen	139	159	(13)
British pound	129	142	(9)
Australian dollar	105	118	(11)

In 2019 compared with 2018, overall foreign exchange contract volume decreased, which we believe resulted from lower overall volatility following periods of higher volatility in early 2018. We believe foreign exchange volatility decreased in 2019 following the indication by the Federal Reserve and other central banks to limit the number of interest rate changes in 2019. We also believe that the lack of a final resolution of a trade agreement between the United States and China and the delay in the United Kingdom European Union membership referendum contributed to lower volume.

Agricultural Commodity Products

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

(amounts in thousands)	2019	2018	Year-over-Year Change 2019-2018
Corn	525	482	9%
Soybean	263	305	(14)
Wheat	215	248	(13)

Overall commodity contract volume decreased slightly in 2019 when compared with 2018. We believe the decline in soybean contract volume was due to lower U.S. exports of soybeans to China due to uncertainty surrounding trade policies between the countries. The decrease in wheat contract volume was due to lower volatility levels resulting from a surplus of global supplies in major growing regions around the world. Corn contract volume increased due to significant uncertainty surrounding crop yields for the 2019 growing season due to higher than normal precipitation levels.

Energy Products

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

(amounts in thousands)	2019	2018	Year-over- Year Change 2019-2018
WTI crude oil	1,329	1,439	(8)%
Natural gas	529	594	(11)
Refined products	381	398	(4)

Overall energy contract volume decreased in 2019 when compared with 2018, which we believe was due to lower price volatility within the energy markets throughout 2019 caused by greater price stability within the crude oil markets. In addition, expanded production of natural gas resulted in a reduction of price volatility in early 2019, which we believe contributed to a decrease in natural gas volume.

Metal Products

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

(amounts in thousands)	2019	2018	Year-over- Year Change 2019-2018
Gold	433	375	16%
Silver	107	103	3
Copper	98	131	(25)

Overall metal contract volume increased in 2019 when compared with 2018 due to an increase in metals price volatility caused by investors using gold and other precious metals as safe-haven alternative investments to other volatile markets, particularly in mid-2019.

Average Rate per Contract

The average rate per contract decreased in 2019 when compared with 2018, which is largely due to a shift in product mix. Interest rate contract volume increased by 2 percentage points as a percent of total volume, while all other products collectively decreased by 2 percentage points. In general, interest rate products have a lower rate per contract compared with the remaining contracts. The decrease in average rate per contract was also due to the introduction of the micro-E-mini equity index contracts, which have a lower average rate per contract compared with a standard E-mini contract. Micro-E-mini equity index contracts have a notional size of one-tenth of the traditional E-mini contracts.

Cash Markets Business

Total clearing and transaction fees revenue in 2019 includes \$483.0 million of transaction fees attributable to the cash markets business acquired from NEX compared with \$91.2 million for the period November 3, 2018 through December 31, 2018. This revenue primarily includes BrokerTec Americas' fixed income volume and EBS foreign exchange volume.

(amounts in millions)	2019	2018
BrokerTec Americas' fixed income transaction fees	\$ 191.5	\$ 32.9
EBS foreign exchange transaction fees	191.8	37.5

The related average daily notional value for the year ended 2019 and the period November 3, 2018 through December 31, 2018 were as follows:

(amounts in billions)	2019	2018
U.S. Treasury	\$ 164.8	\$ 187.2
European Repo (in euros)	269.6	253.6
Spot FX	75.1	79.0

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. No individual clearing firm represented at least 10% of our clearing and transaction fees in 2019. 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 2019 when compared with 2018, the increase in market data and information services revenue was attributable to the additional market data revenue generated by market data subscribers and distributors associated with the cash markets business subsequent to the NEX acquisition in November 2018. In addition, fees for legacy CME basic real-time market data services increased to \$105 per month from \$85 per month for each device beginning in the second quarter of 2018, which also contributed to the increase in revenue in 2019 compared with 2018. The increase was partially offset by a reduction in revenue due to modest declines in screen counts due to cost-cutting initiatives at member firms.

The two largest resellers of our market data represented, in aggregate, 37% of our market data and information services revenue in 2019. 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 subscribes to 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. The increase in other revenues in 2019 when compared with 2018 is largely attributable to the additional other revenue contributed by the NEX acquisition. Other revenues from NEX primarily include optimization services such as portfolio management, analytics, and trade and regulatory reporting.

Expenses

(dollars in millions)			Year-over-Year Change	
	2019	2018	2019-2018	
Compensation and benefits	\$ 898.7	\$ 672.2	34%	
Technology	201.5	117.2	72	
Professional fees and outside services	174.1	166.1	5	
Amortization of purchased intangibles	314.7	130.0	142	
Depreciation and amortization	158.6	118.7	34	
Licensing and other fee agreements	172.2	170.6	1	
Other	360.4	327.0	10	
Total Expenses	<u>\$ 2,280.2</u>	<u>\$ 1,701.8</u>	34	

2019 Compared With 2018

Operating expenses increased by \$578.4 million in 2019 when compared with 2018. The following table shows the estimated impact of key factors resulting in the net increase in operating expenses.

(dollars in millions)	Year-over-Year Change	Change as a Percentage of 2018 Expenses
Salaries, benefits and employer taxes	\$ 210.0	12%
Amortization of purchased intangibles	184.7	11
Technology	81.2	5
Net losses on fixed assets and assets held for sale	65.1	4
Occupancy and building operations	46.6	3
Bonus expense	45.8	3
NEX integration costs	29.4	2
Foreign currency exchange rate fluctuation	(66.4)	(4)
NEX acquisition costs	(107.8)	(6)
Other expenses, net	89.8	4
Total	\$ 578.4	34%

Overall operating expenses increased in 2019 compared with 2018 due to the following reasons:

- Compensation and benefits expense increased as a result of headcount added from the NEX acquisition in the fourth quarter of 2018.
- Amortization of purchased intangibles related to the NEX acquisition accounted for the additional amortization expense.
- Technology expense, specifically hardware and software maintenance expense, was higher largely due to the addition of our NEX operations.
- During 2019, we recognized higher impairment losses on certain fixed assets and net losses on assets held for sale compared to 2018.
- Occupancy and building operations expense increased due to the inclusion of leases for our NEX operations.
- Bonus expense increased in 2019 largely due to the headcount added as part of the NEX acquisition.
- Integration costs increased following the NEX acquisition in the fourth quarter of 2018. These costs primarily consisted of professional and legal fees incurred to support the post-acquisition integration efforts during 2019.

Decreases in operating expenses in 2019 when compared with 2018 were as follows:

- In 2018, we recognized a net loss of \$73.6 million primarily due to the decline in the British pound versus U.S. dollar exchange rate on \$1.6 billion of restricted cash held for the acquisition of NEX, which was denominated in British pounds, compared to a net loss of \$7.2 million in 2019. Gains and losses from exchange rate fluctuations result when subsidiaries with a U.S. dollar functional currency hold cash as well as certain other monetary assets and liabilities denominated in foreign currencies.
- Transaction costs and transfer taxes incurred by CME Group related to the NEX acquisition resulted in additional expense in 2018.

Non-Operating Income (Expense)

(dollars in millions)	2019	2018	Year-over-Year Change 2019-2018
Investment income	\$ 637.9	\$ 745.1	(14)%
Interest and other borrowing costs	(178.0)	(157.7)	13
Equity in net earnings (losses) of unconsolidated subsidiaries	176.8	152.8	16
Other income (expense)	(534.9)	(570.0)	(6)
Total Non-Operating	\$ 101.8	\$ 170.2	(40)

Investment income. The decrease in investment income in 2019 when compared with 2018 was largely due to a decline in net realized and unrealized gains (losses). The decrease in investment income was also due to a decline in earnings from cash performance bond and guaranty fund contributions that are reinvested, which primarily resulted from lower average reinvestment balances as well as an overall decrease in the rate of return earned on our investments.

Interest and other borrowing costs. Interest and other borrowing costs were higher in 2019 compared with 2018 due to a full year of interest expense incurred on \$500.0 million of 3.75% fixed rate notes due June 2028 and \$700.0 million of 4.15% fixed rate notes due June 2048 issued in the second quarter of 2018.

Equity in net earnings (losses) of unconsolidated subsidiaries. Higher income generated from our S&P/DJI business venture and net earnings from investments acquired through the transaction with NEX contributed to increases in equity in net earnings (losses) of unconsolidated subsidiaries in 2019 when compared with the prior year.

Other income (expense). In 2019 when compared with 2018, we recognized lower net losses on various derivative contracts. In 2018, we recognized net losses on our foreign exchange option and forward contracts used to mitigate certain exposure to foreign exchange rate fluctuation on the currency required to facilitate the NEX acquisition as well as derivative contracts that we assumed in our acquisition of NEX. Expense related to the redistribution of income earned on performance bond and guaranty fund contributions was relatively flat in 2019 compared to 2018.

Income Tax Provision

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

	2019	2018	Year-over-Year Change 2019-2018
Year ended December 31	21.3%	29.3%	(8.0)%

In 2019 when compared with 2018, the effective tax rate was lower due to the recognition of benefits from the Internal Revenue Code Section 250 deduction in 2019. Proposed FDII Deduction regulations were released in 2019 and as a result, we have revised our income tax calculations to reflect the proposed guidance. The benefit recognized in 2019 includes estimates for the deduction for 2018 and 2019.

In addition, we recognized higher deferred tax expense in 2018 due to the acquisition of NEX.

LIQUIDITY AND CAPITAL RESOURCES

Cash Requirements

We have historically met our funding requirements with cash generated by our ongoing operations. However, as part of the funding for the NEX acquisition, we utilized our commercial paper program in late 2018 and throughout 2019 for short-term funding requirements. While our cost structure is 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 operating leases and non-cancellable purchase obligations as well as other obligations reflected as long-term liabilities on our consolidated balance sheet at December 31, 2019. These were as follows:

(in millions)	Leases	Purchase Obligations	Debt Obligations	Other Long-Term Liabilities ⁽¹⁾	Total
Year					
2020	\$ 80.7	\$ 25.3	\$ 133.3	\$ —	\$ 239.3
2021-2022	159.9	24.4	1,016.5	—	1,200.8
2023-2024	150.4	8.0	237.6	—	396.0
Thereafter	510.5	—	4,214.8	—	4,725.3
Total	<u>\$ 901.5</u>	<u>\$ 57.7</u>	<u>\$ 5,602.2</u>	<u>\$ —</u>	<u>\$ 6,561.4</u>

(1) The liability for gross unrecognized income tax benefits, including interest and penalties, of \$441.8 million for uncertain tax positions is not included in the table due to uncertainty about the date of their settlement. It also excludes liabilities for lease

arrangements as well as liabilities that have uncertainty associated with timing of payments, including liabilities for benefit plans. It also excludes liabilities that will not be settled in cash.

Leases include rent payments for office space in Chicago, New York and other smaller offices in the United States and in various foreign countries. The lease for our headquarters in Chicago expires in 2032. Annual minimum rental payments under this lease range from \$14.0 million to \$19.7 million. We also maintain leases for datacenter space in the Chicago area, which expires in March 2031. Annual minimum rental payments under this lease range from \$16.9 million to \$18.3 million. The lease for our office space in New York expires in December 2028. Annual minimum rental payments under this lease range from \$14.3 million to \$15.3 million.

Purchase obligations include minimum payments due under agreements for advertising, licensing, hardware, software and maintenance as well as telecommunication services. Debt obligations include repayment of principal and interest associated with the debt obligations.

Future capital expenditures for technology are anticipated as we continue to support our growth through increased system capacity, performance improvements, integration of acquired platforms as well as improvements to some of our office spaces. Each year, capital expenditures are incurred for improvements to and expansion of our offices, remote data centers, telecommunications network and other operating equipment. In 2020, we expect capital expenditures to total approximately \$180 million to \$200 million, net of any leasehold improvement allowances and any one-time costs associated with the NEX integration. 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. CME Group is also required to comply with restrictions contained in the general corporation laws of its state of incorporation, which could also limit its ability to declare and pay dividends. On February 5, 2020 the board of directors declared a regular quarterly dividend of \$0.85 per share. The dividend will be payable on March 25, 2020 to shareholders of record on March 10, 2020. Assuming no changes in the number of shares outstanding, the first quarter dividend payment will total approximately \$300 million. The board of directors also declared an additional, annual variable dividend of \$2.50 per share on December 11, 2019 paid on January 15, 2020 to the shareholders of record on December 27, 2019. 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, capitalization 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)	2019	2018	Year-over-Year Change
			2019-2018
Net cash provided by operating activities	\$ 2,672.8	\$ 2,440.8	10%
Net cash used in investing activities	(152.6)	(1,889.6)	n.m.
Net cash used in financing activities	(2,340.8)	(1,080.0)	117

n.m. not meaningful

Operating activities

The increase in net cash provided by operating activities in 2019 compared with 2018 is largely due to the incremental operating cash generated from the business lines acquired through our acquisition of NEX in November 2018.

Investing activities

The decrease in cash used in investing activities in 2019 when compared with 2018 was largely due to the cash consideration required for the acquisition of NEX in November 2018, net of cash received.

Financing activities

Cash used in financing activities was higher in 2019 when compared with in 2018 due to a net reduction in outstanding debt in 2019 compared with issuance of debt in 2018. The increase in cash used in financing activities was partially offset by a decrease in cash dividends.

Debt Instruments

The following table summarizes our debt outstanding as of December 31, 2019:

(in millions)	Par Value
Fixed rate notes due September 2022, stated rate of 3.00% ⁽¹⁾	\$ 750.0
Fixed rate notes due May 2023, stated rate of 4.30%	€ 15.0
Fixed rate notes due March 2025, stated rate of 3.00% ⁽²⁾	\$ 750.0
Fixed rate notes due June 2028, stated rate of 3.75%	\$ 500.0
Fixed rate notes due September 2043, stated rate of 5.30% ⁽³⁾	\$ 750.0
Fixed rate notes due June 2048, stated rate of 4.15%	\$ 700.0
Commercial Paper	\$ 304.0

- (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 3.32%.
- (2) 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%.
- (3) 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 \$2.4 billion multi-currency revolving senior credit facility with various financial institutions, which matures in November 2022. 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 \$3.0 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, 2017, 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 the outstanding commercial paper balance is 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 CME Clearing. The facility provides for borrowings of up to \$7.0 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 for our collateral), or 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. 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. At December 31, 2019, guaranty funds available to collateralize the facility totaled \$8.5 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 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. On May 1, 2019, we amended and extended the agreement, which will expire on April 29, 2020.

The indentures governing our fixed rate notes, our \$2.4 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, 2019, we have excess borrowing capacity for general corporate purposes of approximately \$2.1 billion under our multi-currency revolving senior credit facility.

At December 31, 2019, 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 a portion of the funds which it uses to pay dividends to its shareholders.

To satisfy our performance bond obligation with Singapore Exchange Limited, we may pledge CME-owned U.S. Treasury securities or U.S. dollars in lieu of, or in combination with, irrevocable letters of credit. At December 31, 2019, we had pledged letters of credit totaling \$260.0 million.

The following table summarizes our credit ratings as of December 31, 2019:

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 due to a change of control, we are required to make an offer to repurchase our CME Group fixed rate notes at a price equal to 101% of the principal amount, plus accrued and unpaid interest.

Off-Balance Sheet Arrangements

As of December 31, 2019, we did not have any off-balance sheet arrangements as defined by Securities and Exchange Commission rules and regulations.

Liquidity and Cash Management

Cash and cash equivalents totaled \$1.6 billion at December 31, 2019 and \$1.4 billion at December 31, 2018. The balance retained in cash and cash equivalents is a function of anticipated or possible short-term cash needs, prevailing interest rates, our 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. 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 on 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 contribution will be necessary in 2020 as we exceeded our funding goal by \$32.7 million in 2019. However, the amount of the actual contribution is contingent on various factors, including the actual rate of return on our plan assets during 2020 and the December 31, 2020 discount rate.

Regulatory Requirements

CME is regulated by the CFTC as a U.S. 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 Dodd-Frank. 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 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 Rule 15c3-3 of the Securities Exchange Act.

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, foreign currency exchange rates and equity prices.

Interest Rate Risk

Debt outstanding at December 31, 2019 consisted of fixed-rate borrowings of \$3.7 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, 2019. At December 31, 2019, we maintained \$303.8 million of commercial paper. Commercial paper is considered a fixed rate borrowing; however, because maturities for commercial paper are generally less than 90 days, commercial paper is considered subject to interest rate fluctuations.

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 assure you 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. In addition, we would make a demand for payment pursuant to any applicable guarantee provided to us by the parent company of the clearing firm. 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 solvent 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 \$2.4 billion multi-currency revolving senior credit facility to provide liquidity for our clearing house in the unlikely event of default.

At December 31, 2019, aggregate performance bond deposits for clearing firms for both financial safeguard packages was \$154.5 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, 2019 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⁾	4,902.8
Assessment powers ⁽³⁾	13,482.7

- (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, 2019 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⁾	3,559.8
Assessment powers ⁽³⁾	1,609.9

- (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 for interest rate swap contracts include guaranty fund contributions required of those 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 reflected the potential obligation that each clearing member could be called for based on potential failure of the third and fourth largest clearing.

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, 2019, 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 2019, 2018 and 2017 were \$(7.2) million, \$(73.6) million and \$9.4 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. On January 31, 2020, the United Kingdom (U.K.) formally withdrew from the European Union (EU) after a majority of voters in the U.K. approved an exit from the EU, commonly referred to as Brexit. Brexit continues to generate economic and political uncertainty throughout the world, particularly throughout the U.K. and the EU. This 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 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 2019, 2018 and 2017 were \$(0.6) million, \$(2.5) million and \$7.5 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,	
	2019	2018
Assets		
Current Assets:		
Cash and cash equivalents	\$ 1,551.4	\$ 1,374.5
Marketable securities	83.2	72.9
Accounts receivable, net of allowance of \$3.4 and \$2.7	491.8	553.3
Other current assets (includes \$4.3 and \$1.5 in restricted cash)	364.4	430.5
Performance bonds and guaranty fund contributions	37,077.0	39,455.5
Total current assets	39,567.8	41,886.7
Property, net	544.0	448.7
Intangible assets—trading products	17,175.3	17,175.3
Intangible assets—other, net	5,117.7	5,500.1
Goodwill	10,742.5	10,805.3
Other assets (includes \$0.9 and \$1.2 in restricted cash)	2,068.0	1,659.6
Total Assets	\$ 75,215.3	\$ 77,475.7
Liabilities and Equity		
Current Liabilities:		
Accounts payable	\$ 61.9	\$ 116.0
Short-term debt	—	574.2
Other current liabilities	1,384.8	1,126.9
Performance bonds and guaranty fund contributions	37,075.8	39,455.5
Total current liabilities	38,522.5	41,272.6
Long-term debt	3,743.2	3,826.8
Deferred income tax liabilities, net	5,635.2	5,665.9
Other liabilities	1,155.1	745.1
Total Liabilities	49,056.0	51,510.4
Shareholders' Equity:		
Preferred stock, \$0.01 par value, 10,000 shares authorized as of December 31, 2019 and 2018; none issued	—	—
Class A common stock, \$0.01 par value, 1,000,000 shares authorized as of December 31, 2019 and 2018, 357,469 and 356,824 shares issued and outstanding as of December 31, 2019 and 2018, respectively	3.6	3.6
Class B common stock, \$0.01 par value, 3 shares authorized, issued and outstanding as of December 31, 2019 and 2018	—	—
Additional paid-in capital	21,113.2	21,054.3
Retained earnings	5,008.7	4,855.3
Accumulated other comprehensive income (loss)	3.4	5.3
Total CME Group shareholders' equity	26,128.9	25,918.5
Non-controlling interests	30.4	46.8
Total Equity	26,159.3	25,965.3
Total Liabilities and Equity	\$ 75,215.3	\$ 77,475.7

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,		
	2019	2018	2017
Revenues			
Clearing and transaction fees	\$ 3,946.1	\$ 3,667.0	\$ 3,098.6
Market data and information services	518.5	449.6	391.8
Other	403.4	192.8	154.3
Total Revenues	4,868.0	4,309.4	3,644.7
Expenses			
Compensation and benefits	898.7	672.2	563.9
Technology	201.5	117.2	101.6
Professional fees and outside services	174.1	166.1	117.6
Amortization of purchased intangibles	314.7	130.0	95.5
Depreciation and amortization	158.6	118.7	113.0
Licensing and other fee agreements	172.2	170.6	146.3
Other	360.4	327.0	196.2
Total Expenses	2,280.2	1,701.8	1,334.1
Operating Income	2,587.8	2,607.6	2,310.6
Non-Operating Income (Expense)			
Investment income	637.9	745.1	531.7
Interest and other borrowing costs	(178.0)	(157.7)	(117.0)
Equity in net earnings (losses) of unconsolidated subsidiaries	176.8	152.8	129.2
Other non-operating income (expense)	(534.9)	(570.0)	(328.2)
Total Non-Operating Income (Expense)	101.8	170.2	215.7
Income before Income Taxes	2,689.6	2,777.8	2,526.3
Income tax provision (benefit)	573.8	814.1	(1,537.1)
Net Income	2,115.8	1,963.7	4,063.4
Less: net (income) loss attributable to non-controlling interests	0.7	(1.5)	—
Net Income Attributable to CME Group	\$ 2,116.5	\$ 1,962.2	\$ 4,063.4
Earnings per Common Share Attributable to CME Group:			
Basic	\$ 5.93	\$ 5.73	\$ 12.00
Diluted	5.91	5.71	11.94
Weighted Average Number of Common Shares:			
Basic	357,155	342,344	338,707
Diluted	358,239	343,737	340,226

See accompanying notes to consolidated financial statements.

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

	Year Ended December 31,		
	2019	2018	2017
Net income	\$ 2,115.8	\$ 1,963.7	\$ 4,063.4
Other comprehensive income, net of tax:			
Investment securities:			
Net unrealized holding gains (losses) arising during the period	1.0	(0.8)	30.2
Reclassification of gains (losses) on sale included in investment income	—	—	(89.5)
Income tax benefit (expense)	(0.3)	0.2	79.4
Investment securities, net	0.7	(0.6)	20.1
Defined benefit plans:			
Net change in defined benefit plans arising during the period	(6.6)	(15.3)	0.3
Amortization of net actuarial (gains) losses and prior service costs included in compensation and benefits expense	4.9	2.6	2.9
Income tax benefit (expense)	0.4	3.2	(1.5)
Defined benefit plans, net	(1.3)	(9.5)	1.7
Derivative investments:			
Net unrealized holding gains (losses) arising during the period	0.6	0.9	—
Amortization of effective portion of net (gains) losses on cash flow hedges included in interest expense	(1.2)	(1.2)	(1.2)
Income tax benefit (expense)	(0.1)	0.1	0.3
Derivative investments, net	(0.7)	(0.2)	(0.9)
Foreign currency translation:			
Foreign currency translation adjustments	(0.6)	(2.5)	10.4
Income tax benefit (expense)	—	—	(2.9)
Foreign currency translation, net	(0.6)	(2.5)	7.5
Other comprehensive income (loss), net of tax	(1.9)	(12.8)	28.4
Comprehensive income	2,113.9	1,950.9	4,091.8
Less: comprehensive (income) loss attributable to non-controlling interest	0.7	(1.5)	—
Comprehensive income attributable to CME Group	\$ 2,114.6	\$ 1,949.4	\$ 4,091.8

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 Equity
Balance at December 31, 2016	338,240	3	\$17,830.3	\$2,524.5	\$ (14.1)	\$ 20,340.7
Net income				4,063.4		4,063.4
Other comprehensive income					28.4	28.4
Dividends on common stock of \$6.14 per share				(2,088.5)		(2,088.5)
Impact of adoption of standards update on employee share-based payments, net of tax			1.4	(2.2)		(0.8)
Exercise of stock options	444		36.7			36.7
Vesting of issued restricted Class A common stock	511		(31.3)			(31.3)
Shares issued to Board of Directors	20		2.4			2.4
Shares issued under Employee Stock Purchase Plan	20		2.8			2.8
Stock-based compensation			58.0			58.0
Balance at December 31, 2017	<u>339,235</u>	<u>3</u>	<u>\$17,900.3</u>	<u>\$4,497.2</u>	<u>\$ 14.3</u>	<u>\$ 22,411.8</u>

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)

	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, 2017	339,235	3	\$17,900.3	\$ 4,497.2	\$ 14.3	\$ 22,411.8	\$ —	\$ 22,411.8
Net income				1,962.2		1,962.2	1.5	1,963.7
Other comprehensive income					(12.8)	(12.8)		(12.8)
Dividends on common stock of \$4.55 per share				(1,591.6)		(1,591.6)		(1,591.6)
Impact of adoption of standards update on tax effects related to accumulated other comprehensive income and revenue recognition				(12.5)	3.8	(8.7)		(8.7)
Common stock issued to complete the acquisition of NEX	16,927		3,105.8			3,105.8		3,105.8
Non-controlling interest resulting from the acquisition of NEX						—	45.3	45.3
Exercise of stock options	175		11.5			11.5		11.5
Vesting of issued restricted Class A common stock	449		(35.0)			(35.0)		(35.0)
Shares issued to Board of Directors	16		2.8			2.8		2.8
Shares issued under Employee Stock Purchase Plan	22		4.0			4.0		4.0
Stock-based compensation			68.5			68.5		68.5
Balance at December 31, 2018	356,824	3	\$21,057.9	\$ 4,855.3	\$ 5.3	\$ 25,918.5	\$ 46.8	\$ 25,965.3

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)

	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, 2018	356,824	3	\$21,057.9	\$ 4,855.3	\$ 5.3	\$ 25,918.5	\$ 46.8	\$ 25,965.3
Net income				2,116.5		2,116.5	(0.7)	2,115.8
Other comprehensive income					(1.9)	(1.9)		(1.9)
Dividends on common stock of \$5.50 per share				(1,970.0)		(1,970.0)		(1,970.0)
Impact of adoption of standards updates on leasing				6.9		6.9		6.9
Changes in non-controlling interest due to measurement period adjustments						—	(15.7)	(15.7)
Exercise of stock options	204		14.2			14.2		14.2
Vesting of issued restricted Class A common stock	399		(36.8)			(36.8)		(36.8)
Shares issued to Board of Directors	16		3.2			3.2		3.2
Shares issued under Employee Stock Purchase Plan	26		5.2			5.2		5.2
Stock-based compensation			73.1			73.1		73.1
Balance at December 31, 2019	<u>357,469</u>	<u>3</u>	<u>\$21,116.8</u>	<u>\$ 5,008.7</u>	<u>\$ 3.4</u>	<u>\$ 26,128.9</u>	<u>\$ 30.4</u>	<u>\$ 26,159.3</u>

See accompanying notes to consolidated financial statements.

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

	Year Ended December 31,		
	2019	2018	2017
Cash Flows from Operating Activities			
Net income	\$ 2,115.8	\$ 1,963.7	\$ 4,063.4
Adjustments to reconcile net income to net cash provided by operating activities:			
Stock-based compensation	73.1	96.5	58.0
Amortization of purchased intangibles	314.7	130.0	95.5
Depreciation and amortization	158.6	118.7	113.0
Net losses on assets held for sale and impaired	61.1	—	—
Income tax expense reclassified from accumulated other comprehensive income upon final sale of BM&FBOVESPA shares	—	—	87.8
Loss on derivative contracts	17.7	62.3	—
Net realized and unrealized gains on investments	1.8	(97.4)	(88.8)
Undistributed earnings, net of losses, of unconsolidated subsidiaries	(43.6)	(8.3)	(26.8)
Deferred income taxes	(3.7)	114.3	(2,445.6)
Change in:			
Accounts receivable	60.8	(65.5)	6.0
Other current assets	110.2	(84.9)	(26.1)
Other assets	29.2	29.7	(77.1)
Accounts payable	(54.1)	32.3	5.1
Income taxes payable	(28.6)	195.4	3.5
Other current liabilities	(99.3)	(36.8)	(8.9)
Other liabilities	(52.8)	(20.5)	(8.5)
Other	11.9	11.3	0.6
Net Cash Provided by Operating Activities	2,672.8	2,440.8	1,751.1
Cash Flows from Investing Activities			
Proceeds from maturities and sales of available-for-sale marketable securities	18.8	11.8	2.5
Purchases of available-for-sale marketable securities	(15.4)	(10.0)	(3.0)
Purchases of property, net	(245.6)	(116.7)	(81.9)
Investments in business ventures	—	—	(5.3)
Proceeds from sale of business ventures	89.6	20.7	267.6
Cash paid to acquire NEX, net of cash received	—	(1,795.4)	—
Net Cash (Used in) Provided by Investing Activities	(152.6)	(1,889.6)	179.9

See accompanying notes to consolidated financial statements.

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

	Year Ended December 31,		
	2019	2018	2017
Cash Flows from Financing Activities			
Issuance of commercial paper, net of maturities	\$ (92.5)	\$ 386.9	\$ —
Proceeds from other borrowings, net of issuance costs	—	1,185.0	—
Repayment of other borrowings	(569.2)	(452.5)	—
Cash dividends	(1,695.9)	(2,149.9)	(1,993.5)
Proceeds from settlement of (premium payment for) derivative contract	16.0	(30.0)	—
Employee taxes paid on restricted stock vesting	(36.8)	(35.0)	(31.3)
Other	37.6	15.5	39.5
Net Cash Used in Financing Activities	(2,340.8)	(1,080.0)	(1,985.3)
Net change in cash, cash equivalents and restricted cash	179.4	(528.8)	(54.3)
Cash, cash equivalents and restricted cash, beginning of period	1,377.2	1,906.0	1,960.3
Cash, Cash Equivalents and Restricted Cash, End of Period	\$ 1,556.6	\$ 1,377.2	\$ 1,906.0
Reconciliation of cash, cash equivalents and restricted cash:			
Cash and cash equivalents	\$ 1,551.4	\$ 1,374.5	\$ 1,903.6
Short-term restricted cash	4.3	1.5	—
Long-term restricted cash	0.9	1.2	2.4
Total	\$ 1,556.6	\$ 1,377.2	\$ 1,906.0
Supplemental Disclosure of Cash Flow Information			
Income taxes paid	\$ 591.2	\$ 577.4	\$ 762.8
Interest paid	146.3	108.3	84.8
Non-cash financing activities:			
Common stock issued for the acquisition of NEX	—	3,105.8	—
Declaration of annual variable dividend, payable in January 2020, January 2019 and January 2018	893.7	624.4	1,187.3

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 trading across asset classes through the CME Globex platform, cash and repo fixed income trading via BrokerTec, and cash and OTC FX trading via EBS. 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.

Effective November 2, 2018, CME Group completed its acquisition of NEX Group plc (NEX). NEX offers electronic trade execution platforms for the foreign exchange and fixed income over-the-counter markets as well as other services across the transaction lifecycle, including trade and portfolio management and portfolio compression. The financial statements and accompanying notes presented in this report include the financial results of NEX and its subsidiaries beginning on November 3, 2018.

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 United States 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, equity securities, available-for-sale debt securities, 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 and equity securities 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. Also, the company maintains long-term investments accounted for under the equity method, which requires that the company recognize our share of net income (loss) in the investee as an adjustment to the carrying amount of the investment each reporting period.

The company reviews its investment portfolio to determine whether a decline in fair value below the carrying value is other-than-temporary. If events and circumstances indicate that a decline in the value of one or more assets has occurred and is deemed to be other-than-temporary, the carrying value of the investment is reduced to its fair value and a corresponding impairment expense is charged to earnings.

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 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 the hedges is

deferred in accumulated other comprehensive income. Any realized gains and losses from effective hedges are classified within the same financial statement line item on the consolidated statements of income as the hedge risk. 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 immediately within other non-operating income (expense).

Accounts Receivable. Accounts receivable are comprised of trade receivables and unbilled revenue. All accounts receivable are stated at cost. 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 historical losses and management's assessment of probable future collections.

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 CME 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.

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 thirty-nine 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 or obtaining 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.

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. 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 and indefinite-lived intangible assets for impairment at least quarterly and whenever events or circumstances indicate that their carrying values 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 evaluates the recoverability of indefinite-lived intangible assets at least quarterly by comparing the estimated fair value of the intangible asset to its carrying value. 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 book value of the amortizing asset to undiscounted cash flows. If the book value exceeds the undiscounted 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 and annually challenge the useful lives.

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 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 when a buy and sell order are matched. 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 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 specific adjustment requests. The company believes the allowances are adequate to cover estimated adjustments.

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 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. No individual clearing firm represented at least 10% of our clearing and transaction fees in 2019. One clearing firm represented 10% of the company's clearing and transaction fee revenue in 2018. One clearing firm represented 13% and another clearing firm represented 12% of clearing and transaction fees revenue in 2017. 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 37% of market data and information services revenue in 2019, 41% in 2018, and 45% in 2017. 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.

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 classifies 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 NEX. The remaining operations do not meet the thresholds for reporting separate segment information.

Newly Adopted Accounting Policies. In February 2016, the FASB issued a standards update that requires lessees to recognize on the balance sheet the assets and liabilities associated with the rights and obligations created by those leases. The guidance for lessors is largely unchanged from current accounting rules. Under the new guidance, a lessee is required to recognize assets and liabilities for leases with terms of more than 12 months. Consistent with current accounting standards, the recognition, measurement, and presentation of expenses and cash flows arising from a lease by a lessee primarily will depend on its classification as a finance or operating lease. The company implemented this standard on January 1, 2019 using the modified retrospective approach with a cumulative effect of initially applying the guidance recognized on the date of initial adoption. Upon adoption of the new standard on January 1, 2019, the company recognized a lease liability of \$568.0 million and right-of-use asset of \$448.2 million.

Recently Issued Accounting Pronouncements. In June 2016, the FASB issued guidance that changes how credit losses are measured for most financial assets measured at amortized cost and certain other instruments. The standard requires an entity to estimate its lifetime expected credit loss and record an allowance, that when deducted from the amortized cost basis of the financial asset, presents the net amount expected to be collected on the financial asset. This forward-looking expected loss model generally will result in the earlier recognition of allowances for losses. The standard also amends the impairment model for available for sale debt securities and requires entities to determine whether all or a portion of the unrealized loss on an available for sale debt security is a credit loss. Severity and duration of the unrealized loss are no longer permissible factors in concluding whether a credit loss exists. Entities will recognize improvements to estimated credit losses on available for sale debt securities immediately in earnings rather than as interest income over time. The standard is effective for reporting periods beginning after December 15, 2019. The standard's provisions must be applied as a cumulative-effect adjustment to retained earnings as of the beginning of the first reporting period in which the guidance is effective. The company does not believe that the adoption of this guidance in 2020 will have a material impact on the consolidated financial statements.

In August 2018, the FASB issued a standards update that modifies the disclosure requirements for employers that sponsor defined pension or other postretirement plans. The guidance clarifies certain existing disclosures and expands the requirements for others. Disclosures that are not considered cost beneficial are removed by the update. Also, there is a new disclosure requirement to include an explanation of the reasons for significant gains and losses related to changes in the benefit obligation for the period. This guidance is effective for reporting periods beginning in 2021. Early adoption is permitted. The company plans to update the disclosures for these changes upon adoption of the guidance in 2021.

In December 2019, the FASB issued an accounting update that is intended to reduce cost and complexity related to accounting for income taxes. The update removes specific exceptions to the general principles for accounting for income taxes. Specifically, it eliminates the need for an entity to analyze whether the following exceptions apply in a given period: incremental approach for intraperiod tax allocation, accounting basis differences when there are ownership changes in foreign investments, and interim period income tax accounting for year-to-date losses that exceed anticipated losses. The update also simplifies the accounting for the following: franchise taxes that are partially based on income, transactions with a government that result in a step up in the tax basis of goodwill, separate financial statements of legal entities that are not subject to tax, and enacted changes in tax laws in interim periods. This update is effective for reporting periods beginning after December 15, 2020. Early adoption is permitted in any period for which the entity's financial statements have not yet been issued. The company does not believe that the adoption of this guidance will have a material impact on the consolidated financial statements.

3. BUSINESS COMBINATIONS

On November 2, 2018, the company completed its acquisition of NEX and its subsidiaries in a transaction valued at £11.28 per share (\$14.63 per share based on the CME Group share price of \$183.75 and the exchange rate of US\$1.30:£1 on November 2, 2018), consisting of £5.00 per share in cash and 0.0444 CME Group shares. The total equity value of the transaction was approximately £4.3 billion (\$5.6 billion), including the issuance of 16.9 million CME Group class A shares and \$2.5 billion of cash consideration. As part of the acquisition, the company also assumed \$1.0 billion of existing debt of NEX. The cash consideration was funded with \$1.2 billion of net proceeds received from a debt offering of fixed rate notes in June 2018, borrowings from commercial paper and cash on hand. The company entered into this acquisition primarily as a means to expand its product base, further leverage its existing operating model, extend its presence in the over-the-counter market and better position itself to compete on a global scale.

Purchase Price Allocation. The purchase price has been allocated to NEX's net tangible and identifiable intangible assets based on their estimated fair values as of November 2, 2018. The identifiable intangible assets include customer relationships, technology-related intellectual property and trade names. The goodwill generated from the acquisition was primarily attributable to synergies expected to arise after the acquisition. The company finalized its purchase price allocation in the fourth quarter of 2019. The finalized purchase price allocation was as follows:

(in millions)	
Cash	\$ 668.5
Identifiable intangible assets	3,258.2
Goodwill	3,205.9
Debt assumed	(1,029.1)
Deferred tax liability on identifiable intangible assets	(641.2)
Other assets and liabilities	151.6
Non-controlling interest	(29.6)
Total Purchase Price	<u>\$ 5,584.3</u>

NEX maintains a 86.7% ownership interest in Traiana Inc and its subsidiaries, resulting in nonredeemable non-controlling interests included in the company's consolidated statements of equity beginning on November 3, 2018.

Pro-forma financial information. For the two-month period ended December 31, 2018, NEX revenues and net losses, which include transaction-related costs, were \$133.6 million and \$(42.5) million respectively.

The following table presents pro-forma information as if the acquisition of NEX had occurred on January 1, 2017. This pro-forma information combines the historical condensed consolidated results of operations of CME Group and NEX after giving effect to certain adjustments, including purchase accounting fair value adjustments, amortization of intangibles, stock-based compensation expense and acquisition costs, as well as the related income tax effects of those adjustments. The pro-forma information does not necessarily reflect the results of operations that would have occurred had the company acquired NEX on January 1, 2017. Furthermore, cost savings and other business synergies related to the acquisition are not reflected in the pro-forma amounts.

(in millions)	2018		2017	
Total revenues	\$	4,983.8	\$	4,388.4
Net income		2,030.8		4,043.3

4. MARKETABLE SECURITIES

The company has equity securities, available-for-sale debt securities and mutual funds classified as marketable securities on our consolidated balance sheets. The amortized cost and fair value of equity securities and available-for-sale debt securities at December 31 were as follows:

(in millions)	2019		2018	
	Amortized Cost	Fair Value	Amortized Cost	Fair Value
Corporate debt securities ⁽¹⁾	\$ 15.8	\$ 16.7	\$ 18.2	\$ 18.1
Municipal debt securities	—	—	1.5	1.7
Asset-backed security	0.5	0.3	0.6	0.3
Equity securities	—	0.1	—	0.1
Total	<u>\$ 16.3</u>	<u>\$ 17.1</u>	<u>\$ 20.3</u>	<u>\$ 20.2</u>

(1) The corporate debt securities are maintained for a non-qualified retirement and benefit plan under the COMEX Members' Recognition and Retention Plan (MRRP) (note 12).

Net unrealized gains (losses) on marketable debt securities classified as available-for-sale are reported as a component of other comprehensive income (loss) and included on the accompanying consolidated statements of comprehensive income and consolidated statements of equity. Changes in the fair value of equity securities are recognized within investment income on the consolidated statements of income.

The fair value and gross unrealized losses of our asset-backed security was \$0.3 million and \$0.2 million, respectively, at December 31, 2019. The asset-backed security was in an unrealized loss position for more than 12 months at December 31, 2019 and was deemed not to be other-than-temporarily impaired. The company does not intend to sell and is not required to sell these securities prior to maturity.

The amortized cost and fair value of the corporate debt securities and asset-backed security at December 31, 2019, by contractual maturity, were as follows:

(in millions)	Amortized Cost	Fair Value
Maturity of one year or less	\$ 1.8	\$ 1.8
Maturity between one and five years	5.3	5.4
Maturity between five and ten years	2.8	2.9
Maturity greater than ten years	6.4	6.9
Total	<u>\$ 16.3</u>	<u>\$ 17.0</u>

The company maintains additional investments in a diverse portfolio of mutual funds related to its non-qualified deferred compensation plans (note 12). These securities are classified as trading securities. The fair value of these securities was \$66.1 million and \$52.7 million at December 31, 2019 and 2018, respectively.

5. 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, fees for trade order routing through agreements from various strategic relationships, as well as other post-trade services to customers and clearing firms. Access and communication fees are charges 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. 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, 2019, 2018 and 2017:

(in millions)	2019	2018	2017
Interest rates	\$ 1,278.5	\$ 1,201.0	\$ 995.4
Equity indexes	583.8	687.0	497.1
Foreign exchange	158.8	187.8	185.6
Agricultural commodities	452.4	470.0	436.0
Energy	683.5	744.2	716.2
Metals	239.3	223.9	200.2
Interest rate swap and credit default swap	66.8	61.9	68.1
Cash markets business	483.0	91.2	—
Total clearing and transaction fees	3,946.1	3,667.0	3,098.6
Market data and information services	518.5	449.6	391.8
Other	403.4	192.8	154.3
Total revenues	\$ 4,868.0	\$ 4,309.4	\$ 3,644.7

Timing of Revenue Recognition

Services transferred at a point in time	3,696.2	3,561.5	3,052.1
Services transferred over time	1,156.9	738.8	579.9
One-time charges and miscellaneous revenues	14.9	9.1	12.7
Total revenues	\$ 4,868.0	\$ 4,309.4	\$ 3,644.7

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 at the end of each reporting period. For annual licenses and upfront fee arrangements, the company generally bills customers upon contract execution. These payments are recognized as revenue over time as the obligations under the contracts are satisfied. Changes in the contract liability balances during 2019 were not materially impacted by any other factors. The balance of contract liabilities was \$42.6 million and \$44.4 million as of December 31, 2019 and 2018, respectively.

6. 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 United States, clearing firm positions 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 investments 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 collateral 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 make 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 2019, the clearing house transferred an average of approximately \$3.4 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 initial and maintenance performance bond requirements and mandatory guaranty fund contributions. The company believes that the guarantee liability is immaterial and therefore has not recorded any liability at December 31, 2019.

At December 31, 2019, performance bond and guaranty fund contribution assets on the consolidated balance sheets include cash as well as U.S. government agency securities with maturity dates of 90 days or less. U.S. government agency securities are purchased by the clearing house, at its discretion, using cash collateral. The benefits, including interest earned, and risks of ownership accrue to the clearing house. Interest earned is included in investment income on the consolidated statements of income. The U.S. government agency securities held at December 31, 2019 will mature during the first quarter of 2020. These securities are marked to fair value on the consolidated balance sheets.

The amortized cost and fair value of these securities at December 31, 2019 were as follows. There were no outstanding balances at December 31, 2018.

(in millions)	2019	
	Amortized Cost	Fair Value
U.S. government agency securities	\$ 898.2	\$ 898.2

CME has been designated as a systemically important financial market utility by the Financial Stability Oversight Council and maintains cash accounts at the Federal Reserve Bank of Chicago. At December 31, 2019 and 2018, the clearing house maintained \$22.9 billion and \$24.7 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.

Clearing firms, at their option, may instruct the clearing house to deposit the cash or securities held by the clearing house into one of the IEF programs. The total principal in the IEF programs was \$4.1 billion at December 31, 2019 and \$3.1 billion at December 31, 2018. This balance is not included in the company's 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 50% each to CME and OCC. The company believes that the guarantee liability is immaterial and therefore has not recorded any liability at December 31, 2019.

In addition, CME has perpetual cross-margin agreements with Fixed Income Clearing Corporation (FICC) whereby the clearing firms' offsetting positions with CME and FICC are subject to reduced performance bond requirements. Clearing firms maintain separate performance bond deposits with each clearing house, but depending on the net offsetting positions between CME and FICC, each clearing house may reduce that firm's performance bond requirements. In the event of a firm default, the total liquidation net gain or loss on the firm's offsetting open positions and the proceeds from the liquidation of the performance bond collateral held by each clearing house's supporting offsetting positions would be divided evenly between CME and FICC. Additionally, if, after liquidation of all the positions and collateral of the defaulting firm at each respective clearing organization, and taking into account any cross-margining loss sharing payments, any of the participating clearing organizations has a remaining liquidating surplus, and any other participating clearing organization has a remaining liquidating deficit, any additional surplus from the liquidation would be shared with the other clearing house to the extent that it has a remaining liquidating deficit. Any remaining surplus funds would be passed to the bankruptcy trustee. The company believes that the guarantee liability is immaterial and therefore has not recorded any liability at December 31, 2019.

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. 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. 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, 2019, guaranty fund contributions available for clearing firms were \$8.5 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 \$2.4 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 United States to segregate cash and securities deposited by clearing firms from its 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 were as follows:

(in millions)	2019		2018	
	Cash	Non-Cash Deposits and IEF Funds ⁽¹⁾	Cash	Non-Cash Deposits and IEF Funds (1)
Performance bonds	\$ 35,597.3	\$ 116,462.7	\$ 38,211.4	\$ 102,264.8
Guaranty fund contributions	1,470.1	7,500.6	1,185.9	6,935.9
Cross-margin arrangements	—	191.2	22.3	202.3
Performance bond collateral for delivery	9.6	2.1	35.9	—
Total	<u>\$ 37,077.0</u>	<u>\$ 124,156.6</u>	<u>\$ 39,455.5</u>	<u>\$ 109,403.0</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 \$133.8 million and \$206.8 million at December 31, 2019 and 2018, 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, these letters of credit, which are not included in the accompanying consolidated balance sheets, were as follows:

(in millions)	2019	2018
Performance bonds	\$ 2,461.0	\$ 2,699.2
Performance bond collateral for delivery	2,242.2	3,273.0
Total Letters of Credit	<u>\$ 4,703.2</u>	<u>\$ 5,972.2</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.

7. PROPERTY

A summary of the property accounts at December 31 is presented below:

(in millions)	2019	2018	Estimated Useful Life
Land and land improvements	\$ 7.8	\$ 7.8	10 - 20 years ⁽¹⁾
Building and building improvements	173.9	174.1	3 - 39 years
Leasehold improvements	219.0	215.6	3 - 19 years
Furniture, fixtures and equipment	433.0	371.6	2 - 7 years
Software and software development costs	577.8	440.7	2 - 4 years
Total property	<u>1,411.5</u>	<u>1,209.8</u>	
Less accumulated depreciation and amortization	<u>(867.5)</u>	<u>(761.1)</u>	
Property, net	<u>\$ 544.0</u>	<u>\$ 448.7</u>	

(1) Estimated useful life applies only to land improvements.

8. INTANGIBLE ASSETS AND GOODWILL

Intangible assets consisted of the following at December 31:

(in millions)	2019			2018		
	Assigned Value	Accumulated Amortization	Net Book Value	Assigned Value	Accumulated Amortization	Net Book Value
Amortizable Intangible Assets:						
Clearing firm, market data and other customer relationships	\$ 5,797.1	\$ (1,346.0)	\$ 4,451.1	\$ 5,862.5	\$ (1,065.6)	\$ 4,796.9
Technology-related intellectual property	174.3	(46.6)	127.7	179.1	(25.6)	153.5
Other	103.8	(14.9)	88.9	102.8	(3.1)	99.7
Total Amortizable Intangible Assets	\$ 6,075.2	\$ (1,407.5)	4,667.7	\$ 6,144.4	\$ (1,094.3)	5,050.1
Indefinite-Lived Intangible Assets:						
Trade names			450.0			450.0
Total Intangible Assets—Other, Net			\$ 5,117.7			\$ 5,500.1
Trading products ⁽¹⁾			\$ 17,175.3			\$ 17,175.3

- (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.

The originally assigned useful lives for the amortizable intangible assets as of December 31, 2019 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 \$314.7 million, \$130.0 million and \$95.5 million for the years ended December 31, 2019, 2018 and 2017, respectively. As of December 31, 2019, the future estimated amortization expense related to amortizable intangible assets is expected to be as follows:

(in millions)	
2020	\$ 312.8
2021	312.7
2022	312.3
2023	311.0
2024	304.3
Thereafter	3,114.6

Goodwill activity consisted of the following for the years ended December 31, 2019 and 2018:

(in millions)	Balance at December 31, 2018	Business Combinations	Other Activity (1)	Balance at December 31, 2019
CBOT Holdings	\$ 5,066.4	\$ —	\$ —	\$ 5,066.4
NYMEX Holdings	2,462.2	—	—	2,462.2
NEX	3,236.3	—	(62.8)	3,173.5
Other	40.4	—	—	40.4
Total Goodwill	<u>\$ 10,805.3</u>	<u>\$ —</u>	<u>\$ (62.8)</u>	<u>\$ 10,742.5</u>

(in millions)	Balance at December 31, 2017	Business Combinations	Other Activity	Balance at December 31, 2018
CBOT Holdings	\$ 5,066.4	\$ —	\$ —	\$ 5,066.4
NYMEX Holdings	2,462.2	—	—	2,462.2
NEX	—	3,236.3	—	3,236.3
Other	40.4	—	—	40.4
Total Goodwill	<u>\$ 7,569.0</u>	<u>\$ 3,236.3</u>	<u>\$ —</u>	<u>\$ 10,805.3</u>

1) Other activity includes measurement period adjustments, including adjustments to intangible assets, fixed assets, other assets and accrued liabilities, as well as goodwill associated with assets sold and held for sale. The company finalized its purchase price allocation of net tangible and intangible assets in the fourth quarter of 2019.

9. 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.

Bursa Malaysia Derivatives Berhad. In December 2019, the company sold its 25% interest in Bursa Malaysia Derivatives Berhad (Bursa Malaysia) and recognized a gain of \$11.1 million. The company and Bursa Malaysia have entered into several agreements including agreements to provide licensing and trade matching services.

DME Holdings Limited. The company owns an approximate 50% interest in DME Holdings Limited (DME Holdings), and accounts for its investment in DME Holdings using the equity method of accounting. The company's investment in DME Holdings was \$15.9 million at December 31, 2019. The company and DME Holdings maintain an agreement for Dubai Mercantile Exchange futures contracts to be exclusively traded on the CME Globex platform.

S&P/DJI Indices LLC. The company owns a 27% interest in S&P/Dow Jones Indices LLC (S&P/DJI) and accounts for its investment in S&P/DJI using the equity method of accounting. The company's investment in S&P/DJI was \$991.6 million at December 31, 2019. The company has long-term exclusive licensing agreements with S&P/DJI to list products based on the Standard & Poor's Indices and Dow Jones Indices.

10. DEBT

In March 2019, the company repaid both the €350.0 million fixed rates notes and the ¥19.1 billion term loan.

Short-term debt outstanding consisted of the following at December 31 (in U.S. dollar equivalent):

(in millions)	2019	2018
€350.0 million fixed rate notes due March 2019, stated rate of 3.13% ⁽¹⁾	\$ —	\$ 400.7
¥19.1 billion term loan due March 2019, stated rate of 0.81% ⁽²⁾	—	173.5
Total short-term debt	<u>\$ —</u>	<u>\$ 574.2</u>

Long-term debt outstanding consisted of the following at December 31 (in U.S. dollar equivalent):

(in millions)	2019	2018
\$750.0 million fixed rate notes due September 2022, stated rate of 3.00% ⁽¹⁾	\$ 747.7	\$ 746.9
€15.0 million fixed rate notes due May 2023, stated rate of 4.30%	16.4	16.6
\$750.0 million fixed rate notes due March 2025, stated rate of 3.00% ⁽²⁾	746.3	745.6
\$500.0 million fixed rate notes due June 2028, stated rate of 3.75%	496.4	495.9
\$750.0 million fixed rate notes due September 2043, stated rate of 5.30% ⁽³⁾	742.8	742.4
\$700.0 million fixed rate notes due June 2048, stated rate of 4.15%	689.8	689.5
Commercial paper ⁽⁴⁾	303.8	389.9
Total long-term debt	<u>\$ 3,743.2</u>	<u>\$ 3,826.8</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%.
- (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 3.11%.
- (3) 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%.
- (4) The commercial paper is backed by the five-year multi-currency revolving credit facility.

Commercial paper with an aggregate par value of \$8.2 billion and maturities ranging from 1 to 18 days was issued during 2019. The weighted average discount rate of commercial paper outstanding at December 31, 2019 was 1.80%. The weighted average balance of commercial paper outstanding during the year was \$263.0 million.

Long-term debt maturities, at par value (in U.S. dollar equivalent), were as follows as of December 31, 2019:

(in millions)	Par Value
2020	\$ —
2021	—
2022	1,054.0
2023	16.8
2024	—
Thereafter	2,700.0

Commercial paper is considered to mature in 2022 because it is backed by the five-year multi-currency revolving credit facility, which expires in 2022.

11. 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:

(in millions)	2019	2018	2017
Income before income taxes:			
Domestic	\$ 2,650.2	\$ 2,716.8	\$ 2,464.2
Foreign	39.4	61.0	62.1
Total	<u>\$ 2,689.6</u>	<u>\$ 2,777.8</u>	<u>\$ 2,526.3</u>
Income tax provision:			
Current:			
Federal	\$ 419.5	\$ 524.8	\$ 783.7
State	139.2	154.2	85.7
Foreign	18.8	20.8	39.1
Total	<u>577.5</u>	<u>699.8</u>	<u>908.5</u>
Deferred:			
Federal	(6.7)	(9.3)	(2,576.3)
State	28.0	127.8	130.8
Foreign	(25.0)	(4.2)	(0.1)
Total	<u>(3.7)</u>	<u>114.3</u>	<u>(2,445.6)</u>
Total Income Tax Provision (Benefit)	<u>\$ 573.8</u>	<u>\$ 814.1</u>	<u>\$ (1,537.1)</u>

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

	2019	2018	2017
Statutory tax rate	21.0%	21.0%	35.0 %
State taxes, net of federal benefit	4.1	4.5	2.1
Domestic production activities deduction	—	—	(1.0)
Increase (decrease) in domestic valuation allowance	—	—	(0.1)
Impact of revised state and local apportionment estimates	0.8	3.5	3.1
Reclassification of accumulated other comprehensive income	—	—	3.5
Impact of 2017 Tax Act	—	(0.2)	(101.6)
Foreign-derived intangible income deduction	(3.8)	—	—
Other, net	(0.8)	0.5	(1.8)
Effective Tax Expense (Benefit) Rate	<u>21.3%</u>	<u>29.3%</u>	<u>(60.8)%</u>

In 2019, the effective rate was slightly higher than the statutory tax rate. The increase to the effective tax rate for the state taxes was offset by the foreign-derived intangible income deduction (FDII) in Sec. 250(a) introduced during the Tax Cut and Jobs Act tax reform. Proposed FDII Deduction regulations were released in 2019 and as a result, management revised the income tax calculations to reflect the proposed guidance. The benefit recognized in 2019 includes estimates for the deduction for 2018 and 2019.

In 2018, the effective rate was higher than the statutory tax rate primarily due to the NEX acquisition impact on state tax expense.

In 2017, the effective rate was lower than the statutory tax rate due to the remeasurement of the deferred tax liabilities as a result of the 2017 Tax Act. This decrease was partially offset by an increase in the state apportionment impact of the Illinois income tax rate change on deferred tax liabilities as well as the reclassification of income tax expense from accumulated other comprehensive income related to the disposal of BM&FBOVESPA shares.

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

(in millions)	2019	2018
Deferred Income Tax Assets:		
Net operating losses	\$ 35.9	\$ 42.1
Property	—	0.3
Accrued expenses, compensation and other	46.2	32.6
Subtotal	82.1	75.0
Valuation allowance	(10.0)	(10.7)
Total deferred income tax assets	72.1	64.3
Deferred Income Tax Liabilities:		
Purchased intangible assets	(5,654.4)	(5,700.6)
Property	(23.3)	—
Total deferred income tax liabilities	(5,677.7)	(5,700.6)
Net Deferred Income Tax Liabilities	\$ (5,605.6)	\$ (5,636.3)
Reported as:		
Net non-current deferred tax assets	\$ 29.6	\$ 29.6
Net non-current deferred tax liabilities	(5,635.2)	(5,665.9)
Net Deferred Income Tax Liabilities	\$ (5,605.6)	\$ (5,636.3)

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, 2019 and 2018, the company had domestic and foreign income tax loss carry forwards of \$202.1 million and \$226.0 million, respectively. These amounts primarily related to losses from the acquisition of NEX Group plc, the acquisitions of Swapstream Limited and its affiliates, the acquisition of Pivot, Inc., losses incurred in the operation of various foreign entities and capital losses from the sales of securities. At December 31, 2019 and 2018, the company determined that it was not more-likely-than-not that deferred income tax assets related to the acquisition of Swapstream Limited and its affiliates and other deferred income tax assets created from the start-up of various foreign operations will be fully realized.

As a result, valuation allowances of \$10.0 million and \$10.7 million were recorded at December 31, 2019 and 2018, respectively.

The following is a summary of the company's unrecognized tax benefits:

(in millions)	2019	2018	2017
Gross unrecognized tax benefits	\$ 388.5	\$ 396.2	\$ 308.8
Unrecognized tax benefits, net of tax impacts in other jurisdictions	359.6	367.9	276.0
Unrecognized interest and penalties related to uncertain tax positions	53.3	63.5	34.0
Interest and penalties recognized on the consolidated statements of income	(10.2)	29.5	1.3

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 unrecognized tax benefits is as follows:

(in millions)	2019	2018	2017
Balance at January 1	\$ 396.2	\$ 308.8	\$ 252.1
Additions based on tax positions related to the current year	30.3	27.2	41.8
Unrecognized tax benefits acquired at date of acquisition	—	58.4	—
Additions for tax positions of prior years	4.7	7.7	47.7
Reductions for tax positions of prior years	(8.8)	(0.3)	(8.7)
Reductions resulting from the lapse of statutes of limitations	(1.7)	(3.1)	(2.1)
Settlements with taxing authorities	(32.2)	(2.5)	(22.0)
Balance at December 31	<u>\$ 388.5</u>	<u>\$ 396.2</u>	<u>\$ 308.8</u>

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, 2019, substantially all federal and state income tax matters had been concluded through 2007 and 2006, respectively.

12. 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)	2019	2018
Balance at January 1	\$ 265.1	\$ 273.9
Service cost	19.0	19.1
Interest cost	12.3	10.5
Actuarial (gain) loss	35.9	(23.5)
Benefits paid	(8.1)	(14.9)
Balance at December 31	<u>\$ 324.2</u>	<u>\$ 265.1</u>

The aggregate accumulated benefit obligation was \$293.1 million and \$240.9 million at December 31, 2019 and 2018, respectively.

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

(in millions)	2019	2018	2017
Balance at January 1	\$ 315.8	\$ 348.0	\$ 238.8
Actual return on plan assets	49.2	(17.3)	29.8
Employer contributions	—	—	90.0
Benefits paid	(8.1)	(14.9)	(10.6)
Balance at December 31	<u>\$ 356.9</u>	<u>\$ 315.8</u>	<u>\$ 348.0</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 is indicated below:

(in millions)	2019	2018
Level 2:		
Money market funds	\$ 9.6	\$ 8.1
Mutual funds:		
Fixed income	155.0	155.0
U.S. equity	121.1	94.4
Foreign equity	71.2	58.3
Total	<u>\$ 356.9</u>	<u>\$ 315.8</u>

At December 31, 2019 and 2018, the fair value of pension plan assets exceeded the projected benefit obligation by \$32.7 million and \$50.7 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 2019 assumptions have been used to project the assets and liabilities from December 31, 2019 to December 31, 2020. The result of this projection is that estimated liabilities would not exceed the fair value of the plan assets at December 31, 2020. Accordingly, the company anticipates based on this projection that no additional contribution in 2020 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 2020 and the December 31, 2020 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 are indicated below:

(in millions)	2019	2018	2017
Components of Net Pension Expense:			
Service cost	\$ 19.0	\$ 19.1	\$ 18.7
Interest cost	12.3	10.5	10.8
Expected return on plan assets	(20.0)	(22.1)	(15.1)
Recognized net actuarial loss	5.0	2.7	2.9
Net Pension Expense	<u>\$ 16.3</u>	<u>\$ 10.2</u>	<u>\$ 17.3</u>
Assumptions Used to Determine End-of-Year Benefit Obligation:			
Discount rate	3.40%	4.40%	3.70%
Rate of compensation increase	5.00	5.00	5.00
Cash balance interest crediting rate	4.00	4.00	4.00
Assumptions Used to Determine Net Pension Expense:			
Discount rate	4.40%	3.70%	4.30%
Rate of compensation increase	5.00	5.00	5.00
Expected return on plan assets	6.50	6.50	6.50
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 was as follows:

	2019	2018
Fixed income	43.5%	49.1%
Money market funds	2.7	2.5
U.S. equity	33.9	29.9
Foreign equity	19.9	18.5

The range of target allocation percentages for 2020 is as follows:

	Minimum	Maximum
Fixed income	50.0%	50.0%
U.S. large-cap equity	10.0%	40.0%
U.S. mid-cap equity	5.0	13.0
U.S. small-cap equity	5.0	10.0
Foreign developed equity	—	20.0
Foreign small-cap equity	—	5.0
Emerging markets equity	—	5.0

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 2019 are as follows:

(in millions)	Actuarial Loss
Balance at January 1	\$ 73.5
Unrecognized net loss	6.7
Recognized as a component of net pension expense	(5.0)
Balance at December 31	<u>\$ 75.2</u>

The company expects to amortize \$4.4 million of actuarial loss and prior service costs from accumulated other comprehensive income (loss) into net periodic benefit costs in 2020.

At December 31, 2019, anticipated benefit payments from the plan in future years are as follows:

(in millions)	
2020	\$ 20.7
2021	21.6
2022	22.5
2023	23.5
2024	24.2
2025-2029	130.5

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, including employees for NEX beginning on November 3, 2018.

Aggregate expense for all of the defined contribution savings plans amounted to \$23.6 million, \$13.8 million and \$11.8 million in 2019, 2018 and 2017, 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 \$66.1 million and \$52.7 million at December 31, 2019 and 2018 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 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 2019, 2018 and 2017. At December 31, 2019 and 2018, the obligation for the MRRP totaled \$16.5 million. Assets with a fair value of \$19.3 million and \$19.2 million have been allocated to this plan at December 31, 2019 and 2018, 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.

13. LEASES AND OTHER COMMITMENTS

Leases. The company adopted the new leasing standard on January 1, 2019, using the modified retrospective approach. The standard requires lessees to recognize on the balance sheet the assets and liabilities associated with the rights and obligations created by those leases. Upon implementation of the standard, the company utilized the package of practical expedients which did not require reassessment of the following: (a) whether any expired or existing contracts are or contain leases, (b) the lease classification for any expired or existing leases, and (c) any initial direct costs for existing leases. In addition, the company has elected not to separately account for lease and non-lease components, resulting in a greater amount of capitalized lease costs on the balance sheet. Upon adoption of the new standard on January 1, 2019, the company recognized a lease liability of \$568.0 million and right-of-use asset of \$448.2 million.

The company has operating leases for datacenters and corporate offices. The operating leases have remaining lease terms of up to 18 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.

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 for purposes of adopting this 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:

(in millions)	Year Ended December 31, 2019
Operating lease expense:	
Operating lease cost	\$ 72.3
Short-term lease cost	6.2
Total operating lease expense included in other expense	<u>\$ 78.5</u>
Finance lease expense:	
Interest expense	\$ 3.6
Depreciation expense	9.2
Total finance lease expense	<u>\$ 12.8</u>
Sublease revenue included in other revenue	\$ 10.2

Supplemental cash flow information related to leases was as follows:

(in millions)	Year Ended December 31, 2019
Cash outflows for operating leases	\$ 66.5
Cash outflows for finance leases	19.0

Supplemental balance sheet information related to leases was as follows:

Operating leases

(in millions)	December 31, 2019
Operating lease right-of-use assets	\$ 417.1
Operating lease liabilities:	
Other current liabilities	\$ 42.3
Other liabilities	514.8
Total operating lease liabilities	<u>\$ 557.1</u>
Weighted average remaining lease term (in months)	146
Weighted average discount rate	4.0%

Finance leases

(in millions)	December 31, 2019
Finance lease right-of-use assets	\$ 97.5
Finance lease liabilities:	
Other current liabilities	\$ 7.4
Other liabilities	91.5
Total finance lease liabilities	<u>\$ 98.9</u>
Weighted average remaining lease term (in months)	135
Weighted average discount rate	3.5%

Future minimum lease payments were as follows as of December 31, 2019 for operating and finance leases:

(in millions)	Operating Leases
2020	63.8
2021	61.4
2022	64.4
2023	60.7
2024	55.1
Thereafter	398.7
Total lease payments	<u>704.1</u>
Less: imputed interest	(147.0)
Present value of lease liability	<u>\$ 557.1</u>

(in millions)	Finance Lease
2020	16.9
2021	17.0
2022	17.1
2023	17.2
2024	17.4
Thereafter	111.8
Total lease payments	<u>197.4</u>
Less: imputed interest	(98.5)
Present value of lease liability	<u>\$ 98.9</u>

Other Commitments. 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. At December 31, 2019, future minimum payments due under purchase obligations were payable as follows (in millions):

Year	
2020	\$ 25.3
2021	13.7
2022	10.7
2023	8.0
2024	—
Thereafter	—
Total	<u>\$ 57.7</u>

14. CONTINGENCIES

Legal and Regulatory Matters. In 2013, the CFTC filed suit against NYMEX and two former employees alleging disclosure of confidential customer information in violation of the Commodity Exchange Act. The case is set for trial in October 2020. Based on its investigation to date and advice from legal counsel, the company believes that it has strong factual and legal defenses to the claim.

In 2003, the U.S. Futures Exchange, L.L.C. (Eurex U.S.) and U.S. Exchange Holdings, Inc. filed suit in federal court alleging that CBOT and CME violated the antitrust laws and tortuously interfered with the business relationship and contract between Eurex U.S. and The Clearing Corporation. On October 31, 2018, the Court granted CBOT's and CME's motion for summary judgment and dismissed the case in its entirety. Eurex has appealed this decision.

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 its 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.

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 legal and regulatory matters as none were probable and estimable as of December 31, 2019 and 2018.

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.

15. GUARANTEES

Mutual Offset Agreement. CME and Singapore Exchange Limited (SGX) maintain a mutual offset agreement with a current term through October 2020. 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 unless either party provides advance notice of its intent to terminate. CME can maintain collateral in the form of U.S. Treasury securities or irrevocable, standby letters of credit. At December 31, 2019, CME was contingently liable to SGX on irrevocable letters of credit totaling \$260.0 million. 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. The company believes that its guarantee liability is immaterial and therefore has not recorded any liability at December 31, 2019.

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 immaterial and therefore has not recorded any liability at December 31, 2019.

16. CAPITAL STOCK

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

(in thousands)	December 31,	
	2019	2018
Class A common stock authorized	1,000,000	1,000,000
Class A common stock issued and outstanding	357,469	356,824
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

CME Group has no shares of preferred stock issued and outstanding.

Associated Trading Rights. Members of CME, CBOT, NYMEX and COMEX own or lease trading rights which entitle them to access 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.

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 22 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 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 24.6 million shares have been granted and are outstanding or have been exercised under this plan at December 31, 2019 (note 17).

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. A total of 625,000 Class A shares have been reserved under this plan, and approximately 399,000 shares have been awarded through December 31, 2019.

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. A total of 500,000

Class A shares have been reserved under this plan, of which approximately 309,000 shares have been purchased through December 31, 2019 (note 17).

17. 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 24.6 million shares have been granted and are outstanding or have been exercised under the plan as of December 31, 2019. 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 stock-based payments and total income tax benefit recognized on the consolidated statements of income for stock-based awards were as follows:

(in millions)	2019	2018	2017
Compensation expense	\$ 85.8	\$ 96.8	\$ 58.3
Income tax benefit recognized	27.3	27.5	42.6

The compensation expense above includes expense of \$5.0 million related to restricted share awards held by NEX employees that vested within 6 months following the acquisition. The employees received cash consideration equivalent to the cash and share consideration received by NEX shareholders upon vesting in 2019.

At December 31, 2019, there was \$143.8 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 2.1 years.

Stock options have not been granted since 2012. The following table summarizes stock option activity for 2019. 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, 2018	397,227	\$ 55	2.0	\$ 53.0
Exercised	(169,363)	55		
Cancelled	(780)	55		
Outstanding at December 31, 2019	227,084	54	1.4	33.2
Exercisable at December 31, 2019	227,084	54	1.4	33.2

The total intrinsic value of options exercised during 2019, 2018 and 2017 was \$23.1 million, \$17.8 million and \$20.4 million, respectively.

In 2019, the company granted 389,162 shares of restricted Class A common stock and 31,595 shares of restricted stock units. 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 \$86.2 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 2019, the company also granted 167,300 performance shares. The fair value related to these grants was \$26.9 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.

The following table summarizes restricted stock, restricted stock units, and performance shares activity for 2019:

	Number of Shares	Weighted Average Grant Date Fair Value
Outstanding at December 31, 2018	1,361,228	\$ 144
Granted	588,057	192
Vested	(398,205)	117
Cancelled	(226,702)	121
Outstanding at December 31, 2019	1,324,378	177

The total fair value of restricted stock, restricted stock units, and performance shares that vested during 2019, 2018 and 2017 was \$77.7 million, \$76.6 million and \$66.0 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 2019, 2018 and 2017, a total of 26,134, 22,249 and 19,936 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 \$0.5 million for the purchase discount was recognized in 2019, \$0.4 million was recognized in 2018 and \$0.3 million was recognized in 2017.

Non-executive directors receive an annual award of Class A common stock with a value equal to \$120,000. Non-executive directors may also elect to receive some or all of the cash portion of their annual stipend, up to \$80,000, in shares of stock based on the closing price at the date of distribution. As a result, 16,328 shares, 16,640 shares and 19,736 shares of Class A common stock were issued to non-executive directors during 2019, 2018 and 2017, respectively. These shares are not subject to any vesting restrictions. Expense of \$3.0 million, \$2.6 million and \$2.5 million related to these stock-based payments was recognized for the years ended December 31, 2019, 2018 and 2017, respectively.

18. 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, 2018	\$ 0.1	\$ (53.8)	\$ 69.7	\$ (10.7)	\$ 5.3
Other comprehensive income before reclassifications and income tax benefit (expense)	1.0	(6.6)	0.6	(0.6)	(5.6)
Amounts reclassified from accumulated other comprehensive income	—	4.9	(1.2)	—	3.7
Income tax benefit (expense)	(0.3)	0.4	(0.1)	—	—
Net current period other comprehensive income	0.7	(1.3)	(0.7)	(0.6)	(1.9)
Balance at December 31, 2019	<u>\$ 0.8</u>	<u>\$ (55.1)</u>	<u>\$ 69.0</u>	<u>\$ (11.3)</u>	<u>\$ 3.4</u>

(in millions)	Investment Securities	Defined Benefit Plans	Derivative Investments	Foreign Currency Translation	Total
Balance at December 31, 2017	\$ 0.6	\$ (36.1)	\$ 58.0	\$ (8.2)	\$ 14.3
Other comprehensive income before reclassifications and income tax benefit (expense)	(0.8)	(15.3)	0.9	(2.5)	(17.7)
Amounts reclassified from accumulated other comprehensive income	—	2.6	(1.2)	—	1.4
Income tax benefit (expense)	0.2	3.2	0.1	—	3.5
Net current period other comprehensive income	(0.6)	(9.5)	(0.2)	(2.5)	(12.8)
Impact of adoption of standards update on tax effects related to accumulated other comprehensive income	0.1	(8.2)	11.9	—	3.8
Balance at December 31, 2018	<u>\$ 0.1</u>	<u>\$ (53.8)</u>	<u>\$ 69.7</u>	<u>\$ (10.7)</u>	<u>\$ 5.3</u>

(in millions)	Investment Securities	Defined Benefit Plans	Derivative Investments	Foreign Currency Translation	Total
Balance at December 31, 2016	\$ (19.5)	\$ (37.8)	\$ 58.9	\$ (15.7)	\$ (14.1)
Other comprehensive income before reclassifications and income tax benefit (expense)	30.2	0.3	—	10.4	40.9
Amounts reclassified from accumulated other comprehensive income	(89.5)	2.9	(1.2)	—	(87.8)
Income tax benefit (expense)	79.4	(1.5)	0.3	(2.9)	75.3
Net current period other comprehensive income	20.1	1.7	(0.9)	7.5	28.4
Balance at December 31, 2017	<u>\$ 0.6</u>	<u>\$ (36.1)</u>	<u>\$ 58.0</u>	<u>\$ (8.2)</u>	<u>\$ 14.3</u>

19. 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, U.S. government 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 assets and liabilities generally consist of asset-backed securities, derivatives and long-term debt notes. Asset-backed securities were measured at fair value based on matrix pricing using prices of similar securities with similar inputs such as maturity dates, interest rates and credit ratings. The derivative contracts were measured at fair value using standard valuation models with market-based observable inputs. The fair values of the long-term debt notes were based on quoted market prices in an inactive market.

Level 3 assets include fixed assets, assets held for sale, certain investments that were impaired and contingent consideration.

Recurring Fair Value Measurements. Financial assets and liabilities recorded at fair value on the consolidated balance sheets as of December 31, 2019 and 2018 were classified in their entirety based on the lowest level of input that was significant to each asset or liability's fair value measurement.

Financial Instruments Measured at Fair Value on a Recurring Basis:

(in millions)	December 31, 2019			
	Level 1	Level 2	Level 3	Total
Assets at Fair Value:				
Marketable securities:				
Corporate debt securities	\$ 16.7	\$ —	\$ —	\$ 16.7
Mutual funds	66.1	—	—	66.1
Equity securities	0.1	—	—	0.1
Asset-backed securities	—	0.3	—	0.3
Total Marketable Securities	<u>82.9</u>	<u>0.3</u>	<u>—</u>	<u>83.2</u>
Performance bonds and guaranty fund contributions ⁽¹⁾ :				
U.S. government agencies securities	898.2	—	—	898.2
Total Assets at Fair Value	<u>\$ 981.1</u>	<u>\$ 0.3</u>	<u>\$ —</u>	<u>\$ 981.4</u>

(in millions)	December 31, 2018			
	Level 1	Level 2	Level 3	Total
Assets at Fair Value:				
Marketable securities:				
Corporate debt securities	\$ 18.1	\$ —	\$ —	\$ 18.1
Municipal bonds	1.7	—	—	1.7
Mutual funds	52.7	—	—	52.7
Equity securities	0.1	—	—	0.1
Asset-backed securities	—	0.3	—	0.3
Total Marketable Securities	72.6	0.3	—	72.9
Derivative Contracts	—	37.7	—	37.7
Total Assets at Fair Value	\$ 72.6	\$ 38.0	\$ —	\$ 110.6
Liabilities at Fair Value:				
Derivative contracts	\$ —	\$ 6.7	\$ —	\$ 6.7
Contingent consideration	—	—	6.7	6.7
Total Liabilities at Fair Value	\$ —	\$ 6.7	\$ 6.7	\$ 13.4

(1) Performance bonds and guaranty fund contributions on the consolidated balance sheet at December 31, 2019 include U.S. government agency securities purchased with cash collateral.

The following is a reconciliation of the level 3 liability valued at fair value on a recurring basis during 2018 and 2019. As of December 31, 2019, the remaining contingent consideration liability has expired.

(in millions)	Contingent Consideration
Fair value of Liability at December 31, 2017	\$ —
Liability acquired through business combination	6.7
Fair value of Liability at December 31, 2018	6.7
Unrealized gains (losses) included in operating expense	(0.4)
Goodwill measurement period adjustment	(6.1)
Settlements	(0.2)
Fair Value of Liability at December 31, 2019	\$ —

Non-Recurring Fair Value Measurements. During 2019, the company recognized impairment charges of \$13.0 million related to some of its investments. The combined fair values of these investments were estimated to be \$57.2 million at December 31, 2019. The company also recognized unrealized losses of \$61.1 million related to assets held for sale and \$20.9 million related to certain fixed assets. The fair value of the fixed assets was estimated to be zero at the impairment date. The fair value of the net assets held for sale were estimated to be \$3.6 million and \$7.7 million at the respective assessment dates. These assessments were based on quantitative and qualitative indications of impairment. The fair value measurements of the investments, fixed assets and assets held for sale are considered level 3 and non-recurring.

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. The fair value of the debt facility that was classified as level 3 under the fair value hierarchy was estimated based on assumptions made by management regarding expectations of future settlement of the debt.

At December 31, 2019, the fair values (in U.S. dollar equivalents) were as follows:

(in millions)	Fair Value	Level
\$750.0 million fixed rate notes due September 2022	772.4	Level 2
€15.0 million fixed rate notes due May 2023	18.8	Level 2
\$750.0 million fixed rate notes due March 2025	784.0	Level 2
\$500.0 million fixed rate notes due June 2028	551.9	Level 2
\$750.0 million fixed rates notes due September 2043	1,010.1	Level 2
\$700.0 million fixed rate notes due June 2048	845.0	Level 2
Commercial paper	303.8	Level 3

20. EARNINGS PER SHARE

Basic earnings per share is computed by dividing net income by the weighted average number of shares of all classes of common stock outstanding for each reporting period. Diluted earnings per share reflects the increase in shares using the treasury stock method to reflect the impact of an equivalent number of shares of common stock if stock options were exercised and restricted stock awards were converted into common stock. Anti-dilutive stock awards were as follows for the years presented:

(in thousands)	2019	2018	2017
Stock awards	519	79	104
Total	519	79	104

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

	2019	2018	2017
Net Income Attributable to CME Group (in millions)	\$ 2,116.5	\$ 1,962.2	\$ 4,063.4
Weighted Average Common Shares Outstanding (in thousands):			
Basic	357,155	342,344	338,707
Effect of stock options and stock awards	1,084	1,393	1,519
Diluted	358,239	343,737	340,226
Earnings per Common Share Attributable to CME Group:			
Basic	\$ 5.93	\$ 5.73	\$ 12.00
Diluted	5.91	5.71	11.94

21. QUARTERLY INFORMATION (UNAUDITED)

(in millions, except per share data)	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Year to Date
Year Ended December 31, 2019					
Total revenues	\$ 1,179.6	\$ 1,272.7	\$ 1,277.3	\$ 1,138.4	\$ 4,868.0
Operating income	631.0	698.6	685.2	573.0	2,587.8
Non-operating income (expense)	9.2	3.5	38.0	51.1	101.8
Income before income taxes	640.2	702.1	723.2	624.1	2,689.6
Net income attributable to CME Group	496.9	513.8	636.3	469.5	2,116.5
Earnings per common share attributable to CME Group:					
Basic	\$ 1.39	\$ 1.44	\$ 1.78	\$ 1.31	\$ 5.93
Diluted	1.39	1.43	1.78	1.31	5.91
Year Ended December 31, 2018					
Total revenues	\$ 1,109.0	\$ 1,059.6	\$ 904.2	\$ 1,236.6	\$ 4,309.4
Operating income	740.9	666.9	549.9	649.9	2,607.6
Non-operating income (expense)	47.8	89.9	11.9	20.6	170.2
Income before income taxes	788.7	756.8	561.8	670.5	2,777.8
Net income attributable to CME Group	598.8	566.1	411.8	385.5	1,962.2
Earnings per common share attributable to CME Group:					
Basic	\$ 1.76	\$ 1.67	\$ 1.21	\$ 1.10	\$ 5.73
Diluted	1.76	1.66	1.21	1.09	5.71

22. 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 fourth quarter of 2019 that have materially affected, or are reasonably likely to materially affect, the company's internal control over financial reporting. The integration of NEX into our overall internal control over financial reporting process was completed during 2019. There were no other changes in the company's internal control over financial reporting which occurred during 2019, 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, 2019. 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, 2019, our internal control over financial reporting is effective. The effectiveness of our internal control over financial reporting as of December 31, 2019 has been audited by Ernst & Young LLP, an independent registered public accounting firm, as stated in the report on page 88.

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, 2019 and 2018, the related consolidated statements of income, comprehensive income, equity, and cash flows for each of the three years in the period ended December 31, 2019, 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, 2019 and 2018, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2019, 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, 2019, 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 28, 2020 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 audit 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 Matters

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 11 to the consolidated financial statements, the Company had unrecognized income tax benefits of \$388.5 million related to uncertain tax positions as of December 31, 2019. 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 28, 2020

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, 2019, 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 December 31, 2019, 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, 2019 and 2018, the related consolidated statements of income, comprehensive income, equity and cash flows for each of the three years in the period ended December 31, 2019, and the related notes and financial statement schedule listed in the Index at Item 15(a) and our report dated February 28, 2020 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 28, 2020

ITEM 9B. OTHER INFORMATION

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, President, 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 6, 2020, to be filed by CME Group with the SEC pursuant to Regulation 14A within 120 days after December 31, 2019 (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 "Employees — 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 16 of the notes to consolidated financial statements. The numbers in the following table are as of December 31, 2019.

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	227,084	\$ 54.45	16,083,992
Equity compensation plans not approved by security holders	—	—	—
Total	227,084		16,083,992

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, 2019 and 2018
 Consolidated Statements of Income for the Years Ended December 31, 2019, 2018 and 2017
 Consolidated Statements of Comprehensive Income for the Years Ended December 31, 2019, 2018 and 2017
 Consolidated Statements of Equity for the Years Ended December 31, 2019, 2018 and 2017
 Consolidated Statements of Cash Flows for the Years Ended December 31, 2019, 2018 and 2017
 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, 2019, 2018 and 2017 (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, 2019				
Allowance for doubtful accounts	\$ 2.7	\$ 2.1	\$ (1.4)	\$ 3.4
Allowance for deferred tax assets	10.7	(0.7)	—	10.0
Year Ended December 31, 2018				
Allowance for doubtful accounts	\$ 2.2	\$ 0.6	\$ (0.1)	\$ 2.7
Allowance for deferred tax assets	11.2	(0.5)	—	10.7
Year Ended December 31, 2017				
Allowance for doubtful accounts	\$ 3.5	\$ 0.6	\$ (1.9)	\$ 2.2
Allowance for deferred tax assets	14.9	(3.7)	—	11.2

- (1) Includes write-offs of doubtful accounts, foreign currency and additions to allowance for deferred tax assets through accumulated other comprehensive income (loss).

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

Exhibit Number	Description of Exhibit
3.	<i>Articles of Incorporation and Bylaws</i>
3.1	Fourth Amended and Restated Certificate of Incorporation 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 May 29, 2012).
3.2	Fifteenth 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 February 7, 2020).
4.	<i>Instruments Defining the Rights of Security Holders</i>
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's 10-K, filed with the SEC on February 26, 2015).
4.2	Commercial Paper Issuing and Paying Agency Agreement, dated as of September 26, 2014, between CME Group Inc. and Bank of America, National Association, as Issuing and Paying Agent (incorporated by reference to Exhibit 4.2 to CME Group'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 Merrill Lynch, Pierce, Fenner & Smith Incorporated, as Dealer (incorporated by reference to Exhibit 4.3 to CME Group's 10-K, filed with the SEC on February 26, 2015).
4.4	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's 10-K, filed with the SEC on February 26, 2015).
4.5	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).
4.6	Fifth Supplemental Indenture (including the form of 3.00% note due 2022), dated September 10, 2012, 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 10, 2012).
4.7	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).
4.8	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).
4.9	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).
4.10	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).
4.11*	Description of securities.
10.	<i>Material Contracts</i>
10.1(1)	CME Group Inc. Second Amended and Restated Omnibus Stock Plan, amended and restated effective as of May 24, 2017 (incorporated by reference to Exhibit 10.2 to CME Group Inc.'s Form 8-K, filed with the SEC on May 30, 2017).
10.2(1)	Form of Equity Grant Letter for Restricted Shares (incorporated by reference to Exhibit 10.2 to CME Group's 10-K, filed with the SEC on March 1, 2018).
10.3(1)	Form of Equity Grant Letter for Annual Grant of Performance Shares (incorporated by reference to Exhibit 10.3 to CME Group's 10-K, filed with the SEC on March 1, 2018).

Exhibit Number	Description of Exhibit
10.4(1)	<u>CME Group Inc. Director Stock Plan, amended and restated effective as of May 21, 2014 (incorporated by reference to Exhibit 10.1 to CME Group Inc.'s Current Report on Form 8-K, filed with the SEC on May 28, 2014).</u>
10.5(1)	<u>Form of Equity Stipend Grant Letter for Non-Executive Directors (incorporated by reference to Exhibit 10.5 to CME Group's 10-K, filed with the SEC on March 1, 2018).</u>
10.6(1)	<u>CME Group Inc.'s Amended and Restated Employee Stock Purchase Plan, amended and restated as of May 23, 2012 (incorporated by reference to Exhibit 10.2 to CME Group Inc.'s Form 8-K, filed with the SEC on May 29, 2012; First Amendment to the Amended and Restated Employee Stock Purchase Plan, effective as of December 5, 2012 (incorporated by reference to Exhibit 10.7 to CME Group Inc.'s Form 10-K, filed with the SEC on February 28, 2013).</u>
10.7(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>
10.8(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>
10.9(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>
10.10(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>
10.11(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's Form 10-Q, filed with the SEC on November 6, 2015).</u>
10.12(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 Form 8-K, filed with the SEC on May 30, 2017).</u>
10.13(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's 10-K, filed with the SEC on February 26, 2015).</u>
10.14(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's 10-K, filed with the SEC on February 26, 2015).</u>
10.15(1)	<u>Amended and Restated Agreement, effective as of December 16, 2019, by and between CME Group Inc. and Terrence A. Duffy (incorporated by reference to Exhibit 10.1 to CME Group Inc.'s Form 8-K, filed with the SEC on December 18, 2019).</u>
10.16(1)	<u>Amendment Deed, dated November 2, 2018, by and among CME Group Inc., NEX Group plc and Michael Spencer (incorporated by reference to Exhibit 10.1 to CME Group Inc.'s Form 8-K, filed with the SEC on November 8, 2018).</u>
10.17(2)	<u>License Agreement, dated June 29, 2012, between Standard & Poor's Financial Services LLC and Chicago Mercantile Exchange Inc. (incorporated by reference to Exhibit 10.6 to CME Group Inc.'s Form 10-Q, filed with the SEC on August 8, 2012).</u>
10.18	<u>\$2,250,000,000 Credit Agreement, dated as of November 21, 2017, 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 Form 8-K, filed with the SEC on November 27, 2017).</u>

Exhibit Number	Description of Exhibit
10.19	<u>Amendment No. 1 to Credit Agreement and Bank Joinder Agreement, dated as of November 1, 2018, 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 certain banks (incorporated by reference to Exhibit 10.1 to CME Group Inc.'s Form 8-K, filed with the SEC on November 7, 2018). Amendment No. 2 to Credit Agreement and Bank Joinder Agreement, dated as of May 1, 2019, between 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 as of May 1, 2019, between 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 (incorporated by reference to Exhibit 10.1 to CME Group Inc.'s Form 8-K, filed with the SEC on May 6, 2019).</u>
10.20	<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>
10.21	<u>Commercial Paper Issuing and Paying Agency Agreement, dated as of September 26, 2014, between CME Group Inc. and Bank of America, National Association, as Issuing and Paying Agent (incorporated by reference to Exhibit 4.2 above).</u>
10.22	<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 4.3 above).</u>
10.23	<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 4.4 above).</u>
21.1*	<u>List of Subsidiaries of CME Group Inc.</u>
23.1*	<u>Consent of Ernst & Young LLP.</u>
31.1*	<u>Section 302—Certification of Terrence A. Duffy.</u>
31.2*	<u>Section 302—Certification of John W. Pietrowicz.</u>
32.1*	<u>Certification Pursuant to 18 U.S.C. Section 1350, as Adopted Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.</u>
101	The following materials from CME Group Inc.'s Quarterly Report on Form 10-K for the year ended December 31, 2019, 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) Consolidated Statements of Cash Flows and (vi) 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, 2019, formatted in Inline XBRL.

* Filed herewith.

- (1) Management contract or compensatory plan or arrangement.
- (2) Confidential treatment pursuant to Rule 406 of the Securities Act has been previously granted by the SEC for portions of this exhibit.

ITEM 16. FORM 10-K SUMMARY

None.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized, in the City of Chicago and State of Illinois on the 28th day of February, 2020.

CME Group Inc.

By: /s/ JOHN W. PIETROWICZ
John W. Pietrowicz
Senior Managing Director and Chief Financial Officer

Signature	Title
/s/ TERRENCE A. DUFFY	Chairman of the Board, Director and Chief Executive Officer
Terrence A. Duffy	
/s/ JOHN W. PIETROWICZ	Senior Managing Director and Chief Financial Officer
John W. Pietrowicz	
/s/ JACK TOBIN	Managing Director and Chief Accounting Officer
Jack Tobin	
/s/ TIMOTHY S. BITSBERGER	Director
Timothy S. Bitsberger	
	Director
Charles P. Carey	
/s/ DENNIS H. CHOOKASZIAN	Director
Dennis H. Chookaszian	
/s/ ELIZABETH A. COOK	Director
Elizabeth A. Cook	
/s/ ANA DUTRA	Director
Ana Dutra	
/s/ MARTIN J. GEPSMAN	Director
Martin J. Gepsman	
/s/ LARRY G. GERDES	Lead Director
Larry G. Gerdes	
/s/ DANIEL R. GLICKMAN	Director
Daniel R. Glickman	
/s/ YRA G. HARRIS	Director
Yra G. Harris	
/S/ GEDON HERTSHTEN	Director
Gedon Hertshten	
/s/ WILLIAM H. HOBERT	Director
Wiliam H. Hobert	
/s/ DANIEL G. KAYE	Director
Daniel G. Kaye	
/s/ PHYLLIS M. LOCKETT	Director
Phyllis M. Lockett	

/s/	DEBORAH J. LUCAS	Director
	Deborah J. Lucas	
/s/	RONALD A. PANKAU	Director
	Ronald A. Pankau	
/s/	TERRY L. SAVAGE	Director
	Terry L. Savage	
/s/	WILLIAM R. SHEPARD	Director
	William R. Shepard	
/s/	HOWARD J. SIEGEL	Director
	Howard J. Siegel	
/s/	MICHAEL A. SPENCER	Director and Special Advisor
	Michael A. Spencer	
/s/	DENNIS A. SUSKIND	Director
	Dennis A. Suskind	
/s/	ROBERT J. TIERNEY JR.	Director
	Robert J. Tierney Jr.	